

Revision of the Indo-African *Pachycerus* Schoenherr, 1823, with a description of four new species (Coleoptera: Curculionidae: Lixinae)

MASSIMO MEREGALLI*

Department of Animal and Human Biology, University of Torino, V. Accademia Albertina 13, 10123 Torino, Italy

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The Indo-African species of the genus *Pachycerus* (Curculionidae: Lixinae: Cleonini) are revised. The identification of *Cleonus senegalensis* Gyllenhal, 1834 is discussed, its holotype rediscovered and the synonymy between *C. senegalensis* and *Ammocleonus hieroglyphicus* (Olivier, 1807) is confirmed. A neotype is established for *Pachycerus opimus* (Gyllenhal, 1834). Lectotypes for *Pachycerus vestitus* (Fåhræus, 1834), *Pachycerus badeni* (Faust, 1888), and *Pachycerus sellatus* Faust, 1904 are designated. *Pachycerus sahelicus* sp. nov. (type locality: Senegal, Bambey), *Pachycerus hippali* sp. nov. (type locality: Saudi Arabia: Jeddah, Taif), *Pachycerus barclayi* sp. nov. (type locality: southern India: Manapparai), and *Pachycerus simonae* sp. nov. (type locality: Morocco, Western Sahara, Cap Boujdour) are described. Some remarks on taxonomy and biogeography of the species are added.

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ADDITIONAL KEYWORDS: biogeography – Cleonini – Indo-African fauna – Sahel – taxonomy – typification.

INTRODUCTION

The study of several specimens of *Pachycerus* Schoenherr, 1823 allowed the taxonomy, nomenclature, and distribution of some species of the genus to be reconsidered. A previous paper (Meregalli, 2002) provided information on nomenclature, and included the description of *Pachycerus somaliensis* Merregalli, 2002. Relationships between *Pachycerus* and *Rhabdorrhynchus* Motschulsky, 1860, with a characterization of the two genera, were discussed by Merregalli (2008). A revision of the Indo-African taxa, with the description of four new species, is proposed here.

MATERIAL AND METHODS

Specimens used in this study are conserved in the following museums and private collections: BMNH, The Natural History Museum, London, UK; CSNV,

coll. Talamelli, Centro Studi Naturalistici Valconca, Italy; FRE, coll. Fremuth, Hradec Kralove, Czech Republic; MER, coll. Merregalli, Torino, Italy; MNHN, Muséum national d'Histoire naturelle, Paris, France; NHMB, Naturhistorisches Museum, Basel, Switzerland; NHRS, Naturhistoriska Riksmuseet, Stockholm, Sweden; NMW, Naturhistorisches Museum Wien, Austria; RMCA, Royal Museum for Central Africa, Tervuren, Belgium; SMTD, Staatliche Naturhistorische Sammlungen, Dresden, Germany; ZMHB, Museum für Naturkunde der Humboldt-Universität, Berlin, Germany. The labels are reported verbatim: hw, handwritten; pr, printed. Notes by the author are given in square brackets []. Almost all of the specimens were dissected: female genitalia were embedded in Solacryl (Medika, Prague, Czech Republic) or were stored in microvials with glycerol; male genitalia were mounted dry. Genitalia preparations, including those in the microvials, were pinned below the specimen from which they were dissected. Photographs were taken with a Nikon Coolpix 4500

*Corresponding author. E-mail: massimo.meregalli@unito.it

camera, with some using a Wild M5A stereomicroscope, and were enhanced with Photoshop 7.0 (Adobe Systems Incorporated) and Combine ZM (<http://micropics.org.uk/index.htm>). The terminology mainly follows that of Van den Berg (1972) and Aslam (1963). Measurements were taken under the stereomicroscope with a micrometric graduated ocular; the length of the body refers to the length measured from the head to the apex of the elytra, measured with the insect in lateral view, and excludes the rostrum length (unless otherwise indicated).

TAXONOMY

The genus *Pachycerus*, whose type species is *Pachycerus segnis* (Germar, 1824), includes about 15 species (there is uncertainty regarding the Palaearctic fauna, which has not been recently revised). It is present in the Palaearctic region, from the Mediterranean to eastern Asia (China), and, with different groups of species, in Central and Southern Africa, and in India and neighbouring countries. Together with some related genera, it apparently belongs to a basal clade in the tribe Cleonini (Meregalli & Silvestro, 2008).

Main characters of *Pachycerus*: Cleonini of usually small to medium size (7–12 mm), winged (excepting one species); vestiture composed of simple or digitate scales; rostrum short, straight, thickened towards apex in lateral view, subquadrate in cross section, with usually distinct median and dorsolateral keels, seldom with the former missing, epistoma often slightly prominent at middle; antennae with scape short, not or barely longer than funicle; this with segments II–VI not or barely longer than wide, segment I usually slightly longer than II; eyes large, ovate-elliptical; pronotum usually with a rhomboidal discal impression, in many species with granules at its sides, seldom scarcely distinct; sides with a stripe of whitish scales; elytra flattened, declivity long and oblique, never sharp; tarsi relatively short, segment III with narrow lobes, approximately as long as, or moderately longer than, segment II; adhesive pad on underside of tarsi seldom complete, usually more or less reduced; claws connate at mid-length, scarcely divergent; ventrites flattened in male, very convex in female, usually with a few round bare spots, regularly aligned; aedeagus tubular, weakly curved, and with a subacute apex; sternum VIII of female with a narrow basal apodeme, plate more or less sclerotized; hemisternites broad, with a dense basal glandular mass, usually angularly compressed apically; styli triangular or cylindrical, apical.

The first species of *Pachycerus* of the Indo-African fauna to be described was *Cleonus opimus* Gyllenhal,

1834, from Senegal. A further species, *Cleonus vestitus* Fåhræus, 1842 was described from the White Nile River, in Sudan. These two species were transferred to *Pachycerus* by Chevrolat (1873). Faust (1888) named *Gonocleonus badeni* Faust, 1888, from Madagascar, which was later transferred to the genus *Pachycerus* (Faust, 1904), and *Pachycerus sellatus* Faust, 1904, from Bengal. Fairmaire (1897) described *Pachycerus spinipennis* from Madagascar, a synonym of *Pachycerus badeni* (Faust, 1888). Tewfik (1942) diagnosed *Cleonus (Pachycerus) efflatouni* Tewfik, 1942 from Yemen, and Meregalli (2002) described *P. somaliensis* from Somalia. A further African species formerly attributed to *Pachycerus* by Faust (1904) was *Lixus granulatus* Olivier, 1807, from Southern Africa. This is an enigmatic taxon, the generic identity of which has not yet been ascertained, although Meregalli (2002, 2008) excluded it from *Pachycerus*. Based on studies in progress (M. Meregalli & D. Silvestro, unpubl. data), this seems to be a relict, rather basal taxon, possibly intermediate between the *Pachycerus* clade and other basal clades of the tribe. This species is not reconsidered here.

THE IDENTITY OF *CLEONUS SENEGALENSIS* GYLLENHAL, 1834

The collections examined in this study included specimens from some of the Sahel countries, including an apparently new species. From this region, Gyllenhal (in Schoenherr, 1834) described *Cleonus senegalensis* Gyllenhal, 1834. This taxon is presently regarded as a synonym of *Ammocleonus hieroglyphicus* (Olivier, 1807) (Csiki, 1934), but it was listed by Dejean (1837) in the genus *Pachycerus*, thus its type specimen needed to be examined in order to ascertain its true identity. The specific epithet was attributed to Chevrolat: in fact the heading of the description reads '*C. SENEGALENSIS*. Chevrolat'. After the diagnosis, the word '*nominatum*' in the singular, '*Senegalia*. *Ita nominatum, ex Musaeo suo, ad describendum, amice communicavit Dom. CHEVROLAT*' (Senegal, named after that country, kindly conveyed for description by Mr. Chevrolat, from his collection) suggests that only a single specimen, from Chevrolat's collection, was examined. The first reference to a *C. senegalensis* is found in Dejean (1837), who listed it under the genus *Pachycerus* as '*P. Senegalensis* Dej.'. The species, as *Cleonus*, was then briefly cited in Schoenherr (1842), probably by Fåhræus, who compiled the *Cleonus* section, but no further data were added. Chevrolat (1873) associated this name with *Leucosomus hieroglyphicus* (Olivier, 1807) (= *A. hieroglyphicus*), as a different but very closely related species. Faust (1904) did not mention *senegalensis*, and Csiki (1934), expanding Chevrolat's concept, reduced it to a

synonym of *A. hieroglyphicus*. This is a very widespread species, ranging from Southwest Asia to West Africa, including Senegal.

A part of Gyllenhal's collection is preserved at the Evolutionmuseum of Uppsala University, but no specimen of *C. senegalensis* is present there (Hans Mejlön, pers. comm.). A small part of Chevrolat's collection is still preserved at MNHN, but no specimen referable to *C. senegalensis* could be recognized there. The largest part of Chevrolat's collection is housed at NHRS. One specimen identified as *Leucosomus senegalensis*, and belonging to *A. hieroglyphicus*, is labelled 'Egypt, e dom. Mannherheim', thus it cannot be the type of *C. senegalensis*. No specimen explicitly labelled Senegal was found among those identified as *L. hieroglyphicus*.

Four female specimens are preserved in Schoenherr's collection, all originally from Chevrolat's collection: three are under an identification label '*Cleonus senegalensis*', and one is under an identification label '*Leucosomus senegalensis*'. The first three specimens belong to two different species of *Pachycerus*, and they bear the following labels: **Specimen 1:** 1. Senegal (light blue, hw); 2. *senegalensis*, Dj Cat 3, 282 (light blue, hw); 3. Coll. Chevrolat (pr). **Specimen 2:** 1. square blank orange; 2. *naevulus* Buq, Cat Dj 3, p 282 (light blue, hw); 3. Typus (red, pr); 4. Coll. Chevrolat (pr). **Specimen 3:** 1. 472 (pr); 2. Coll. Chevrolat (pr). The third edition of Dejean's Catalogue was published in 1837, after the description of *C. senegalensis* (and *C. opimus*); the reference to this catalogue in the labels of two specimens suggests that they were introduced to Chevrolat's collection after 1837. The specimen identified as *L. senegalensis*, here defined as **Specimen 4**, bears the following labels: 1. square blank orange; 2. 157 (pr); 3. Typus (red, pr); 4. Coll. Chevrolat (pr). Can any of these specimens from the Chevrolat collection be the type of *C. senegalensis*?

The description of *C. senegalensis* is rather accurate, and many characters (reported below in *italics*) differ from those of specimen 1 (the differences are presented in square brackets []).

1. '*Cleonus ophthalmico* [= *Leucophyes pedestris* (Poda, 1761)] *longior*' (longer than *Cleonus ophthalmicus*) [much smaller, only half as long as *L. pedestris*].
2. '*Caput breve, ... fronte ad verticem usque canaliculata ... parce cinereo-squamulosum*' (head short, vertex canaliculate, sparsely scaly) [vertex not canaliculate, not scaly].
3. '*Rostrum ... plus duplo longius ... supra carina media alte elevata, apice bifida instructum*' (rostrum more than twice as long as head, above

with high middle keel, bifurcate at apex) [rostrum 1.5 times as long as head, median keel not bifurcate at apex].

4. '*Antennae ... piceae*' (antennae ... black) [antennae ferrugineous].
5. '*Thorax latitudine paulo brevior*' (pronotum slightly transverse) [pronotum very transverse].
6. '*Scutellum triangulare, demersum, dense squamulosum*' (scutellum triangular, prominent, densely scaly) [scutellum very small, barely visible, not scaly].
7. '*Elytra ... thorace quadruplo longiora ... subremote punctato-striata ... lateribus et apice dense cinereo-squamulosa, plaga magna antice fere nude*' (Elytra three times as long as pronotum, indistinctly punctured, sides and apex with dense grey scales, with a broad bare patch) [elytra three times as long as pronotum, striae with distinct round punctures, vestiture relatively uniform on dorsum and side, lacking a broad, not scaly patch].
8. '*Tarsi ... articulis longius producti, acuminatis*' (tarsal segments elongate, acuminate) [tarsal segments short, as long as wide, not acuminate].
9. '*Observ. – Statura, magnitudine et facie Bothynoderi mendico* [= *Pycnodactylus mendicus* (Gyllenhal, 1834)]' (size and aspect of *P. mendicus*) [completely different from *P. mendicus*].

It is thus possible to exclude the possibility that the description of *C. senegalensis* refers to specimen 1, which is considerably smaller than *L. pedestris*, and completely dissimilar from *P. mendicus*. This specimen belongs to an as yet undescribed species of *Pachycerus*, which will be described here as *Pachycerus sahelicus* sp. nov.

Specimens 2 and 3 belong to *Pachycerus opimus* (Gyllenhal, 1834). Several of their morphological traits (pronotum with a narrow linear keel, ventrites with bare dots, etc.) contrast with the description of *C. senegalensis*, which cannot have been based on these specimens.

Specimen 4 belongs to *A. hieroglyphicus*. It corresponds perfectly with the description, in all details. Of particular significance is the sentence '*Elytra ... plaga magna antice fere nude*' (elytra with a broad bare patch): this is in fact an old specimen lacking scales on most of its elytral surface, which thus appears bare. This specimen is therefore recognized as the holotype of *C. senegalensis*, and the synonymy with *A. hieroglyphicus* is confirmed. The attribution of this specimen to the genus *Leucosomus*, made by Chevrolat (1873), was evidently maintained when his collection was merged with the Schoenherr's collection. The following labels have been added to this specimen: 5. *Cleonus senegalensis* Gyllenhal, 1834, Holotypus, Meregalli 2008 vidit

KEY TO THE INDO-AFRICAN SPECIES OF *PACHYCERUS*

1. Elytral scales simple, lanceolate, or aciculate.....2
- Elytral scales bifid, at least in apical half.....5
2. Micropterous, scales round, very dense, whitish, completely covering integument. Length 10.6 mm. Somalia.
.....*Pachycerus somaliensis* Meregalli, 2002 (see Meregalli, 2002 for the description and data)
- Macropterous, scales elliptical, not hiding integument on the whole surface.....3
3. Sides of pronotum widened anteriorly before apex and with a large, sharply conical tubercle at mid-length.
Length: 7.0–8.9 mm. Madagascar.....*Pachycerus badeni* (Faust, 1888)
- Sides of pronotum not widened anteriorly before apex, and with a small, scarcely prominent hump at mid-length..
.....4
4. Elytra with four very distinct round black spots, two near humeri and two on declivity; pronotum devoid of vestiture
on disc; underside of rostrum with pentafig scales. Length: 12.0 mm (probably with rostrum). Yemen.....*Pachycerus efflatouni* (Tewfik, 1942)
- Elytra lacking distinct bare round spots on humeri and declivity; pronotum with vestiture of whitish scales on disc;
underside of rostrum with bifid scales. Length: 7.5–10.4 mm. Sahel regions of Africa.....*Pachycerus sahelicus* sp. nov.
5. Elytra with dense, long, erect setae, as long as the intervals, in several series on odd intervals, and in one series
on even intervals. Length: 9.2–10.3 mm. Sudan; West Africa.....*Pachycerus vestitus* Fähræus, 1842
- Elytra without setae or with short, moderately distinct setae.....6
6. Elytra with short but distinct semi-erect setae; scales bifid, nearly from base.....7
- Setae on elytra microscopic, indistinct or shorter than the scales; scales bifid, connected up to mid-length.....8
7. Sides of vertex raised above eyes. Length: 5.9–8.7 mm. India, Pakistan, and Burma.....*Pachycerus sellatus* Faust, 1904
- Sides of vertex not raised above eyes. Length: 10.4–14.3 mm. Southern Morocco.....*Pachycerus simonae* sp. nov.
8. Head with raised tubercles above eyes; space between eyes smaller than rostrum at base.....9
- Head smooth, lacking tubercles above eyes; space between eyes larger than rostrum at base. Length: 11.5 mm.
Southern India.....*Pachycerus barclayi* sp. nov.
9. Apex of aedeagus subtruncate, lamella oval (Fig. 28); cornu of spermatheca not acuminate; hemisternites broad
(Fig. 18); sides of pronotum converging forwards, dorsolateral impressions sharp, granules low, scarcely convex;
length/width of elytra > 1.5. Length: 10.7–13.9 mm. Senegal, Mauritania, southern Morocco.....*Pachycerus opimus* (Gyllenhal, 1834)
- Apex of aedeagus acute, lamella triangular (Fig. 27); cornu of spermatheca narrowed at apex; hemisternites
S-shaped, narrow (Fig. 19); sides of pronotum parallel, dorsolateral impressions shallow; granules distinctly
convex; length/width of elytra, 1.4. Length: 12.2–12.4 mm. Saudi Arabia, Egypt, and Sudan.....*Pachycerus hippali* sp. nov.

(red, pr); 6. *Cleonis senegalensis* = *Ammocleonis hieroglyphicus* (Olivier, 1807), 2008 Meregalli det. (pr).

PACHYCERUS OPIMUS (GYLLENHAL, 1834)

Cleonus opimus Gyllenhal, 1834: 185.

Pachycerus opimus (Gyllenhal): Chevrolat, 1873: 110.

Pachycerus opimus: Faust, 1904: 223.

Cleonus (Pachycerus) opimus: Csiki, 1934: 53.

Cleonus (Pachycerus) opimus: Alfieri, 1976: 255.

Type specimen: not found.

Neotype female (designated here): 1. Blank orange label; 2. *naevulus* Buq, Cat Dj 3, p 282 (light blue, hw); 3. Typus (red, pr); 4. Coll. Chevrolat (pr); 5.

Cleonus opimus Gyll. 1834, Neotypus, 2007 Meregalli des. (red, pr) (NHRS, coll. Schoenherr, drawer # 186).

Other specimens: Senegal: ‘Senegal, Baden’ 1 ♀; ‘Senegal, Dämel’ 1 ♀ (coll. Faust, SMTD); ‘Senegal’ 1 ♀ (BMNH); ‘*Pachycerus senegalensis* Dej Buq/Senag./34888/185/= 138 Faust’, 1 ♂ (ZMHB); ‘Mauritania ‘Sénégal, Rosso à Boutilimit, 8.X.47, Miré’, 1 ♀ (MNHN, coll. de Peyerimhoff); Morocco: ‘Rio de Oro, Ouad Zammel [22°14’N, 15°45’W], IV. Mateu’, 1 ♀ (MNHN, coll. de Peyerimhoff). No data: ‘472/coll. Chevrolat’, 1 ♀ (NHRS); Madagascar (dubious locality): ‘Madagasc., Tipitz’, 1 ♂ (SMTD).

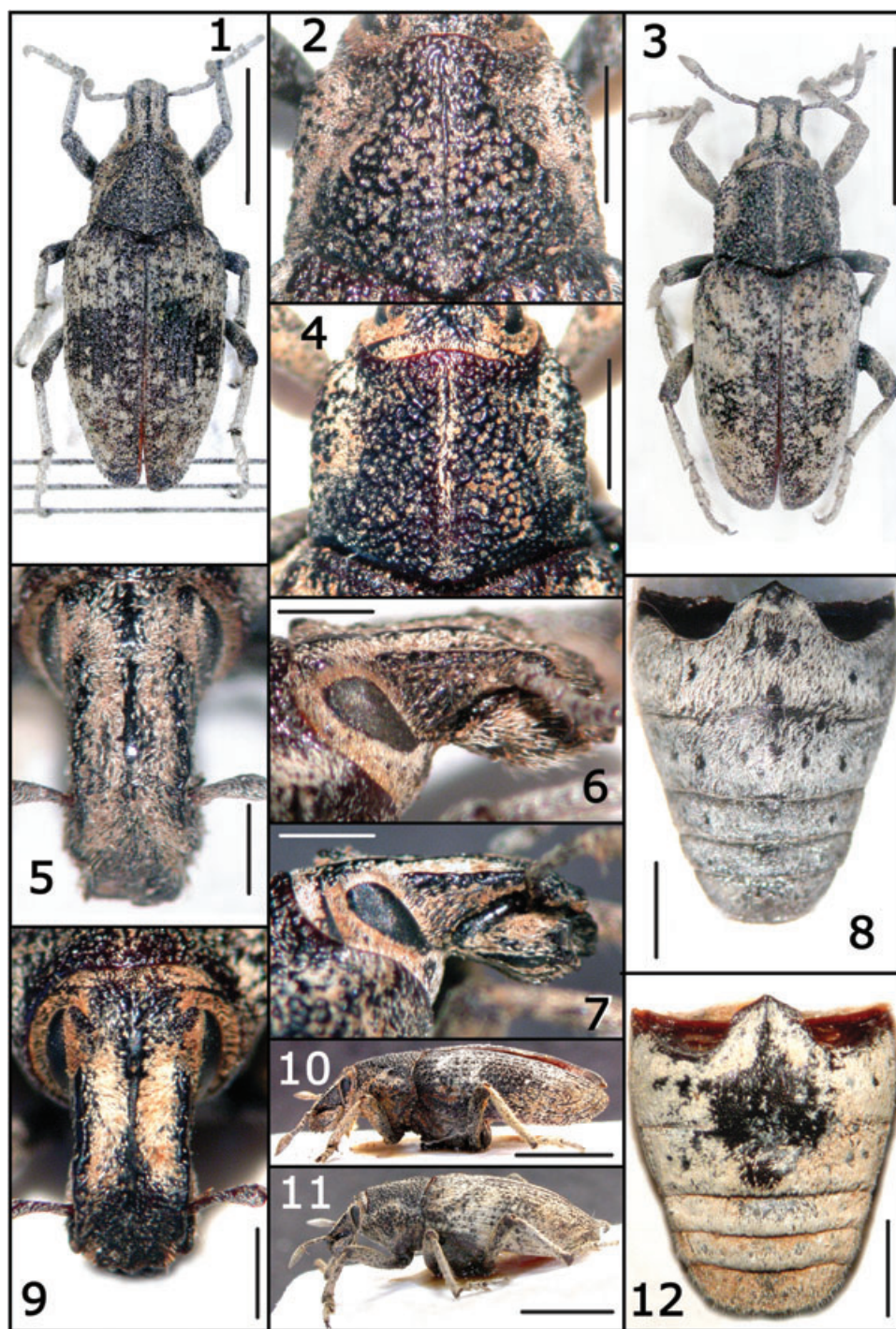
Type: There are analogies between the description of *C. opimus* and that given in the same work by Gyllenhal (1834) for *C. senegalensis* discussed above. In

both cases Gyllenhal received the specimens from Chevrolat, as the sentence '*Senegalia. Ex Musaeo Dom Chevrolat, sub hoc nomine ad describendum amice communicatus*' (Senegal, from Mr. Chevrolat's collection, kindly conveyed under this name for description) confirms. It also suggests that only a single specimen ('*communicatus*', in singular) was examined. *Cleonus opimus* was then briefly cited in Schoenherr (1842), probably by Fåhræus, who compiled the *Cleonus* section, without adding further data. Although the genus *Pachycerus* had already been proposed (Schoenherr, 1823), only Chevrolat (1873) included *C. opimus* in it. Chevrolat (1873: 110) also referenced a synonym of *P. opimus*, '*Navosus* Buqt., var. *Linegalensis* [sic], Dej., Cat., 3, p. 282'. This (misspelled) reference evidently refers to Dejean (1837: 282), where the names '*Pachycerus Naevosus* Buquet' and '*P. Senegalensis* Dej.' were listed. It is surprisingly similar to the label of one of the specimens found in Schoenherr's collection, originally from Chevrolat, listed under *C. senegalensis*, which reads '*naevulus* Buq, Cat Dj 3, p 282'. This suggests that Chevrolat was referring to this specimen when he wrote the synonymic note. The epithet *naevosus* (or *navosus* or *naevulus*) Buquet does not seem to have been validly described, and is not cited by Sherborn (1922–1933). The type specimen of *C. opimus* could not be found in the collections examined, so a neotype may be designated. Whether a neotype designation for *P. opimus* fulfils the provisions of article 75, ICZN (1999), in particular the 75.3 'qualifying conditions', should be questioned. Although the identity of *P. opimus* was never questioned [indeed, it was seldom cited in the literature, and never appeared in any taxonomic paper after Faust (1904)], the sympatry of this species with three other taxa of the genus, the very old description, the absence of any original illustration, and the presence of the sister species *P. hippali* sp. nov. in Arabia and East Africa suggest that it is advisable to fix the usage of the epithet. The historical specimen originally belonging to Chevrolat's collection, now conserved at NHRS in Schoenherr's collection, seems to be a good candidate, and it is therefore designated here as the neotype of *C. opimus*.

Measurements: Body length excluding rostrum: 13.95 mm. Rostrum: length, 2.83 mm; width, 1.49 mm; ratio, 1.90. Pronotum: length, 3.66 mm; width, 4.48 mm; ratio, 0.82. Elytra: length, 9.57 mm; width, 6.12 mm; ratio, 1.56. Ratio of elytral to pronotal length: 2.61 (neotype).

Redescription: Body oval, integument glossy, black, with simple and bifid whitish scales (Figs 1, 10). Rostrum robust, quadrangular in transverse section,

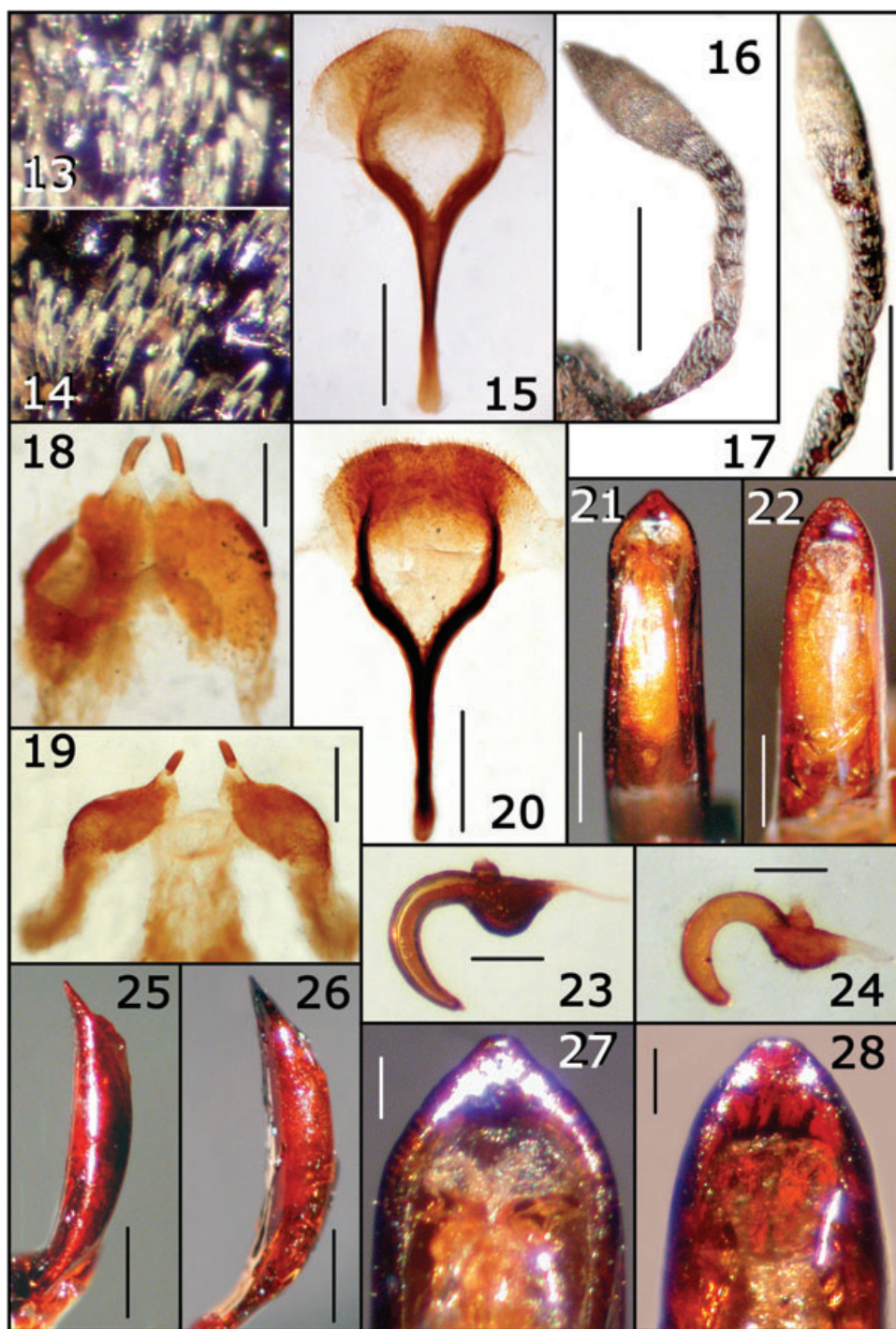
dorsolateral margins keeled, glossy, sparsely punctured, subparallel, barely broadened apicad, median keel convex, broad, smooth, with a single basal puncture beyond head, anteriorly reaching antennal insertion, where a shallow elongated fovea is sometimes present; dorsum weakly depressed in the two furrows delimited by the central and lateral keels; apical plate flattened, depressed, with a slightly raised median line; epistoma weakly prominent at middle; surface in the large furrows rough, with very dense irregular puncturation; in lateral view rostrum nearly straight up to antennal insertion, then strongly curved to apex, thickened from base to mid-length, underside convex; upper margins of scrobes curved, weakly sinuate basad, extended towards lower margin of eyes, but separated from the eyes by a short scaly space; lower margin of scrobes shortly curved downwards, reaching underside of rostrum near its base; scrobes very deep, slightly broadened basad. Vestiture composed of oval-lanceolate whitish or white-yellowish scales, nearly centripetal, and densely covering integument on dorsal furrows and less dense, forwards or outwards directed on apical plate; scales bifid, but with very short teeth on dorsal furrows, and simple and narrower towards apex, on apex, transformed into slightly erect setae; on sides narrow, sparse on triangular plate beyond eyes, and more dense, mixed with some white setae on pregenae (Figs 5, 6). Antennae short, scaly, scape shorter than funicle, moderately curved forwards, and thickened from base; segment I of funicle conical, twice as long as wide, segment II as long as wide, segments III–VII progressively broadened and transverse; club very slender, finely hairy, segment I with barely apparent basal glossy scales, segments II and III together longer than segment I, apex long and acuminate (Fig. 16). Head transverse, densely and roughly punctured, with two tubercles above eyes; vertex finely keeled at centre, in correspondence with the base of the median keel of rostrum; base of head with a distinct transversal keel, slightly curved forwards; eyes large, elongate, slightly convex, and broadened on upper half. Pronotum large, convex, base obliquely prominent towards elytra, broadly curved at centre towards scutellum, sides subrectilinear, weakly convergent, maximum width near base, shortly convergent at apex; apex curved, prominent over head; postocular lobes weakly distinct; dorsum with a barely raised, very narrow median keel, higher near apex, sometimes finely channelled, particularly at mid-length, and slightly broadened in a glossy granule on disc; dorsum of pronotum in its median part with an approximately triangular convex area, broadened from apex to base, deeply and densely punctured, margins of the punctures glossy, irregularly convex, forming small granules and short keels;



Figures 1–12. *Pachycerus opimus* (Gyllenhal, 1834), neotype female: body (1, 10); rostrum (5, 6); pronotum (2); ventrites (8). *Pachycerus hippali* sp. nov., holotypus: body (3, 11); rostrum (7, 9); pronotum (4); ventrites (12). Scale bars: 1, 3, 10, 11, 5 mm; 2, 4, 8, 12, 2 mm; 5–7, 9, 1 mm.

dorsolateral part of pronotum, by sides of the median convexity, flattened–depressed, broadened anteriorly, with smooth, rough integument, sparsely granulose; sides weakly compressed, particularly forwards, with

some large, glossy isolate granules. Vestiture composed of whitish oval scales, bifid in apical half, relatively dense in the anterior dorsolateral depressions, and extended near to base with a few patches;



Figures 13–28. *Pachycerus opimus* (Gyllenhal, 1834), neotype female: antenna (16); detail of elytral scales (13); sternite VIII (15). *Pachycerus opimus*, Senegal, female: hemisternites (18); spermatheca (24). *Pachycerus opimus*, Senegal, male: aedeagus, dorsum, profile and lamella (22, 25, 28). *Pachycerus hippali* **sp. nov.**, holotypus: antenna (17); detail of elytral scales (14); aedeagus, dorsum, profile and lamella (21, 26, 27). *Pachycerus hippali* **sp. nov.**, Kordofan, paratypus female: sternite VIII (20); hemisternites (19); spermatheca (23). Scale bars: 15–17, 20–22, 25, 26, 1 mm; 18, 19, 0.5 mm; 23, 24, 27, 28, 0.2 mm.

very scarce on median convexity, and often present along the median keel (Fig. 2). Scutellum: small and triangular. Elytra oval, at base as wide as thorax base, widened at humeri, with maximum width near base, sides nearly parallel, slightly compressed beyond humeri, more strongly converging after mid-length, broadly rounded at apex; in lateral view nearly completely flattened from base to apex, declivity not curved downwards, indistinct; intervals broader than striae, very slightly convex, irregularly sculptured, with punctures as well as transverse wrinkles, and sparse, small glossy granules, usually larger towards base and apex, and relatively prominent, sharper along lateral intervals, lateral margin, and near apex; base with raised broad and sculptured irregular humps at beginning of intervals 2–3 and 4–5; striae narrower than intervals, scarcely delimited, with irregular, barely differentiated shallow, round or elongate punctures, often fused in narrow furrows. Vestiture composed of whitish scales of variable size, with a few as long as wide, bifid up to near base, and with the majority longer, glossy white, connate up to mid-length (Fig. 13), disposed in relatively dense patches, not hiding integument, and absent on two large bare patches near mid-length, where only small, round spots of scales are sometimes present. Legs slender, scaly, with usually single, in part bifid, acuminate glossy scales, and with moderately erect setae, more dense on tibiae; femora very scarcely broadened at middle, fore tibiae narrow, rectilinear, scarcely broadened at apex, with an apical fringe of strong denticles; middle and hind tibiae shorter and straight; tarsi slender, all segments with glossy white simple scales and setae, segment I triangular, as long as wide, segment II subcylindrical, slightly wider than long, segment III with small lobes; onychium nearly as long as the first three segments of tarsi, claws weakly widened, connate up to the middle. Underside of tarsi with a highly reduced adhesive pad, limited to the median part of segment III, and with some spiny setae on sides. Ventrites convex, segments I and II of the same length, segments III and IV half as long as segment II, segment V transverse, weakly impressed near apex on female, flat on male. Vestiture dense, with bifid or trifurcate elliptical scales, with very narrow teeth, particularly the central one, with four small bare spots on segment I, six spots on segment II, and two lateral spots on segments III and IV, bare spots not always clearly delimited (Fig. 8). Sternite VIII of female subquadrate, with apodeme nearly as long as plate; arms strong, gently divergent, curvilinear, moderately widened, window of plate not sclerotized on basal and median parts; sclerotization of apex of plate broad, uniform between apex of arms; margin with dense short setae (Fig. 15). Spermatheca slender,

curved, cornu thick, not acuminate, curved at 90° with respect to nodulus, which is straight and thickened (Fig. 24); hemisternites broadened up to apex, not angularly constricted; styli cylindrical and slender (Fig. 18). Aedeagus tubular, slender, with median lobe scarcely curved, apical lamella gently tapering, and subtruncate at apex (Figs 22, 25, 28).

Variation: The range of variation is relatively conspicuous. The body length ranges between 10.69 and 13.95 mm, and the length:width of the elytra is always greater than 1.50; the sculpture is always relatively dense and deep, but in some specimens the granules are higher and more frequent, and more distinct among the scales; the anterior part of the pronotum always has the typical dorsolateral broad impressions, which usually have some granules inside, visible among the scales; the median keel can be more or less complete from base to apex, although it is always scarcely distinct near the base, and higher in the anterior half; the integument can be strongly and deeply wrinkled and/or punctured, extremely irregular, or more shallowly sculptured. The bifid elytral scales can be round, with short teeth, or have slender teeth, connate at basal third. The female genitalia are relatively variable: the spermatheca is sometimes more slender, and its nodulus is less thickened; however, its apex is never acute in the specimens examined; the sternite VIII can have arms that are sublinearly broadened or more distinctly curved.

Affinities: The differences between *P. opimus* and the sister species *P. hippali* sp. nov. are discussed in the description of the latter species (also see Figs 1–28). *Pachycerus opimus* and *P. hippali* sp. nov. are very easily differentiated from all of the other species of the genus because of the very typical shape and sculpture of the pronotum (Figs 2, 4). In addition, *P. sahelicus* sp. nov. and *P. badeni* are smaller, and do not have bifid scales on the dorsum; the eyes, in lateral view, reach the upper margin of the head. These last traits should also allow the differentiation of *P. efflatouni*. *Pachycerus vestitus* has very long setae on the elytra. The northernmost population of *P. opimus* is nearly sympatric with *P. simonae* sp. nov., which differs in the vestiture composed of slender scales, connate at their base, and with long, narrow teeth, the longer rostrum, the vertex not raised above the eyes, the pronotum with isolate granules, and the sternite VIII of the female with fully sclerotized lamina.

Distribution (Fig. 108): *Pachycerus opimus* is found in the south-western Sahara and the western Sahel. The specimen from Wadi Aideb, a tributary of Wadi Kan-

sisrob (Egypt, Gebel Elba) cited by Alfieri (1976) belongs to the sister species, *P. hippali* sp. nov., which is diffused along the coasts of the Red Sea. The indication of Madagascar is doubtful: considering the broad gap between Madagascar and the range of the other specimens examined, the absence of any recent finding of this species from the island, and the extreme morphological similarity of this specimen with those from Senegal, including the shape of the aedeagus, a labelling error has very likely occurred.

***PACHYCERUS HIPPALI* SP. NOV.**

Type locality: Saudi Arabia, Jeddah, Taif, 20°17'N, 40°23'E.

Holotype male: Saudi Arabia: 'Jeddah – Taif [20°17'N, 40°23'E], 200–600 m, 1.V.1979 / KAU-NHMB 1979, Exp. N. Hedjaz', 1 ♂ (NHMB).

Paratypes: Egypt: 'Egypte, Gabal Elba, W. Cansisrob [Wadi Kansisrob, 22°15'N, 36°32'W], 25.I.1933', 1 ex. (NHMB); Sudan: 'Kordofan, Grahm./34837/138/*opimus* Ghl.', 1 ♀ (ZMHB).

Diagnosis: A *Pachycerus* sister species to *P. opimus*, characterized by the aedeagus acutely pointed at the apex, the narrow, S-shaped hemisternites, the spermatheca with slender, acuminate cornu, the pronotum with subparallel sides, and the ratio length/width of the elytra less than 1.40.

Measurements: Body length excluding rostrum: 12.45 mm. Rostrum: length, 1.97 mm; width, 1.38 mm; ratio, 1.43. Pronotum: length, 3.25 mm; width, 3.97 mm; ratio, 0.82. Elytra: length, 7.45 mm; width, 5.37 mm; ratio, 1.38. Ratio of elytral to pronotal length: 2.29 (holotype).

Description (with characters of P. opimus in parenthesis): General aspect of *P. opimus*; ratio of elytral to pronotal length usually slightly lower (Figs 3, 11 vs. 1, 10). Rostrum with a narrow sharp median keel, and glossy raised dorsolateral keels, almost lacking punctures (median keel scarcely sharp, slightly obtuse; dorsolateral keels with several punctures) (Fig. 9 vs. 5). Antennae very similar, segment I of funicle slightly narrower at base (Fig. 17 vs. 16). Eyes nearly symmetrical, moderately broadened on upper part, and regularly rounded on superior margin (eyes relatively asymmetrical, slightly angular in the point of maximum width) (Fig. 7 vs. 6). Pronotum robust, with maximum width at middle of length, sides subparallel, with relatively dense convex glossy granules, base at centre with a slight indentation, dorsum with interspaces of granules narrow, high, dorsolateral

impression shallow, with several granules (pronotum with maximum width near base, lateral granules sparse, scarcely raised, flattened on top, base more acutely prominent, dorsum with scarcely differentiated punctures, interspaces scarcely raised) (Fig. 4 vs. 2). Elytra with narrow, barely defined striae, much smaller than intervals, punctures nearly indistinct, transformed in short, relatively deep furrows; integument deeply wrinkled; sides at apex shortly convergent behind weak subapical impression (striae smaller than intervals but clearly differentiated, with irregular but usually distinct round or elongate punctures, integument shallowly wrinkled, glossy; apex more elongated behind subapical impression). Vestiture with scales usually connate at basal third, and with long teeth (scales usually with very short teeth) (Fig. 14 vs. 13). Aedeagus with lamella broad, triangular, sides shortly convergent, apex subacute (aedeagus with regularly narrowed lamella, apex subtruncate) (Figs 21, 26–27 vs. 22, 25, 28). Hemisternites S-shaped, narrow, with cylindrical styli (hemisternites broad, oblong, not evidently S-shaped, styli longer) (Fig. 19 vs. 18); spermatheca with curved, slender cornu, subacute at apex (spermatheca with cornu short, scarcely curved, not acute at apex) (Fig. 23 vs. 24); sternum VIII not significantly differentiated (Fig. 20 vs. 15).

Variation: The two specimens from both sides of the Red Sea, Gabal Elba and Jeddah, are nearly identical. The specimen from Sudan has slightly shallower sculpture and deeper dorsolateral impressions of the pronotum. The ratio of elytral to pronotal length is constant in the three specimens examined (2.27–2.29).

Etymology: This species, diffused along the coasts of the Red Sea, is named after Hippalus. He was a Greek navigator and merchant who probably lived in the 1st century BCE, and was credited with discovering the direct route from the Red Sea to India over the Indian Ocean (Wikipedia contributors, 2008).

Distribution (Fig. 108): *Pachycerus hippali* sp. nov. is present all along the coasts of the Red Sea, and reaches Kurdufan, in central Sudan.

***PACHYCERUS SELLATUS* FAUST, 1904**

Pachycerus sellatus Faust, 1904: 223.

Cleonus (Pachycerus) Schenklingi Csiki, 1934: 53.

Lectotype male (designated here): 1. Square blank gold label; 2. ♂ Bengal, Baden (Faust's hw); 3. *sellatus* Faust (Faust's hw); 4. ex. coll. Faust (hw, yellow); 5. Type (pr, red); 6. Staatl. Museum für Tierkunde

Dresden (pr); 7. *Pachycerus sellatus* Faust, 1904, Lectotypus, 2007 Meregalli des. (red, pr) (SMTD).

Paralectotype female (designated here): 1. F. (small, hw); 2. *sellatus* Type (hw), det Faust (pr); 3. *sellatus* Fst (hw); 4. *sellatus* Fst, Ind. or. (pr); 5. *Pachycerus sellatus* Faust, 1904, Paralectotypus, 2007 Meregalli des. (red, pr) (NMW).

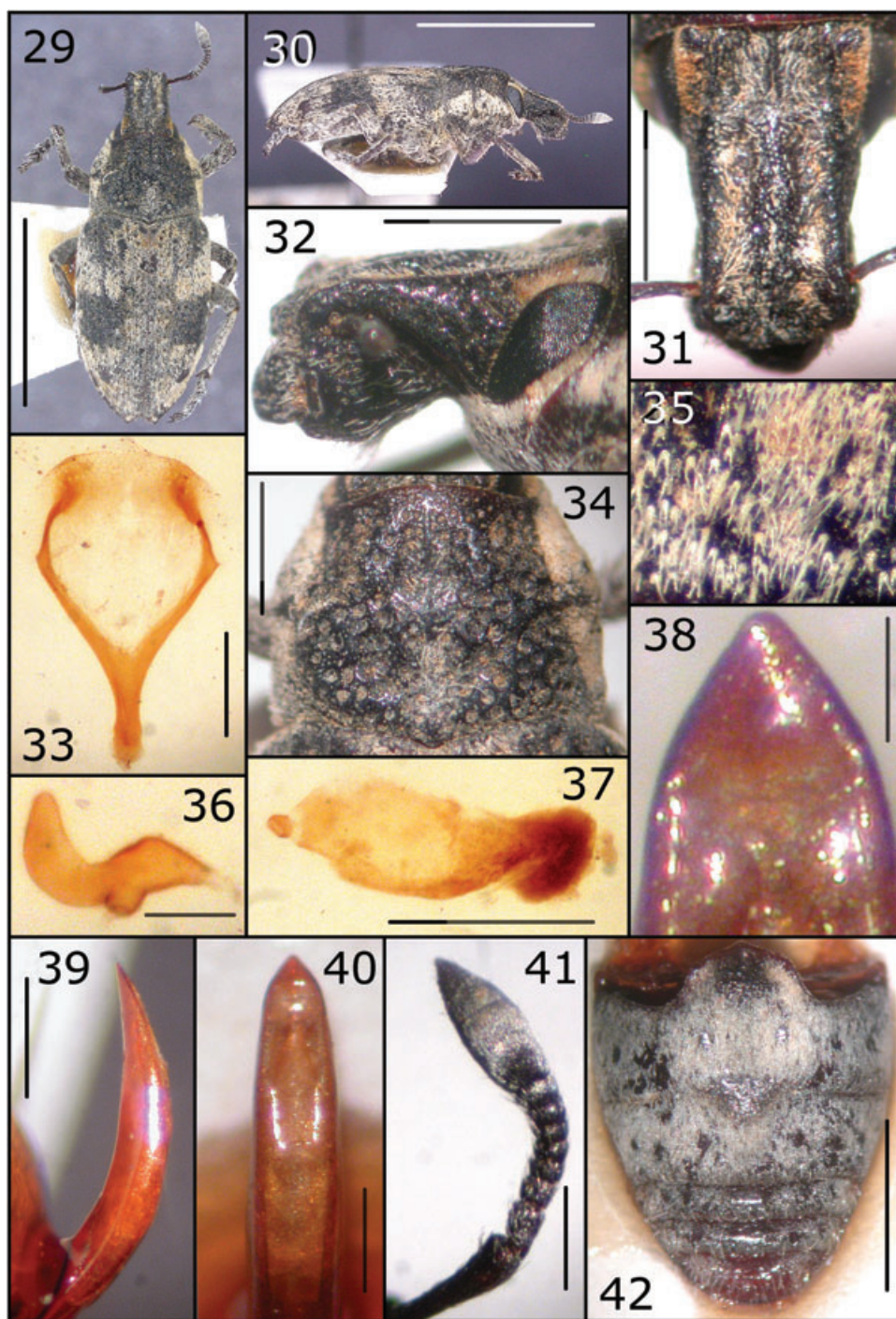
Other specimens: India: 'S. India, Salem [11°39'N, 78°09'E], 30-VIII-1934, P.S. Nathan', 7 ex. (6 BMNH, 1 MER); 'S. India, Mysore State, Shimoga [13°55'N, 75°34'E], 1865 ft., 6.V.1937', 2 exx. (BMNH); 'S. India, Mysore State, Shimoga, 1865 ft., 7.V.1937', 1 ex. (BMNH); 'N. India' 1 ex. (BMNH); Pakistan: 'India, Punjab, Murree Hills [33°54'N, 73°23'E], Thobba', 1 ex. (BMNH); 'West Pakistan, Rawalpindi Umg., Basal, 4-7.I.1956, Kalachitta Range, Chr. Lindemann leg.', 1 ♂ (NHMB, coll. Frey); Burma: 'Burma, Magwe pr., Seikpyu [20°53'N, 94°47'E], 100 m, 25-26.02.1996, leg. S. Kasantsev', 1 ♀ (MER); Nepal: 'Nepal: Kosi #5, Mangmaya 27°07'N, 87°15'E to Aki-bunkyabeshi 27°12'N, 87°15'E, 300-400 m, 30.V.2001/NHMB Basel, expedition to Nepal 2001' 1 ♀ (NHMB).

Type: In Faust's collection (SMTD), one specimen is preserved, designated here as the lectotype. A syntype is preserved at the NMW, which is designated here as the paralectotype. Csiki (1934) considered all *Cleonini* in the single genus *Cleonus* Schoenherr, 1826, and replaced the epithet *sellatus* with *schenklingi* to avoid junior secondary homonymy with *Cleonus sellatus* (Faust, 1894) (= *Chromonotus menetriesi* Faust, 1894). However, Csiki's substitute name was never used, and thus the junior secondary homonym is not to be rejected (Art. 59.3 ICZN).

Measurements: Body length excluding rostrum: 7.34 mm. Rostrum: length, 1.54 mm; width, 1.03 mm; ratio, 1.49. Pronotum: length, 2.12 mm; width, 2.69 mm; ratio, 0.79. Elytra: length, 6.13 mm; width, 4.07 mm; ratio, 1.50. Ratio of elytral to pronotal length: 2.89 (♀; Salem).

Redescription (Figs 29-42): Body oval, integument glossy, black, including legs; antennae very dark reddish, nearly black; vestiture with bifid scales and distinct setae (Figs 29-30). Rostrum stout, strong, subquadrate in transverse section, dorsolateral margins broadly and obtusely keeled, high, parallel, raised up to apex, minutely punctulate, and with some large round punctures; central keel high, more or less distinctly broadened from base to antennal insertion, with a deep median furrow from middle of length to antennal insertion; dorsum with deep

furrows delimited by the broad longitudinal keels; apex densely and deeply wrinkled, epistoma smooth, convex at middle, prominent in centre; in lateral view rostrum straight, moderately thickened at apex; upper margin of scrobes not keeled, smooth, weakly curved, directed to and nearly touching the lower apex of eyes; lower margin of scrobes subparallel with upper margin, curved downwards, short, reaching underside at base; scrobes deep, narrow; sides in front of eyes punctured. Vestiture relatively thick, composed of light-greyish bifid or simple scales, mainly inserted in the furrows, inward- or forward-directed here, and outward-directed at apex (Figs 31, 32). Antennae relatively narrow, scaly; scape short, straight, moderately thickened from base; segment I of funicle subcylindrical, as long as wide, segments II-VII short, transverse; club elliptical, covered with fine and glossy hairs, shorter than funicle, segment I at base with scarcely evident, very narrow scaly ring (Fig. 41). Head transverse, large, vertex flattened at centre, rough, and with some irregular punctures, raised laterally above eyes to a small conical hump; eyes large, elliptical, moderately convex on their upper part, lower margin rounded. Pronotum transverse, base scarcely curved, weakly prominent at middle towards scutellum, sides subparallel or barely widened from base to middle of length, then slightly bulging outwards, and regularly convergent at apex; apex feebly curved above head, postocular lobes distinct; disc with a broad, round, shallow impression, often formed by a smaller anterior and a larger posterior impression, separated by a median bulge, with dense irregular large punctures, median line not present, only slightly distinct near apex; dorso-lateral part with less densely impressed round punctures, with interspaces nearly as large as punctures, and with fine secondary punctulation; sides with sparse punctures and one distinct glossy granule at the margin between dorsum and sides, in the middle; vestiture composed of light-greyish bifid scales, sparse on disc, quite dense on a lateral stripe, its lower margin straight, upper margin curved or angular, prominent towards disc; setae scarce, limited to lower part of pronotum sides (Fig. 34). Scutellum: very small and nearly indistinct. Elytra oval, in lateral view elytra flattened, weakly and regularly curved, declivity feeble, barely distinct; at base as large as base of pronotum, distinctly widened at humeri, sides nearly rectilinear, regularly converging at apex, with small apical teeth scarcely distinct in front of interval 3; odd intervals weakly convex, higher and wider than even intervals, higher and broadened at base, surface smooth, lacking granules or wrinkles; even intervals narrow, nearly flat, irregularly delimited;



Figures 29–42. *Pachycerus sellatus* Faust, 1904, India, Salem, male: body (29, 30); rostrum (31, 32); antenna (41); pronotum (34); detail of elytral scales (37); ventrites (42); aedeagus (38–40). *Pachycerus sellatus*, Burma, female: sternite VIII (33); hemisternite (37); spermatheca (36). Scale bars: 29, 30, 5 mm; 42, 2 mm; 31, 32, 1 mm; 33, 34, 37, 39, 41, 0.5 mm; 36, 38, 0.2 mm.

striae broader than even intervals, composed of large, dense, round punctures, some of the interspaces of punctures forming short transverse ridges between neighbouring odd intervals; vestiture com-

posed of yellowish bifid scales, connate at base (Fig. 35), in part absent from base between intervals 4 and 9, completely absent from a broad median transverse subquadrate stripe between intervals 3

and 9, and from two round spots on declivity behind apex of interval 5, thus forming a relatively narrow transverse light sub-basal stripe, irregularly broadened on sides, and a more uniform vestiture behind middle of length; setae present, short, more visible in lateral view, more frequent and erect on declivity, usually settled in a single row on odd intervals. Legs relatively short, with simple elongate and acuminate scales, and long sparse setae; femora scarcely thickened at middle; fore tibiae short, straight, weakly broadened at apex, with a fringe of denticles; middle and hind tibiae shorter, weakly broadened from base to apex; tarsi short, segment I very short, conical, segment II transverse, segment III not longer than segment II, lobes very short, not widened; onychium as long as segments I–III of tarsi, claws strong, moderately divergent, connate up to middle of length; underside of tarsi without adhesive pad, replaced with a few scales and some spiny setae. Ventrite I as long as ventrite II, both longer than ventrites III–V combined; ventrite III and ventrite IV, each one quarter as the length of ventrite II, ventrite V slightly longer than ventrite IV, and transversely impressed near apex; vestiture composed of dense, slender, bifid scales, with six bare glossy round spots on ventrites I, eight on ventrite II, a central common spot between ventrites I and II, and six smaller and more irregular spots on ventrites III and IV; hair-like curved setae, more frequent and longer on ventrites IV and V (Fig. 42). Aedeagus slender, median lobe tubular, weakly and regularly curved; apical lamella shortly triangular (Figs 38–40); sternum VIII of female with short apodeme, arms broadened at middle, converging apicad, lamina nearly not sclerotized, sclerotization limited to apex of arms (Fig. 33); spermatheca robust, with short and thick, moderately curved cornu, narrowed towards apex, nodulus shortly thickened (Fig. 36). Hemisternites short, with angular apical constriction typical of the genus; styli short, apical (Fig. 37).

Variation: The few specimens examined are very variable. The male from Pakistan is smaller, with a length of 5.63 mm, and its vestiture hides the sculpture of the integument over the whole body; the pronotum is less transverse, with ratio length/width of 0.85, and the elytra have more evident and dense raised setae; the specimen from the neighbouring locality of Rawalpindi is, however, not particularly differentiated from the Indian specimens: the female from Burma has a distinctly stronger sculpture, with deeply impressed punctures on the pronotum and the elytral striae, and has a distinctly prominent lateral hump on the middle of the sides of the pronotum; the

specimens from southern India, Salem, are very similar to the type.

Affinities: At the southern limits of its range, *P. sellatus* is sympatric with *P. barclayi* sp. nov.: the differences between the two species are discussed after the description of the latter. The populations at the northern extremes of the range, in Pakistan, may be nearly sympatric with some Palaearctic taxa of *Pachycerus*, namely *Pachycerus desertorum* Faust, 1904 and *Pachycerus obliquatus* Faust, 1883, which are diffused in the Central Asian steppes. These species lack the supraorbital tubercle on the head, have the rostrum nearly twice as long as wide, the pronotum with glossy granules on disc, lacking round isolate punctures, and have the elytral setae shorter than the scales.

Distribution (Fig. 108): *Pachycerus sellatus* has a fairly broad range, from northern Pakistan to southern India, stretching east to Burma.

PACHYCERUS VESTITUS (FÄHRAEUS, 1842)

Cleonus vestitus Fähræus, 1842: 49.

Pachycerus vestitus: Chevrolat, 1873: 110.

Pachycerus vestitus: Faust, 1904: 223.

Cleonus (Pachycerus) vestitus: Csiki, 1934: 54.

Cleonus (Pachycerus) vestitus: Alfieri, 1976: 255.

Lectotype (designated here), probably male (not dissected): 1. W. Abiad [?] 1837 (hw); 2. Bahr el Abiad (pr); 3. '85' (pr); 4. '3.' (pr); 5. Hdb (pr); 6. Type (red, pr); 7. *Cleonus vestitus* Fähræus, 1842, *Lectotypus*, 2007 Meregalli des. (NHRS, coll. Schoenherr, drawer #187).

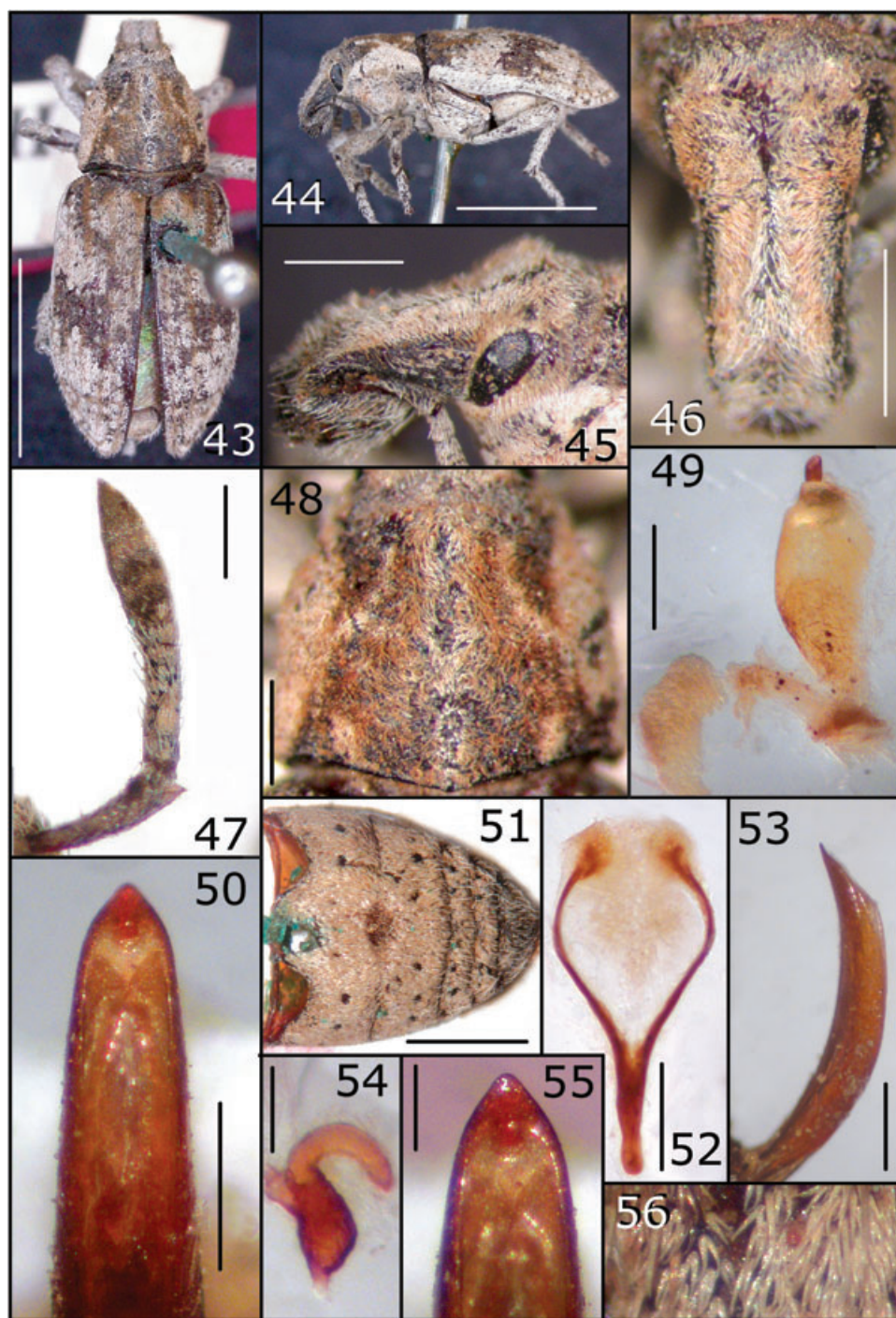
Other specimens: Sudan: 'Kordofan, Bedel', 1 ♀ (SMTD); Senegal: 'Senegal, Richter', 1 ♂ (SMTD); 'Seneg', 1 ♀ (BMNH); Guinea: 'Guinea', 1 ♂ (BMNH).

Type: The name *vestitus* probably comes from Schoenherr, whose acronym 'Schh.' is cited by side of the epithet, before the diagnosis; the description is signed by Fähræus. The description (Fähræus, in Schoenherr, 1842: 49) reads '*Patria*: Bahr el Abiad Aegypti. Dom. Hedenborg. Mus. Reg. Ac. Scient. Holm.' One specimen is preserved in NHRS, and is labelled Bahr el Abiad. The original description gives no hint of the number of specimens seen by Fähræus, thus the specimen preserved in NHRS is designated here as the lectotype of *C. vestitus*.

Measurements: Body length excluding rostrum: 10.29 mm. Rostrum: length, 2.05 mm; width, 1.03 mm; ratio, 2.00. Pronotum: length, 2.48 mm; width, 3.14 mm; ratio, 0.79. Elytra: length, 6.60 mm; width, 4.36 mm; ratio, 1.51. Ratio of elytral to pronotal length: 2.66 (♂; Guinea).

Redescription (Figs 43–56): Body oblong-elliptical, of medium size, integument dark reddish, thickly covered with bifid scales and long setae (Figs 43–44). Rostrum strong, subquadrate in transverse section, dorsolateral margins moderately raised, straight, parallel from base to apex, median line raised, obtusely convex, widened forwards, epistoma angularly convex at middle, apex prominent; dorsum weakly impressed between central and dorsolateral margins; in lateral view rostrum nearly straight from base to antennal insertion, curved downwards apically, distinctly thickened from base to apex; upper margin of scrobes straight, not keeled, reaching base of eyes; lower margin shortly directed to underside of rostrum; scrobes wide, broadened from antennal insertion to base, and glossy; vestiture extremely thick, completely hiding surface, composed of long, light-yellowish scales, bifid from base, very dense, moderately erect, imbricate, centripetal to forward-directed on dorsum, also very dense on dorsal keel, where they are often simple, relatively broad, long acuminate; beyond antennal insertion scales simple, long, acuminate, outward-directed, and semi-erect; dorsolateral margins with a row of hair-like setae, erect, and slightly longer than the scales; epistoma with some very long, erect, forward-directed setae; sides in front of eyes with few setae, upward oriented and very scarce simple scales, not hiding the glossy, punctured integument; underside with long, slender setae moderately raised (Figs 45–46). Antennae short, densely scaly; scape distinctly curved forwards, moderately thickened from base; funicle thick, compact, of uniform thickness, segment I subcylindrical, as long as wide; segments II–VII progressively more transverse; club long elliptical, acuminate, segment I subcylindrical, thick also at base, densely scaly in its basal half, finely hairy as the rest of club in apical half (Fig. 47). Head moderately larger than rostrum, strongly delimited from base of rostrum, vertex distinctly raised laterally above eyes, flattened on centre, base behind eyes impressed; vestiture extremely dense, on vertex with narrow acuminate simple scales, directed backwards, above eyes with tufts of dense raised short light-brownish setae. Eyes elongate, oblique, weakly convex, dorsal margins parallel. Pronotum small, transverse, base weakly oblique, centre not sharply protruded towards elytra, sides straight, nearly parallel from base to apical quarter, shortly converging

at apex; apex weakly rounded above head, postocular lobes distinct; dorsum on disc with a shallow longitudinal broad impression; surface densely punctured, with deep round punctures delimited by narrow raised interspaces, sculpture hidden by vestiture; sides lacking distinctly raised glossy granules; vestiture composed of generally bifid, rarely simple, light- and dark-brown scales, forming a sharp pattern: light-brown scales disposed in a broad stripe in the central longitudinal impression, in two narrow curved dorsal lines, starting near centre at apex, outwards curved up to behind middle of length, rectilinearly narrowed at base, and in a broad dorsolateral stripe, sharply delimited and straight in its lower margin, corresponding with the maximum width of pronotum, and angularly expanded towards dorsum, joined to dorsal narrow lines in their external point; dark-brown scales cover integument on remaining places; setae narrow, semi-erect, with the same colour as adjacent scales, and relatively densely inserted over the whole pronotum (Fig. 48). Scutellum very narrow, and scarcely distinct. Elytra long and oval, at base slightly broader than base of pronotum; weakly broadened at humeri, sides subrectilinear up to near apex, and shortly convergent at apex; in lateral view regularly curved from base to apex, with declivity not sharp but distinct; odd intervals moderately convex, wider than even intervals and wider than striae, intervals 3 and 5 higher and curved at base; even intervals narrow, flat; striae broad, composed of dense seriate round punctures, larger in basal half and progressively narrowed towards apex; integument smooth, lacking granules or deep wrinkles; vestiture composed of bifid light- and dark-brown scales (Fig. 56), and long, erect setae, light- and dark-brown in distinctive patterns: dark-brown scales dense and uniform on interval 3 from base to declivity, dense on intervals 5 and 7 from base to apex, but interrupted by light transverse stripes, and on suture at base; light-brown scales in patches on declivity and interval 2 from near base to apex, on intervals 9 and 10 forming a lateral stripe from base to apex; on basal half forming a broad transverse curved stripe, broadened laterally, starting from suture, interrupted on interval 3, and joined to the lateral stripe; on declivity forming a broad transverse stripe; base on intervals 4–8, and median part of elytra between the two transverse light stripes, excepting on intervals 3 and 5, nearly devoid of scales, with a few scattered dark-brown scales and a few round spots of white scales; setae semi-erect and of same colour as neighbouring scales, on intervals 3, 5, and 7 longer than interval width, dense, arranged in two or three rows, on even intervals shorter, usually arranged in a single row. Legs strong, very densely scaly and with very long



Figures 43–56. *Pachycerus vestitus* Faust, 1904, lectotype: body (43, 44); rostrum (45, 46); pronotum (48). *Pachycerus vestitus*, Guinea, male: antenna (47); detail of elytral scales (56); ventrites (51); aedeagus (50, 53, 55). *Pachycerus vestitus*, Kordofan, female: sternite VIII (52); hemisternite (49); spermatheca (54). Scale bar: 43, 44, 5 mm; 51, 2 mm; 45, 46, 48, 50, 1 mm; 47, 49, 52, 53, 0.5 mm; 54, 55, 0.2 mm.

setae, scales usually simple, slender, and light brownish; femora scarcely thickened at middle; fore tibiae strong, moderately widened from base to apex, apex not broadened, with strong denticles; middle

and hind tibiae stronger; fore tarsi short, segment I not longer than wide, shortly triangular, segment II triangular, as long as wide, segment III short, lobes scarcely developed, onychium nearly as long as seg-

ments I–III together; claws strong, connate at mid-length, and widely separate; hind tarsi only moderately longer than fore tarsi; underside lacking an adhesive pad, replaced by a few whitish simple scales, with some spiny setae on sides. Ventrites with segment I as long as segment II, together longer than segments III–V combined, segment III as long as segment IV, segment V slightly longer than segment IV, transverse, flat; vestiture composed of extremely dense bifid light-brownish scales and frequent long, semi-erect setae (Fig. 51). Aedeagus tubular, slender, median lobe long, moderately curved, apical lamella shortly triangular (Figs 50, 53, 55). Sternite VIII of female with apodeme nearly as long as lamina, arms broadened, sclerotization limited to apical part of lamina (Fig. 52); spermatheca with curved, moderately narrowed cornu; nodulus shortly thickened, ramu short, lateral (Fig. 54). Hemisternites globose, apical shortening very close to neck; styli cylindrical, obliquely cut (Fig. 49).

Variation: The few specimens examined are relatively uniform. Those with complete vestiture have a slightly variable distribution of light- and dark-brown scales; however, the two transverse broad light stripes delimiting a dark-brown patch are always distinct. The length of the setae on the elytra is variable; the specimens from West Africa have longer setae. The size ranges between 9.2 and 10.3 mm.

Affinities: The very long, semi-erect setae on the elytra allow an immediate distinction of *P. vestitus* from all the other species of the genus. Based on the vestiture, the form of the scales, i.e. long, bifid, and with very divergent teeth, and the shape of the rostrum and the pronotum, this species seems to be more closely related to *P. sellatus* than to the other species of the genus.

Distribution (Fig. 108): The type locality, Bahr el Abiad, indicates the river also known as the White Nile, one of the chief tributaries of the Nile, which extends upstream from Khartoum to the junction of the Bahr el Jebel and the Bahr el Ghazal at Lake No, c. 160 km above Malakal, in present-day Sudan. *Pachycerus vestitus* appears to have a disjunct range in the Sahel, and the specimens from West Africa appear to be moderately differentiated; however, the available material is too scant to allow any further discussion about a possible taxonomic vicariance of the West African population: one of the very few specimens seen originates from Kurdufan, in central Sudan, whereas the others are from Guinea and Senegal. Alfieri (1976) cited the species generically for Egypt ('Recorded for

Egypt', Alfieri, 1976: 255), without further details, but so far it has not been recorded for the present-day territory of Egypt.

PACHYCERUS BADENI (FAUST, 1888)

Gonocleonus Badeni Faust, 1888: 288.

Pachycerus spinipennis Fairmaire, 1897: 168.

Pachycerus Badeni: Faust, 1904: 222.

Cleonus (Pachycerus) Badeni: Csiki, 1934: 52.

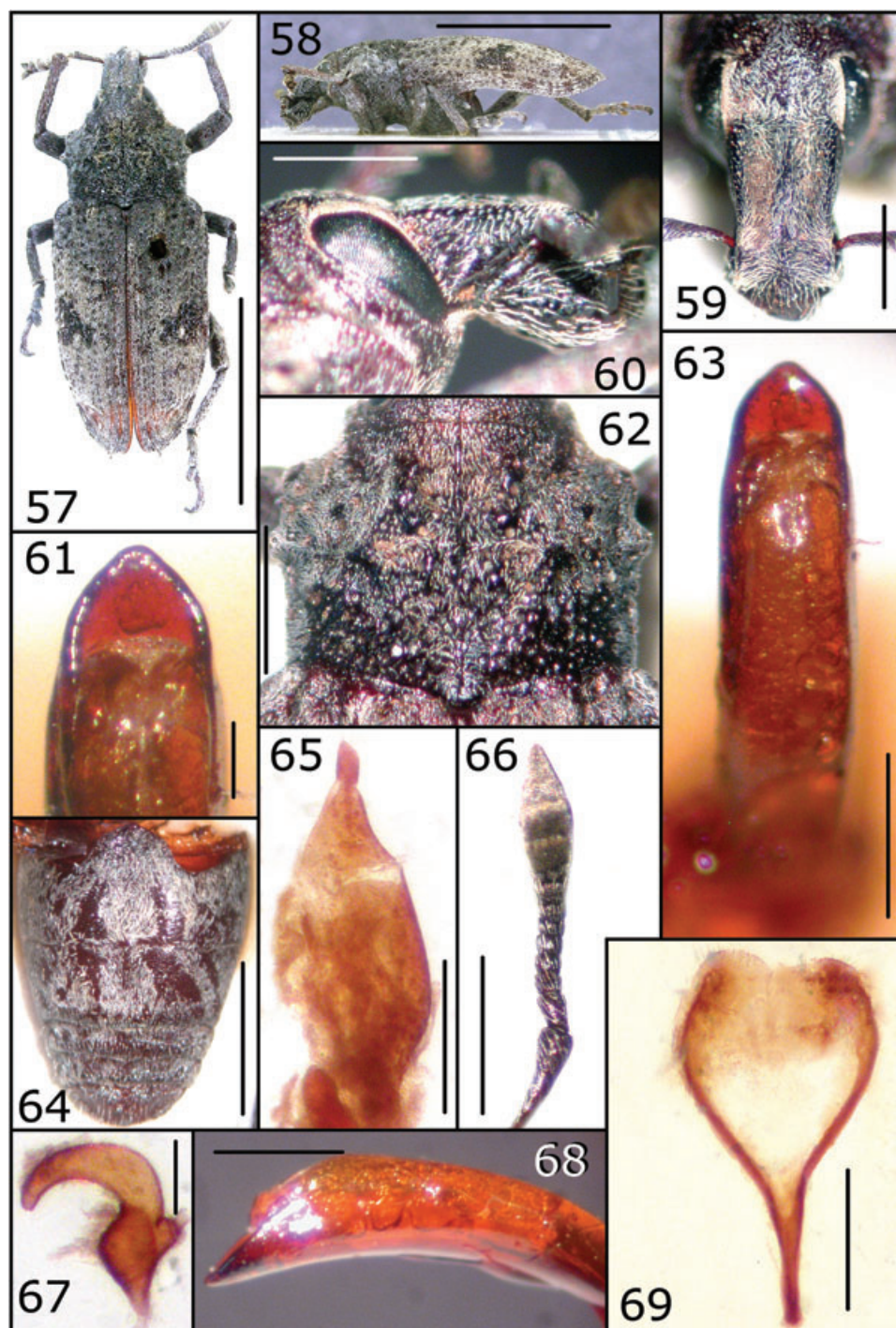
Lectotype male (designated here): 1. square blank gold label; 2. Madagascar Baden (Faust's hw); 3. Badeni Faust (Faust's hw) (note: 1–3 were glued on a new label); 4. Coll. J. Faust, Ankauf 1900 (pr, light blue); 5. Staatl. Museum für Tierkunde Dresden (pr); 6. Type (pr, red); 7. *Gonocleonus badeni* Faust, 1888, Lectotypus, 2007 Meregalli des. (pr, red) (SMTD).

Paralectotypes: 2 ♀. Same labels as 1–6 of the lectotype; 7. *Gonocleonus badeni* Faust, 1888, Paralectotypus, 2007 Meregalli des. (pr, red) (SMTD).

Type: Three syntypes are preserved in Faust's collection, all with the same indication: 'Madagascar, Baden'. The male is designated here as the lectotype, the two females are designated as paralectotypes.

Measurements: Body length excluding rostrum: 8.28 mm. Rostrum: length, 1.62 mm; width, 0.95 mm; ratio, 1.71. Pronotum: length, 2.10 mm; width, 2.87 mm; ratio, 0.73. Elytra: length, 5.57 mm; width, 3.52 mm; ratio, 1.59. Ratio of elytral to pronotal length: 2.65 (lectotype).

Redescription (Figs 57–69): Body elliptical, of small size, integument glossy, and blackish on rostrum, pronotum, and elytral sides, dark reddish on median part of elytra, legs, and antennae, covered with lanceolate simple scales (Figs 57–58). Rostrum short and robust, subquadrate in transverse section, dorsolateral margins keeled, finely punctured, slightly sinuate, and moderately convergent from base to antennal insertion, outward curved from antennal insertion to apex, median keel obtusely raised, punctured, broadened anteriorly, and interrupted at antennal insertion, all keels sharply interrupted before head, dorsum with two deep furrows, delimited by median and dorsolateral keels, apex depressed, epistoma triangular, prominent at centre; surface minutely wrinkled and punctured, finely sculptured; rostrum in lateral view straight up to antennal insertion and strongly curved downwards at apex, thickened apicad, dorsolateral keels straight, linear; upper margin of scrobes obtuse, linearly directed towards lower part of eyes, and touch-



Figures 57–69. *Pachycerus badeni* (Faust, 1888), lectotype: body (57, 58); rostrum (59, 60); pronotum (62); antenna (66); ventrites (64); aedeagus (61, 63, 68). *Pachycerus badeni*, paralectotype: sternite VIII (69); hemisternite (65); spermatheca (67). Scale bars: 57, 58, 5 mm; 64, 2 mm; 59, 60, 62, 66, 1 mm; 63, 65, 68, 69, 0.5 mm; 61, 67, 0.2 mm.

ing eyes, lower margin parallel with upper margin, reaching underside at basal third; scrobes deep, glossy, surface in front of eyes roughly sculptured. Vestiture composed of dense white-greyish lan-

ceolate acuminate scales, usually forward-directed in the furrows and outward-directed at apex, also present and less dense on punctures of keels, episoma with long, moderately erect golden hair-like

setae; sides with sparse, narrower scales in front of eyes, and slender, longer scales on pregenae (Figs 59–60). Antennae relatively short, sparsely scaly, scape moderately curved forwards, regularly thickened from base to apex; funicle of nearly uniform thickness; segment I subcylindrical, slightly longer than wide, and slightly narrower than apex of scape, segments II–VII weakly transverse, progressively slightly widened; club long and elliptical, acuminate, finely hairy, excepting on scaly base of segment I (Fig. 66). Head large, finely punctured, vertex flat, with a narrow scarcely distinct central pit; eyes large, moderately convex, in dorsal view upper margins subparallel, weakly convergent behind; vestiture composed of sparse setae, thickened along upper margin of eyes. Pronotum transverse, base oblique, shortly prominent at middle towards scutellum, sides straight, parallel from base to apex, with a strongly prominent cylindrical lateral bulge beyond middle of length, and an obtuse subapical hump, apex straight, not prominent over head, postocular lobes round, weakly distinct; dorsum on disc with a rhomboidal pattern shallowly impressed, delimited by narrow, moderately raised ridges, distinctly angular at middle, curved and not joined at apex, joined at base, central part roughly sculptured, with a very narrow middle line, higher forward, flattened and broadened at middle, nearly indistinct in basal half; surface in rhomboidal impression with irregular large punctures, barely delimited, anterior part with two large glossy granules, median part with a few other irregularly delimited granules; dorsolateral surface, by side of margins of discal impression, slightly impressed anteriorly, with some irregular granules, and a narrow, raised vertical ridge joining the angle of discal ridges with lateral bulges; base flattened, more glossy, with dense regular punctures; sides smooth, flattened, regularly punctured. Vestiture composed of elongate glossy whitish scales, sparsely disposed on discal impression, reaching base near median keel, absent from basal dorso–lateral plate, and larger, thickened on anterior dorso–lateral impression and on upper part of sides, forming a lateral stripe broadly curved towards dorsum on middle (Fig. 62). Scutellum strongly prominent, elongate, bare, glossy. Elytra elongate, in lateral view dorsum weakly and regularly curved, declivity very feeble, nearly indistinct; at base narrower than base of pronotum, sharply broadened at humeri, maximum width shortly behind humeri, sides nearly parallel up to middle and regularly curved to apex; apex with an acute, distinct short projection in front of interval 3; surface smooth, finely punctured, without granules; intervals barely convex, odd intervals slightly wider than even, as wide as striae,

particularly intervals 3 and 5, these distinctly more raised and slightly curved at base, interval 5 interrupted in a slightly raised hump followed by a transverse impression before apex, interval 7 more raised in basal quarter, flattened behind; striae deeply impressed, with seriate round punctures. Vestiture composed of glossy elliptical simple scales, relatively dense and uniformly disposed, not hiding integument, absent from an irregular median stripe between intervals 4 and 8, but usually with a round densely scaly spot on interval 6, and absent from impression behind apex of interval 5; setae extremely short, indistinct, except on lateral margin near apex. Legs slender, with elliptical acuminate simple scales on femora, tibiae and tarsi and sparse setae on internal side of tibiae and tarsi; femora slender, scarcely thickened at middle; fore tibiae rectilinear, scarcely broadened at apex, with apical denticles; middle and hind tibiae slightly more robust; tarsi with segment I triangular, segment II moderately transverse, segment III as long as wide, broadly lobed; hind tarsi with all segments longer; underside of segment III with nearly complete pad of orange scales, also present in a small patch on segment II; onychium longer than tarsal segments on fore tarsi, as long as tarsal segments on hind tarsi; claws very weakly divergent, thick, connate at middle. Ventrites convex, I and II of equal length and together longer than III–V together, III and IV very short, convex, V short, transverse; vestiture composed of very long, lanceolate whitish simple scales and, on ventrite V, semierect hair-like setae (Fig. 64). Aedeagus tubular, median lobe scarcely curved, shortly narrowed at apex, apical lamella not expanded (Figs 61, 63, 68). Sternite VIII of female with basal apodeme shorter than length of lamina, arms broadly widened, sclerotization dense in apical half of lamina; spermatheca with thick cornu, curved at 90° with respect of nodulus, this large, thick (Fig. 67); hemisternites broad, with distinct subapical angle, regularly tapering at apex, styli apical, elongate (Fig. 65).

Variation: The three specimens examined all have rather uniform sculpture and vestiture: one of the females is smaller, 7.0 mm long, and has the pronotum with a slightly less raised sculpture, and with the vestiture of scales on the pronotum and elytra more dense. The other female has the sternite VIII with a longer apodeme, as long as the lamina.

Affinities: *Pachycerus badeni* is closely related to *P. sahelicus* sp. nov. The differences between them are detailed in the description of the latter species. These two species, probably together with *P. efflatouni*, form a monophyletic group, differentiated from the other

taxa of the genus by the small size, the simple scales, the absence of a prominent hump above the eyes, and the more or less prominent lateral humps on the pronotum.

Distribution (Fig. 108): Known so far only from the three type specimens collected by Baden in an unknown locality of Madagascar, and by those used by Fairmaire for his description of *P. spinipennis*.

PACHYCERUS EFFLATOUNI (TEWFIK, 1942)

Cleonus (Pachycerus) Efflatouni Tewfik, 1942: 171.

Holotype (not found): Yemen, Wadi Sharis [15°41'N, 43°35'E].

Type: This species was based on a single specimen labelled 'Wadi Sharis (Yemen), 16–21.7.1936' (Tewfik, 1942: 174). Tewfik was the Curator of the Entomological Collections of the Faculty of Science, Fuad I University, Cairo, Egypt, and in the original description it was stated that the holotype was deposited in this collection. However, notwithstanding a long search in all of the collections of the institute, my colleague Mahmoud Abdel-Dayem (Fouad I University, Cairo, Egypt) was not able to find it.

Discussion: No other specimen referable to this species was cited after the description, and the only other *Pachycerus* examined from the Arabian Peninsula belongs to *P. hippali* sp. nov., a completely different taxon. Hence, the true identity of *P. efflatouni* remains uncertain. The original description is relatively good, although it particularizes non-specific traits, which are sometimes even typical of the entire family or subfamily, and are thus devoid of any significant value in the characterization of this species. The text and the schematic drawings of the body suggest that this species belongs to the *P. badeni* group. It is 12-mm long (probably including the rostrum), and is characterized by four black round spots on the elytra, two on the base and two on the declivity, behind the apex of interval 5, forming a distinctive pattern; it should have simple scales on the elytra and have bifid to multifid scales on the rostrum. Refer to Tewfik (1942) for the complete description: a detailed comparative discussion between the original description of *P. efflatouni* and the characters of *P. sahelicus* sp. nov. is given in the description of the latter species. The original drawings are reproduced here in Figure 70.

PACHYCERUS SAHELICUS SP. NOV.

Type locality: Senegal, Bambey, 14°42'N, 16°28'W.

Holotype female: Senegal: 'Senegal, Bambey, [14°42'N, 16°28'W], 30.VIII.1949, Richard Toll, on rice twigs/Pres by Com Inst Ent, BM 1955–49' (BMNH).

Paratypes: Senegal: same data as the holotype, 2 ♀ (1 BMNH, 1 MER); 'Senegal/Bowring, 63 47*/7669', 1 ♂ (BMNH). Senegal: 'Senegal (light blue label)/senegalensis, Dj Cat 3, 282 (light blue label)/Coll. Chevrolat', 1 ♀ (NHRS). Burkina Faso: 'Ob. Volta, Pundu, [= Burkina Faso, Pondou, 12°12'N, 3°35'W], Olsufiew', 1 ♂ (NHRS); 'Franz. Sudan, oberer Volta, Pundu, ges. Olsufieff', 2 ♀. (1 NHMB, 1 MER). Mali: 'Mali, Khouna [six different localities named Khouna have been found in maps of Mali], 30.IX.1969, H. Mathes, 1 ♀ (RMCA); N Cameroun, Yagoua, 10°21'N, 15°14'E, 2 ♀ (1 RMCA, 1 MER); Sudan 'Sudan, Prov. Darfur, El Fasher [= Al Fashir, 13°37'N, 25°21'E], 5.8.1977, H.J. Bremer legit, gekätschert', 1 ♀ (CFRE); no data: '3877', 1 ♂ (BMNH).

Diagnosis: A *Pachycerus* similar and apparently related to *P. badeni* and *P. efflatouni*. It is characterized by the rostrum with keeled margins, a narrow median keel interrupted at the antennal insertion, the transverse pronotum with a subtrapezoidal depression on dorsum, and low humps on the sides, the elytra with whitish simple scales, relatively uniformly distributed, and absent from two central subrectangular patches, and short semi-erect setae; ventrite I with four, and ventrite II with six, bare spots.

Measurements: Body length excluding rostrum: 10.37 mm. Rostrum: length, 2.31 mm; width, 1.26 mm; ratio, 1.83. Pronotum: length, 2.54 mm; width, 3.25 mm; ratio, 0.78. Elytra: length, 6.94 mm; width, 4.45 mm; ratio, 1.56. Ratio of elytral to pronotal length: 2.73 (holotype).

Description (Figs 71–84): Body oval-elliptical, integument black on head, pronotum, and base of elytra, dark reddish on apical half of elytra, underside, legs, and antennae, glossy (Figs 71–72). Rostrum rectilinear, robust, subquadrate in transverse section, dorso-lateral margins keeled, straight, glossy, and smooth, subparallel, barely converging forwards; dorsum flat, median line distinct, narrow, moderately raised, higher towards vertex, and progressively flattened towards apical part, interrupted beyond antennal insertion; surface between median and dorsolateral keels roughly sculptured, densely and irregularly punctured, interspaces of punctures much narrower than punctures; epistoma prominent at middle; sides between dorsolateral margins and upper margin of scrobes barely visible from above; in lateral view rostrum weakly curved, dorsolateral margins slightly

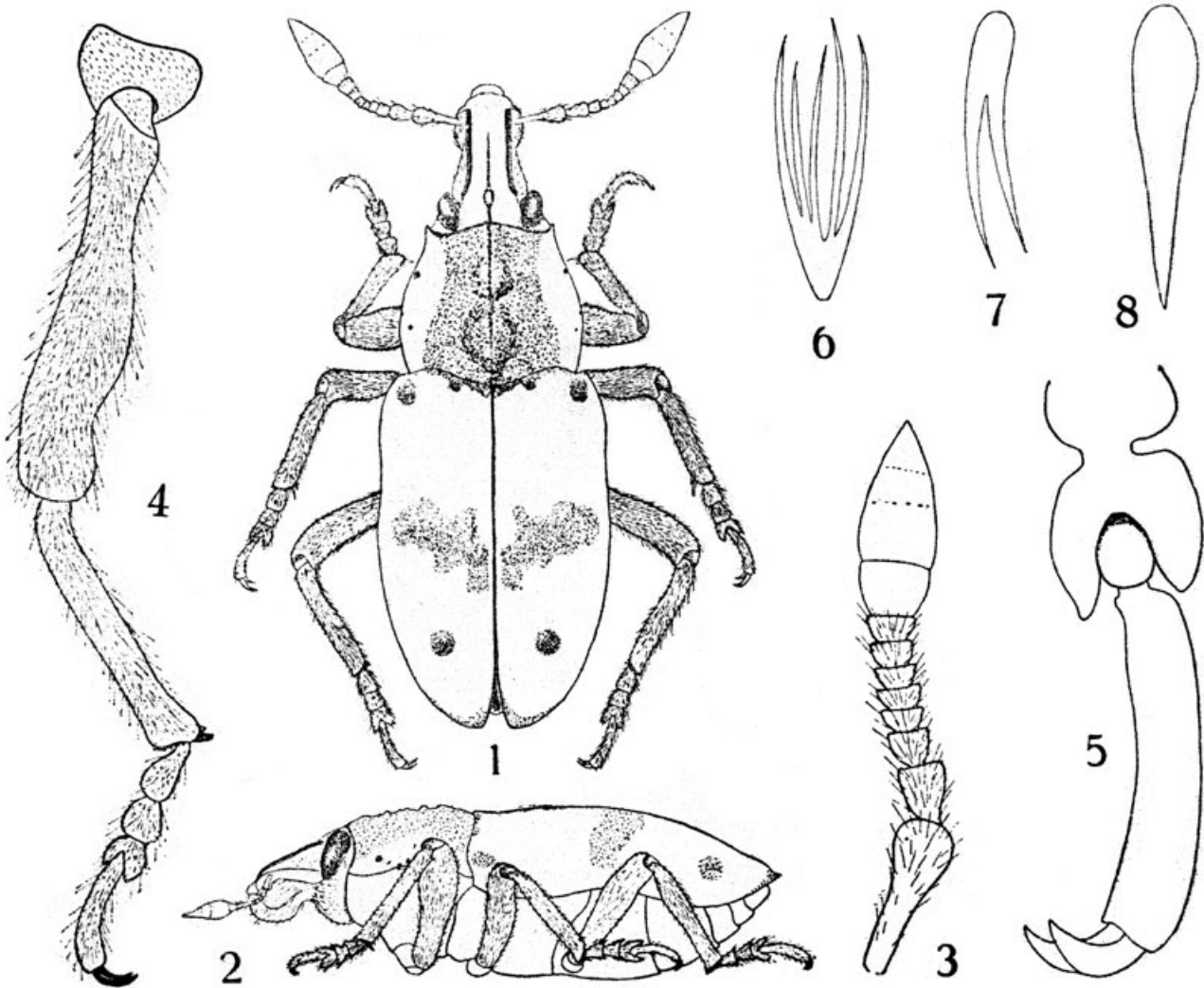
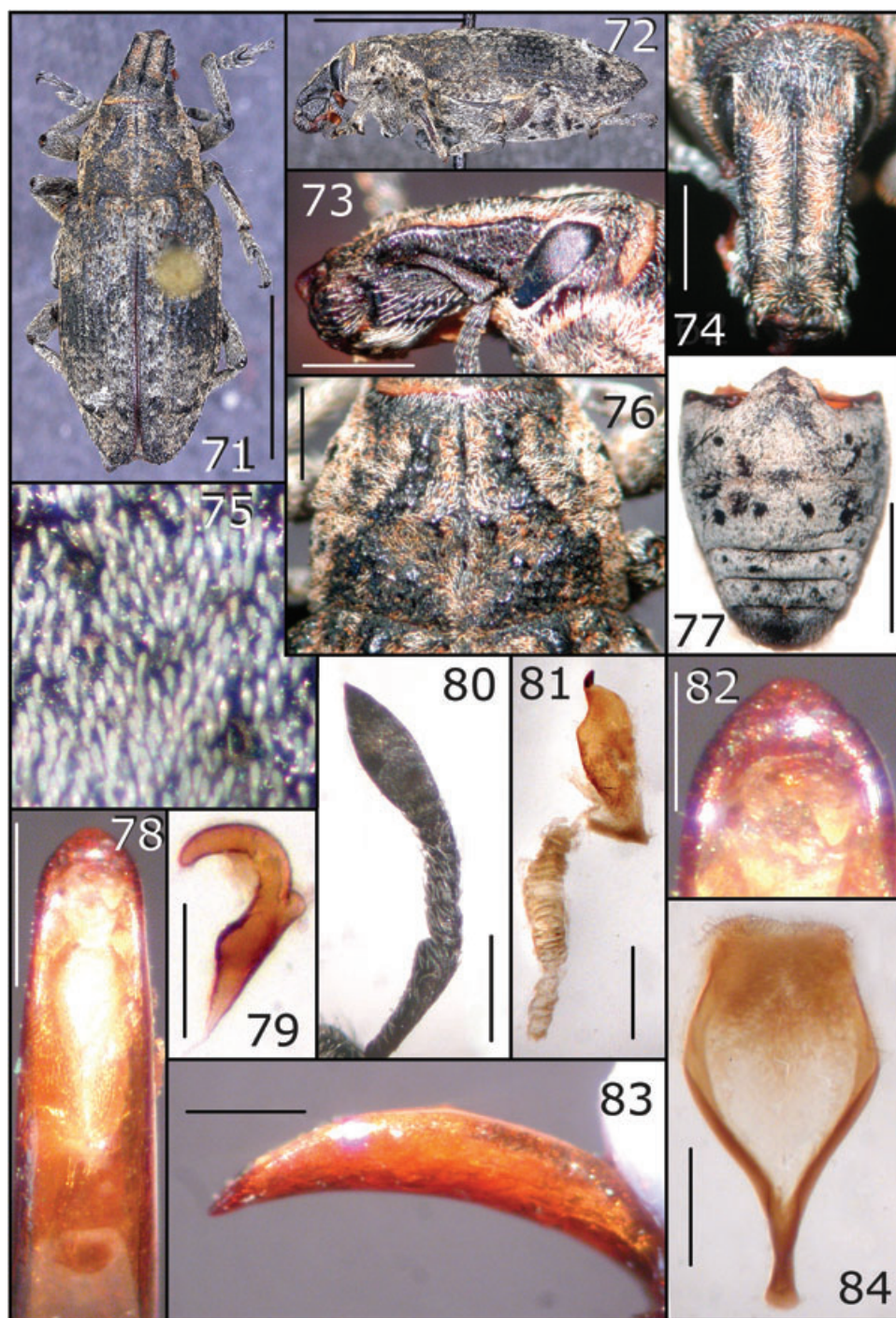


Figure 70. *Pachycerus efflatouni* (Tewfik, 1942). Reproduction of the original drawings (from Tewfik, 1942: 173; 'Fig. 1: Dorsal view. – Fig. 2: Lateral view. – Fig. 3: The antenna. – Fig. 4: Middle left leg. – Fig. 5: Last tarsal segment of middle left leg, ventral aspect. – Fig. 6: Quinqued scale-like hair. – Fig. 7: Bifid scale-like hair. – Fig. 8: Fid-like scaly hair').

concave from base to antennal insertion, and convex above antennal insertion; median keel visible, weakly convex; sides in front of eyes triangular, sharply delimited by upper margin of scrobes and dorsolateral keels, glossy and irregularly punctured; upper margin of scrobes straight, obtusely raised, reaching lower margin of eyes; scrobes narrow and rectilinear, deep, lower margin reaching underside or rostrum at its mid-length. Vestiture composed of lanceolate, relatively dense, whitish simple scales, centripetal, and inserted on dorsal part of rostrum, and narrow, slender short setae on sides (Figs 73–74). Antennae short, scape and funicle scaly; scape shorter than funicle, thickened from base, and very moderately curved forwards; funicle nearly as thick as apex of scape, with all segments of equal width; segment I

barely longer than wide, segment II weakly transverse, segments III–VII transverse and short; club elliptical, finely hairy, except at base of segment I, scaly and glossy on inner side, segment II as long as segment I, segment III long, and acuminate (Fig. 80). Head small, transverse, vertex flat, interocular pit indistinct, vertex roughly punctured, with a narrow short central keel; eyes large, elongate, vertical, and very slightly convex. Pronotum transverse, base bisinuate, moderately prominent towards scutellum, sides barely widened from base to point of maximum width, slightly beyond mid-length, shortly converging at apex; dorsum with irregular sculpture, forming an irregularly rhomboidal weak impression on disc, limited laterally by glossy, raised and punctured broad obtuse ridges, curved outwards from apex to



Figures 71–84. *Pachycerus sahelicus* sp. nov., holotypus: body (71, 72); rostrum (73, 74); pronotum (76); antenna (80); detail of elytral scales (75); ventrites (77); sternite VIII (84); hemisternite (81); spermatheca (79). *Pachycerus sahelicus* sp. nov., paratypus: aedeagus (78, 82, 83). Scale bars: 71, 72, 5 mm; 77, 2 mm; 73, 74, 76, 1 mm; 78, 80, 81, 83, 84, 0.5 mm; 79, 82, 0.2 mm.

middle of dorsolateral part, and from here converging towards centre of pronotal base, expanded towards sides, and entirely covered with very dense and irregular punctures; internal part of the rhomboidal

figure with some granules at centre, and with a narrow carina from centre to apex; sides with three or four small round glossy granules, isolated, clearly distinct; anterior margin with distinct, regular pos-

ocular lobes, and with short postocular setae. Sculpture of sides irregular, with relatively small and shallow punctures. Vestiture composed of lanceolate whitish scales, relatively dense on the central shallow impression, and sparse, not hiding integument on the raised glossy parts, scales generally simple, with a few bifid; sides with distinctly thicker vestiture of scales identical to those of dorsum (Fig. 76). Scutellum small, reddish, glossy, and bare. Elytra elliptical, base curved, as wide as base of pronotum, sides moderately broadened, subparallel, maximum width near humeri, gently converging at apex, individually rounded at apex, with external margin in front of apex of interval 3 with an acute granule; in lateral view flattened, very uniformly and moderately convex, declivity only visible as a small sinuosity after apex of interval 5, not curved downwards; surface densely and minutely wrinkled, particularly on suture and interval 3; intervals flat, all of the same width, excepting interval 3, which is slightly larger, linear, and a little more raised; base of intervals 3 and 5 with a glossy, wrinkled hump; striae broader than intervals, composed of round punctures not well delimited and irregularly aligned. Vestiture composed of whitish lanceolate glossy simple scales (Fig. 75), relatively dense over the whole surface, but absent from two rectangular nearly bare patches in median position from interval 3 to interval 8; setae sparse, regularly aligned, short, and semi-erect. Legs short, scaly, and with hair-like setae obliquely inserted; femora scarcely broadened at middle; tibiae straight, slender, flattened, apex of fore tibiae slightly expanded, with several yellowish short spines; tarsi short, segment I narrow, very small, segment II trapezoidal, as long as wide, segment III with lobes scarcely developed; onychium at least as long as segments I–III of tarsi, claws very robust, connected for half of their length, not divergent, thickened up to near apex; underside with adhesive pad small, limited to segment III of middle and hind tarsi, and also present on segment II of fore tarsi. Ventrites convex, intercoxal process of ventrite I broadly rounded; ventrite II longer than ventrite I at its shortest point; ventrites III and IV very short; ventrite V transverse, three times as wide as long, at middle with some granules, and depressed near apex. Vestiture very dense, composed of elliptical white-greyish, often imbricate scales, bifid from base, with each tooth broad and glossy; ventrite I with four round small bare spots, not well delimited; ventrite II with six spots, larger and more visible (Fig. 77). Sternite VIII with broad plate, sclerotized in its apical part (Fig. 84); spermatheca with thick and curved cornu, not acutely pointed at apex; nodulus tapering basally, moderately thickened (Fig. 79); hemisternites short, broad, styli shortly cylindrical, oblique at apex;

symbiont pouches robust, elongate, and thick (Fig. 81).

Description of the male and variation: The male does not differ significantly from the female. Ventrites I and II are flattened at the middle, and ventrite V is a little longer and not depressed before the apex. The aedeagus is similar to that of the other species of the genus: it has a slender, moderately and regularly curved median lobe, and a short, subtriangular apical lamella (Figs 78, 82–83). The specimens examined are rather similar regarding morphology, sculpture, and vestiture; body length, 7.5–10.4 mm. The irregularly rectangular bare patch on the elytra can reach as far as the lateral margin or can be interrupted at interval 8: in some specimens there are one or two small groups of scales and some setae present inside the bare patch; in the specimen from Pundu smaller brownish scales nearly cover the patch completely. The granules on the side of the pronotum are sometimes small and nearly indistinct, or are larger, glossier, and more raised. The specimen from Cameroon does not show any significant morphological difference. Those from Burkina Faso have the median keel of the pronotum extended also behind the central granules, although this part of the keel is smaller and scarcely evident. The specimen from Sudan is the smallest: it has a denser vestiture of scales, which are also slightly larger in size; the granules on the sides of the pronotum and on the ventrites are not distinct.

Affinities: See the preliminary discussion for remarks about the incompatibility between the description of *C. senegalensis* and the new species.

A further taxonomic question regards its relationships with *P. efflatouni* (see above for notes on this species). According to the description, the two species seem closely related, so whether the Sahelian specimens should be referred to *P. efflatouni* may be questioned. The absence of any type material of this specimen, and of specimens from Yemen, renders the interpretation of the African *Pachycerus* very complex: it apparently differs from the Yemenite taxon by several traits, with particular regard to the absence of large, round bare black patches on the elytra, to which Tewfik gave great importance, both in the text and in the schematic drawings (see Fig. 70). The differentiating traits are summarized here, with the states of *P. efflatouni* reported verbatim in parenthesis. Median keel on head barely distinct beyond the interocular pit ('median carina . . . continued in a straight carina reaching the back of the head'); rostrum laterally and ventrally with scales and setae, and lacking any bifid scale ('rostrum clothed with many bristle-like hairs together with a few scattered yellowish-white bifid scales-like ones directed anteri-

only'); scale on underside of head bifid ('the scaly hairs on the genae are quinquefid'); segment I of antennal funicle barely longer than wide, and barely longer than segment II (according to the drawing in Tewfik, 1942: 173, fig. 3, segment I longer than wide and distinctly larger, broader, and longer than segment II); disc of pronotum with a distinct rhomboidal impression, and with two glossy raised granules near median line (according to the drawing, the sculpture of the disc of the pronotum has two shallow impressions; no glossy granule was cited for *P. efflatouni*), and in lateral view lacking highly raised granules (according to Fig. 2 of the original drawing, pronotum in lateral view with clearly raised granules); pronotum with relatively dense vestiture of whitish scales ('pronotum . . . devoid of scaly or any other type of hairs'); scutellum present, clearly visible ('scutellum indistinct'); base of intervals 3 and 7 distinctly raised, much more elongate, glossy, and devoid of scales (base of elytra differently structured, according to the description and the drawing, 'anterior margin possesses distinct elevated granules [probably referring to the base of interval 3], and 'behind the shoulder' [probably near the apex of interval 7], with a 'large, shiny, black round tubercle'); apex of interval 5 with a scarcely distinct bare patch (apparently a very distinct, much larger round patch on *P. efflatouni*); elytra lacking minute granules ('there are also many other minute granules on the elytre'); elytra, in lateral view, nearly flat, upper point at a lower level than the upper point of the pronotum (elytra, according to Fig. 2, slightly convex on dorsum); ventrites with distinct bare spots (no bare spots cited for *P. efflatouni*).

Pachycerus sahelicus sp. nov. is sympatric with *P. opimus* and *P. vestitus*. Some specimens of *P. sahelicus* sp. nov. were found in collections identified as *P. opimus*: the simple scales of *P. sahelicus* sp. nov. enable an immediate distinction between these two species. Moreover, *P. opimus* is larger, its head has a small prominent tubercle above the eyes, and the pronotum is regularly convex, with dense small granules, and a narrow, continuous median furrow, often with a minute median keel in its centre; the elytra near the apex have several small granules. *Pachycerus vestitus* has long, raised setae on the whole body, including on the rostrum and above the eyes. The Madagascan *P. badeni* has the dorsum of the rostrum depressed between the dorsolateral and central ridges, the pronotum has two distinctly expanded lateral humps, and the elytra lack semi-erect setae.

Etymology: From the African region of the Sahel, where all the known specimens were originated.

Distribution and ecology (Fig. 108): All the known specimens of the new species were found in the central and western part of Sahel, from western Sudan to Senegal. No documented data about their biology are available; some specimens were found on rice twigs, but it does not seem likely that this is the host plant of this species, as Cleonini are not usually associated with monocots.

***PACHYCERUS SIMONAE* SP. NOV.**

Type locality: Southern Morocco, Cap Boudjour, 14°30'W, 25°08'N.

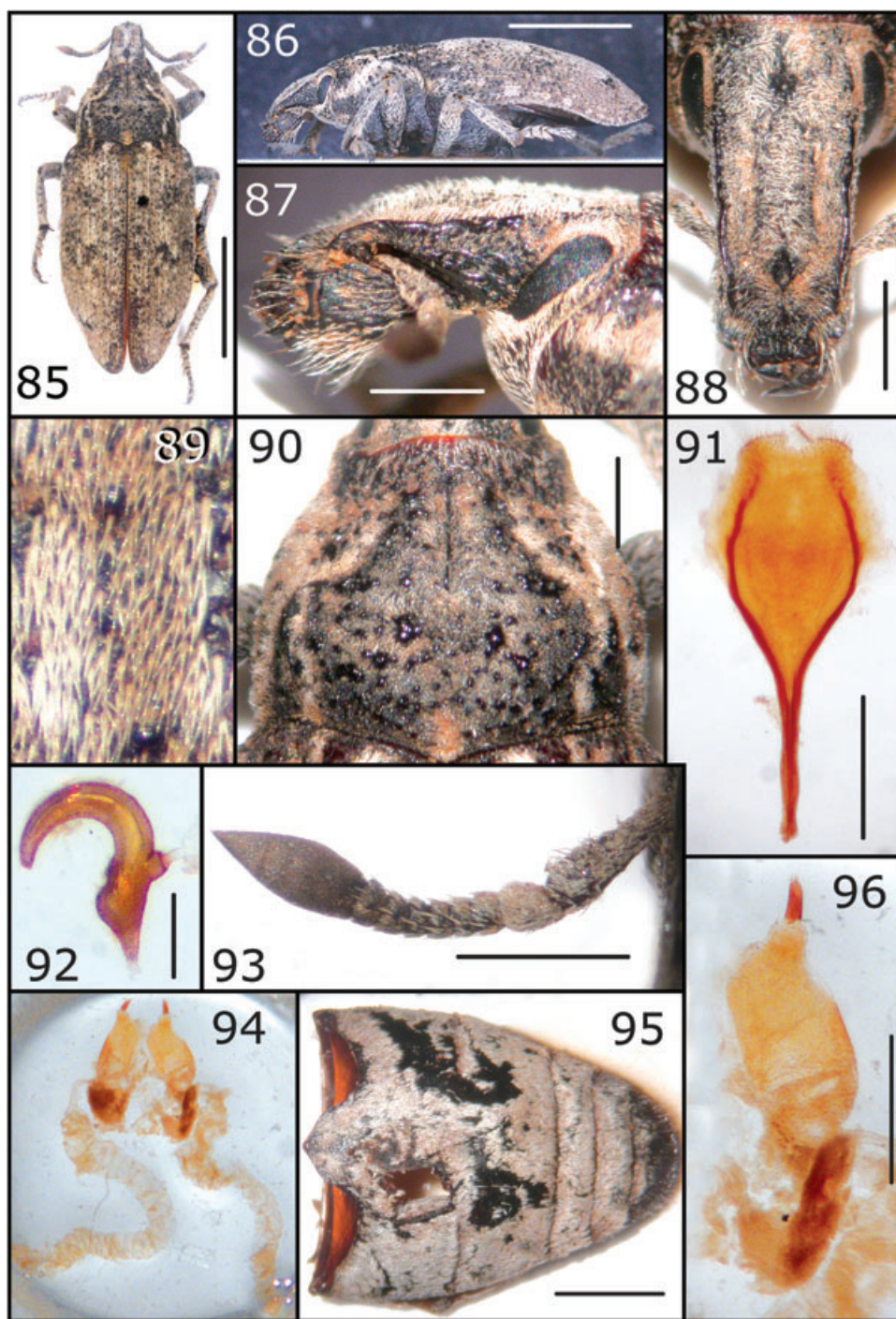
Holotype female: Morocco: 'Rio de Oro, El Arch [= Cap Boudjour, 14°30'W, 25°08'N], X. Mateu' (MNHN, coll. De Peyerimhoff).

Paratypes: same data as above, 1 female (MER); 'Maghreb, wil. Tiznit, Ait ou Mribibele, Oued Massa [09° 41'W, 29° 52'N], 16.III.1997, E. Colonnelli', 1 female (CSNV).

Diagnosis: A *Pachycerus* of large size, apparently related to *P. segnis*. It is characterized by the scales being bifid, and only connate at the base, with very divergent teeth, regularly covering the whole integument, by the relatively long rostrum, with sharp, narrow, slightly converging dorsolateral keels, a broad median elevation, and a narrow median keel, by the elytra with spaced small glossy granules on the intervals, and by the shape of sternite VIII of the female.

Measurements: Body length excluding rostrum: 14.31 mm. Rostrum: length, 2.56 mm; width, 1.49 mm; ratio, 1.71. Pronotum: length, 3.68 mm; width, 4.50 mm; ratio, 0.82. Elytra: length, 9.89 mm; width, 5.96 mm; ratio, 1.66. Ratio of elytral to pronotal length: 2.69 (holotype).

Description (Figs 85–96): Body oval-elliptical, integument black, scarcely glossy, and densely covered with bifid scales (Figs 85–86). Rostrum relatively long, nearly subquadrate in transverse section, dorsolateral margins very sharp, glossy, narrowly keeled, sublinear, and weakly convergent from base to apex, extended beyond antennal insertion; dorsum on middle with a broad obtuse very wide elevation, with narrow longitudinal glossy lines, and a narrow linear median keel, bifurcate at antennal insertion to delimit an oval fovea, linear again up to epistoma; epistoma subtruncate at apex, at centre convex, and with a narrow low keel continuing the median keel of rostrum; longitudinal furrows between the raised dorsolateral margins and the median elevation not



Figures 85–96. *Pachycerus simonae* sp. nov., holotype: body (85, 86); rostrum (87, 88); pronotum (90); antenna (93); detail of elytral scales (89); ventrites (95); sternite VIII (91); hemisternites (94, 96); spermatheca (92). Scale bars: 85, 86, 5 mm; 94, 95, 2 mm; 87, 88, 90, 91, 93, 96, 1 mm; 92, 0.2 mm.

deeply impressed, relatively broad; surface deeply sculptured, with short narrow irregular longitudinal wrinkles delimiting short and deep narrow impressions; in lateral view rostrum straight from base, upper margins slightly irregular, straight, median

line visible, moderately and regularly convex; sides in front of eyes long triangular, glossy, with very dense irregular oval punctures, in part convergent and forming short rows; upper margin of scrobes not sharply delimited, moderately curved, flattened,

barely distinct basally, and not reaching eyes, lower margin short, straight, reaching underside in basal part; scrobes short, deep, and glossy. Vestiture composed of long, bifid, dark ivory scales, connate at base and with long, divergent, acuminate teeth, inserted centripetally on the whole dorsum from base to antennae, relatively dense and partly hiding integument on all surface, including the central raised area, and of long, narrow, curved hair-like setae, sparse and barely visible on dorsum and more dense, replacing scales beyond antennal insertion up to basal part of epistoma (Figs 87–88). Antennae short, robust, and densely covered with bifid scales and some slender acuminate setae; scape regularly thickened from base, straight; funicle as wide as scape at apex, segment I as long as wide, moderately conical, more densely scaly, segments II–VII short, transverse; club elliptical, as long as segments III–VII of funicle, finely and densely hairy, base of segment I moderately scaly, not glossy (Fig. 93). Head slightly wider than rostrum at base, flattened, vertex flat, between eyes as wide as base of rostrum, sculpture and vestiture undifferentiated between base of rostrum and vertex; dorsolateral margins of rostrum extended to apex of vertex, slightly convergent behind, and not raised above, eyes; interocular pit round, deep, and clearly distinct; eyes nearly flat, narrowly elliptical. Pronotum large, base nearly linearly and obliquely prominent towards elytra, at centre acutely and shortly angular, sides weakly and regularly rounded, nearly parallel at base, and progressively more rounded towards apex, maximum width in basal third; apex slightly swollen above head, postocular lobes distinct; dorsum with a very thin median line in apical half and a shallow longitudinal impression in basal half; disc irregularly sculptured, with several scattered small glossy granules, more frequent at base, two larger granules near centre and some irregular glossy wrinkles delimiting sides of disc and forming a barely distinct, shallowly impressed curved figure, much narrowed forwards; dorso-lateral sides anteriorly shallowly impressed and with some minute granules; sides in their upper part with some isolated larger glossy granules; vestiture composed of bifid scales, connate at base, with narrow divergent teeth, dark ivory and relatively dense on the discal flat surface, amidst the granules, and not hiding the integument; lighter and more dense in a narrow curved dorsolateral stripe, convergent forwards, and in a lateral broad stripe, connected at middle of its length with the dorsolateral stripe, reaching apex in the upper part of postocular lobes and base in front of intervals 8–10 (Fig. 90). Scutellum: not visible. Elytra oval-elliptical, at base narrower than pronotum base, moderately widened at humeri, sides nearly parallel, slightly compressed

behind humeri, regularly and not sharply converging at apex, in lateral view regularly and weakly convex, and only slightly more curved on declivity; intervals flat, much wider than striae; odd intervals at base slightly more raised and densely granulose, and slightly larger than even intervals; surface with very small glossy spaced granules, more distinct on basal part of elytra, and usually more frequent and irregularly scattered on odd intervals, and sparse and aligned in a single row on even intervals, being less evident from middle of length to apex. Vestiture composed of relatively dense light-brown–yellowish bifid scales, connate at base, with very narrow divergent teeth, alternating with some slightly larger and lighter, either not or moderately bifid, scales, forming irregular and vaguely delimited patterns (Fig. 89), the lighter scales being more frequent on striae and on two scarcely distinct round patches on intervals 3–4, one near base and one behind middle of length, this second patch followed by a slightly distinct patch with narrower and darker less dense bifid scales; apex of interval 5 followed by a small bare patch. Legs slender, with long, slightly prominent, bifid scales, including on tarsi, usually simple on fore tibiae, and with long, curved setae; femora very weakly thickened at middle; fore tibiae straight, broadened at apex, with a fringe of dark-orange apical denticles; fore tarsi short, segment I as long as wide and triangular, segment II transverse, segment III with lobes regularly developed; lateral margin of all segments with strong downward-directed setae, underside of segment III with small pad limited to anterior part; onychium as long as segments I–III, claws strong, connate up to mid-length, teeth robust, and scarcely divergent; hind tarsi slightly longer. Ventrites convex, intercoxal projection of ventrite I acute and long; ventrite I as long as ventrite II, ventrites III and IV short, suture slightly sinuate at margin, ventrite V narrow, depressed at apex; all ventrites with very dense coating of light-greyish bifid scales, connate at base, with very long teeth, and some long, curved narrow setae; bare spots scarcely visible (Fig. 95). Sternite VIII with a short apodeme, arms narrow, regularly curved, moderately divergent, lamina oval, and fully sclerotized (Fig. 91); spermatheca with a curved cornu, not narrowed apically; nodulus thick and tapering (Fig. 92); hemisternites strong, parallel for most of their length, shortly converging at apex, styli slender, and cylindrical; symbiont pouches very long, twice as long as hemisternites (Figs 94, 96).

Variation: The topotypical paratype is very similar to the holotype, excepting the smaller size (10.40 mm). The specimen from Tiznit has slightly more uniformly

coloured vestiture of scales, but does not differ in the traits of taxonomic significance.

Affinities: This species seems to be related to the Mediterranean *P. segnis* (= *P. scabrosus* Brullé, 1832), from which it differs mainly in the bifid scales being connate at base, and with very narrow, often hair-like teeth, quite uniformly dispersed on the elytra, whitish alternating with light-brownish (scales larger, connate at mid-length, and with teeth comparatively broad, glossy white, irregularly dispersed on the elytra, and missing from two vague patches on the median part in *P. segnis*). *Pachycerus segnis*, moreover, has dorsolateral margins of the rostrum scarcely raised, not sharply keeled, barely distinct near head, and, in lateral view, curved downwards; sides of pronotum with more prominent granules; elytra with maximum width in their basal third, sides slightly convergent behind the humeri; sternite VIII of the female more strongly sclerotized, with slightly angular arms, its apical plate nearly perfectly rectangular, and with a longer apodeme.

Etymology: I am pleased to name this species after my colleague Simona Bonelli, a lepidopterologist who patiently bears the disorder and confusion that I daily bring to the laboratory.

Distribution (Fig. 108): *Pachycerus simonae* was found in the coastal deserts of southern Morocco, from the surrounding of Tiznit to Cap Boujdour (today's name of "El Arch"). It seems to be a geographical vicariant of *P. segnis*. No species of *Pachycerus* was reported by Kocher (1961) for Morocco.

***PACHYCERUS BARCLAYI* SP. NOV.**

Type locality: India, Tamil Nadu, Manapparai, 10°35'N, 78°25'E.

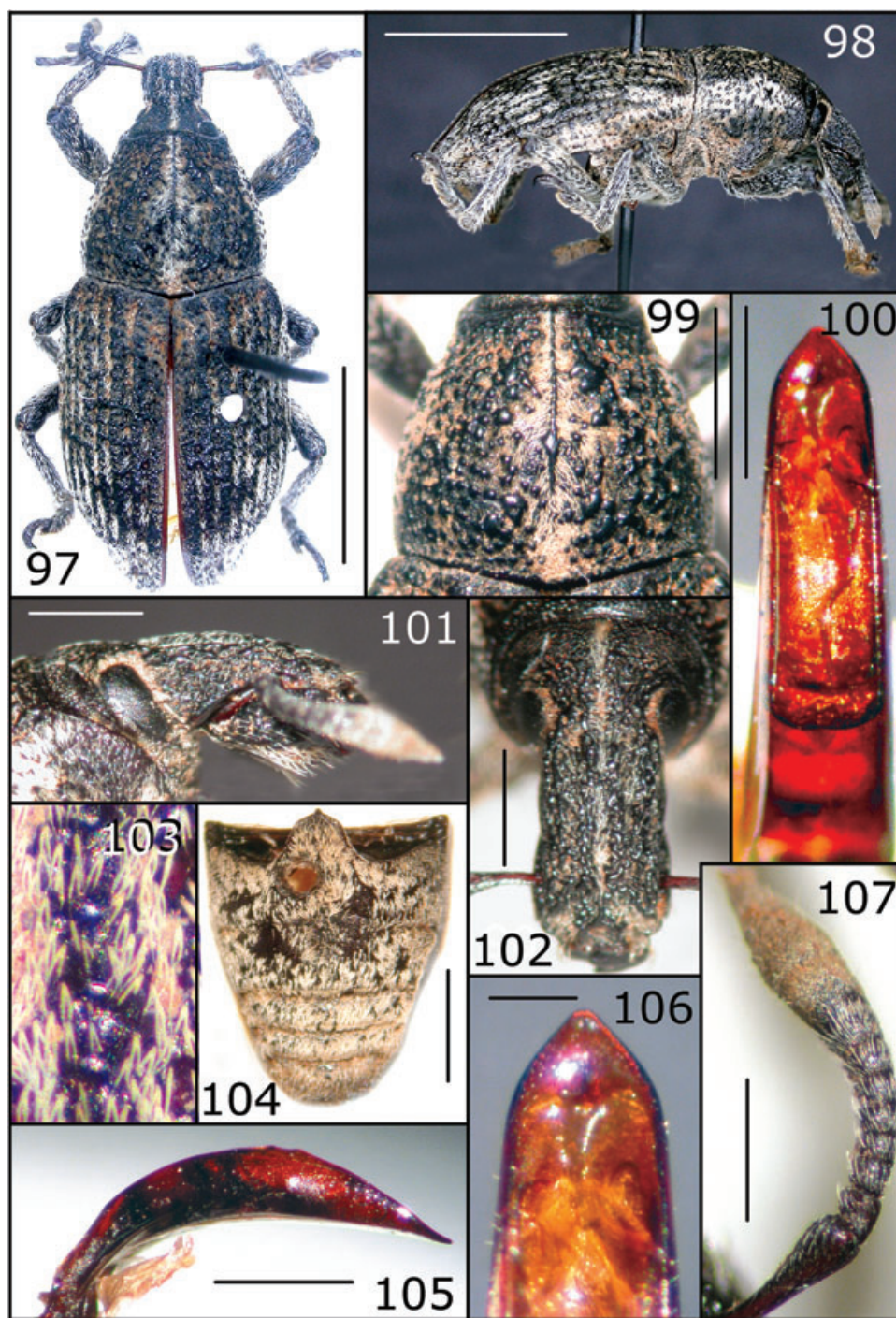
Holotype male: India: 'S. India, Manaparai [= Manapparai, 10°35'N, 78°25'E]/A. Prebunnatha, Pillai (BMNH). No collecting date is reported; however, the specimen was found in a drawer containing old collections, apparently referable to the first half of the 20th century or before.

Diagnosis: A *Pachycerus* of medium size, different from all the other species of the genus, and characterized by the convex body, the rostrum with a furrowed median line, the head between the eyes narrower than the base of the rostrum, the densely granulose pronotum, with a few scattered larger granules, the elytra with slightly convex granulose,

nearly bare, intervals, the whitish scales that are bifid nearly from the base on the striae and the ventrites.

Measurements: Body length excluding rostrum: 11.48 mm. Rostrum: length, 2.24 mm; width, 1.18 mm; ratio, 1.89. Pronotum: length, 3.56 mm; width, 4.14 mm; ratio, 0.86. Elytra: length, 7.45 mm; width, 4.96 mm; ratio, 1.50. Ratio of elytral to pronotal length: 2.09.

Description (Figs 97–107): Body oblong, convex, humeri not expanded outwards, integument black, moderately glossy, antennae and tarsi ferruginous, with a sparse vestiture of usually whitish bifid scales (Figs 97–98). Rostrum robust, very deeply sculptured, in lateral view regularly curved, dorsolateral margins convergent from base to apex, very irregularly delimited, at base convergent, extended to frontal part of head, with deep convergent punctures, sometimes fused in short rows, margins of punctures in part raised, median part with a large flat surface, not connected to head, slightly broader forwards, delimited from dorsolateral margins by two irregular, scarcely impressed, broad furrows, joined together in front of head and progressively more superficial above antennal insertion, very densely sculptured; median line with equally sculptured surface, with very irregular punctures, single or in part joined together in short rows, interspaces of punctures forming narrow vermiculate wrinkles, central part with a shallow longitudinal impression; apex flattened, with two divergent, barely distinct furrows, with deep sculpture, delimited apically by a short trifurcate ridge; epistoma subquadrate, not expanded apicad; sides in front of eyes with a dense sculpture, with some larger granules on upper part; pregenae glossy, scarcely punctured; upper margin of scrobes weakly sinuate, directed below anterior margin of eye, which is not reached; inferior margin reaching underside of rostrum a little before base. Underside, in lateral view, downward expanded apicad, with a distinct median carinula. Vestiture composed of sparse whitish or yellowish lanceolate or hair-like scales, simple and scattered on surface, scarcely visible, excepting a more dense vestiture of shorter and larger, mainly bifid scales on longitudinal impression of median plate, forming a narrow white stripe; sides with scarce hair-like scales, slightly longer and larger on pregenae; underside with slender white setae. Scrobes narrow, deep, and curved downwards (Figs 101–102). Antennae robust; scape shorter than funicle, regularly broadened towards apex, and weakly curved forwards; funicle short, thick, segment I subquadrate, segment II barely shorter than segment I, segments III–VII transverse, segments VI



Figures 97–107. *Pachycerus barclayi* sp. nov., holotypus: body (97, 98); rostrum (101, 102); pronotum (99); antenna (107); detail of elytral scales (103); ventrites (104); aedeagus (100, 105, 106). Scale bars: 97, 98, 5 mm; 99, 104, 2 mm; 100–102, 105, 107, 1 mm; 106: 0.2 mm.

and VII slightly larger; club large, nearly as long as funicle, densely hairy (Fig. 107). Head shortly globose, in profile curvature slightly sinuate with respect to base of rostrum; interocular space three-quarters as wide as rostrum at base, surface densely

and deeply sculptured, with irregular punctures deeper and larger between eyes, and smaller and poorly defined on vertex; eyes large, flat, elliptical, lower margin rounded, upper half and upper margin delimited by a furrow in its anterior part. Vestiture

composed of whitish bifid scales, disposed in a median stripe connected anteriorly to stripe on rostrum and reaching apex of vertex, and with dense yellowish hair-like setae in periocular furrow. Pronotum very robust, convex, moderately transverse, base sublinearly prominent towards elytra, at centre not expanded against scutellum, sides very regularly curvilinear, maximum width near base, very moderately converging to apex, apex barely prominent above head, postocular lobes scarcely distinct, with a short fringe of setae; dorsum with a narrow, raised median line, continuous on anterior half, broadened into a flat granule at centre, and interrupted shortly behind the central granule; sides of median line flattened, with few glossy granules, surface punctulate, flattened area broadened in its median part, and narrowed forwards and basad, narrower apicad, vaguely rhomboidal, delimited antero- and posterolaterally by a few very large, glossy, very irregularly shaped granules; dorsolateral surface with dense and irregular round glossy granules, occasionally joined by short ridges; sides with less dense granules irregularly aligned in four longitudinal rows, with a larger flat granule in central position between the second and the third row; lower part of sides with smaller, flat granules, with two larger granules near base; surface among granules dull and punctulate. Vestiture composed of slender bifid whitish scales, connected at a third of their length, with long, narrow teeth, dispersed in the median flattened area, obliquely directed forwards, in a few vague patches among granules on the dorsolateral part, and forming a lateral stripe clearly delimited by the rows of granules, narrowed anteriorly; of much smaller and narrower brown bifid scales, connate at base, and sparsely dispersed below the white lateral stripe; and of simple hair-like, scarcely distinct, light-brownish scales, inserted among granules on the dorso-lateral surface (Fig. 99). Scutellum minute, and barely distinct. Elytra oval, convex, at base as large as pronotum base, sides scarcely curvilinear in basal quarter, indistinctly compressed behind humeri, subrectilinear up to apical quarter, regularly converging at apex, distinctly bulging in dorsolateral view before apex between intervals 4 and 8, and transversely compressed behind bulge; in lateral view moderately and regularly curved, declivity scarcely distinct. Intervals large, glossy, slightly convex, odd intervals broader than even ones and slightly larger than striae, excepting interval 2, as large as interval 3 in basal half; all intervals with obtuse granules, dense and aligned in two rows in basal half, and more scattered, and dispersed in one row towards apex; interspaces among granules rough, punctulate, and duller; intervals 7 and 8 at base fused, slightly raised in a rough plate; striae deep, clearly distinct, with dense round punctures sepa-

rated by an obtuse granule, sometimes as high as the intervals, and forming a short transverse ridge. Vestiture composed of whitish bifid scales, dispersed in the striae and between the granules of intervals (Fig. 103), more dense on sides and declivity, particularly on striae 9 and 10 near base, and joined to the lateral stripe of pronotum; and of simple or rarely bifid narrower light-brownish scales sparsely placed on intervals; setae indistinct, hair-like, curved against integument, scarcely present on lateral intervals, and not particularly differentiated from scales. Legs relatively slender; femora weakly thickened in median part; tibiae rectilinear, internal side weakly sinuate, with minute granules; tarsi broad, segment II transverse, segment III broadly lobed, and longer than segment II; onychium inserted at basal third of segment III; claws connate up to middle of their length, thick, and barely divergent. Vestiture composed of scattered bifid whitish scales and long setae, semi-erect and denser on internal side of tibiae; underside of segments I–III with complete adhesive pad. Ventrites convex, ventrite I depressed in median part, ventrite II as long as ventrite I in its shorter part; ventrite IV slightly shorter than ventrite III, together as long as ventrite II, ventrite V transverse, and twice as wide as long; surface minutely punctulate, and with a few moderately larger punctures. Vestiture composed of whitish very slender bifid scales, connate near base, and at least five times as long as wide, inserted in the minute punctures, with at least one irregular bare glossy patch on ventrites II and III, in semilateral position, not clearly distinct; and some sparse semi-erect long setae inserted in the slightly larger punctures (Fig. 104). Aedeagus slender, median lobe curved, sides subparallel, and weakly convergent anteriorly; apical lamella short, triangular, and not curved (Figs 100, 105–106).

Etymology: I name this new species, with great pleasure, after my friend Maxwell Barclay, curator of the Coleoptera collections of the BMNH, acknowledging his kindness and assistance in all my studies based on the material preserved at the museum.

Affinities: *Pachycerus barclayi* sp. nov. is clearly differentiated from all of the other species of the genus, but has some similarities in the form of the pronotum and elytra with *P. opimus* and *P. hippali* sp. nov. Several important traits, however, separate *P. barclayi* sp. nov. from them, namely the head without supraorbital tubercles, the forehead between the eyes narrower than the rostrum at the base, rostrum with a shallow median furrow instead of a raised keel, elytra with intervals not raised, etc. All the other taxa of the genus are even more differentiated from *P. barclayi* sp. nov. In southern India, only *P. sellatus*

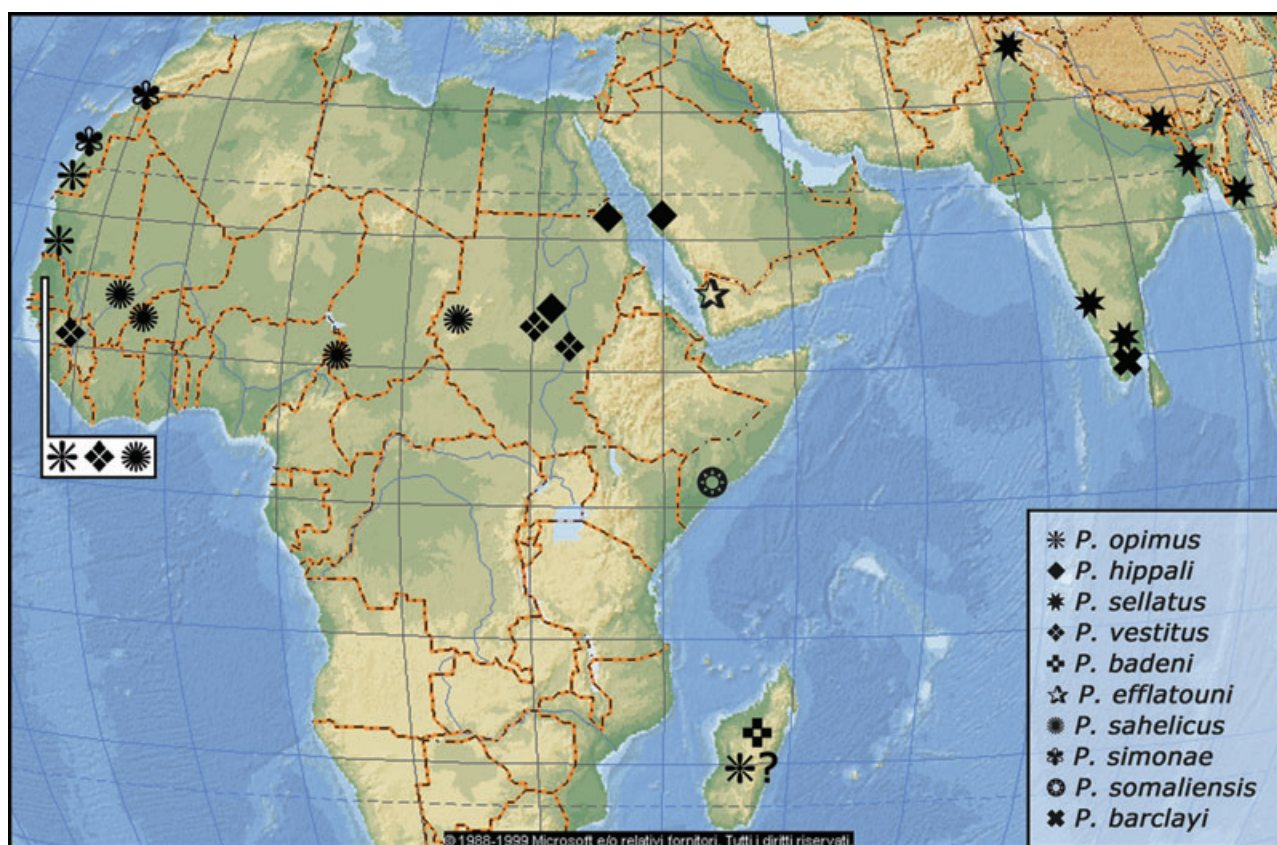


Figure 108. The Indo-African species of *Pachycerus*. Distribution map. Map taken from Encarta World Atlas 2000 (Microsoft Corporation), refined with Photoshop 7.0.

occurs. This is a completely different species: much smaller, with a tubercle above the eyes, the rostrum with sharp median and dorsolateral keels, the pronotum flattened, with a broad rhomboidal median impression, the scales bifid from base, the elytra with scales also covering the intervals, etc.

Distribution (Fig. 108): So far only known from the type specimen, collected at Manapparai, in southern India, in the Tamil region.

DISCUSSION

A complete reconstruction of the phylogenetic relationships among the Indo-Malayan species of *Pachycerus* would give incomplete, and possibly imprecise, results without also including the Palaearctic taxa of the genus, which have not yet been studied in the same detail. Although limited by the paucity of specimens, and the very incomplete faunistic knowledge of several regions, a few remarks on the species of the Indo-African fauna are proposed. It should be anticipated that, according to preliminary results of a phylogenetic and biogeo-

graphic study of the genera of the tribe Cleonini (Meregalli & Silvestro, 2008, in press), the genus *Pachycerus*, together with a few other African and Mediterranean genera, clusters in a basal clade, related to Southern African, very likely even more basal, genera of Cleonini.

Meregalli (2002) recognized two phylogenetic lineages in *Pachycerus*: one comprising the Palaearctic species and the other comprising the Indo-African species. The present study indicates that this second group is in fact very heterogeneous, and includes five highly differentiated species-groups: the *P. badeni* group, also including *P. sahelicus* sp. nov. and *P. efflatouni*; the *P. vestitus* group, also including *P. sellatus*; the *P. opimus* group, also including the sister species *P. hippali* sp. nov.; and finally *P. barclayi* sp. nov. and *P. somaliensis*, two morphologically isolated species.

The Moroccan species *P. simonae* sp. nov. is not part of the Indo-African fauna of the genus, since it is a Palaearctic taxon, localized at the southernmost limit of the distribution of the Mediterranean elements.

The *P. badeni* complex is characterized by small size, usually simple scales, at least on the elytra, the

absence of a supraorbital tubercle, and the presence of a short spine at the apex of the elytra. The complex is diffused in Madagascar, with *P. badeni*, in most, probably all, of the Sahel, with *P. sahelicus* sp. nov., and in Yemen, with the enigmatic *P. efflatouni*. This range, and the savannah-type habitat colonized by *P. sahelicus* sp. nov., suggest that the dry grassland ecotypes of East Africa, which were present at least from the Miocene (Retallack, 1992), allowed connections between the Sahel and Madagascar, explaining the apparently disjunct distribution of this group.

The *P. vestitus* group includes two apparently sister species: *P. vestitus*, ranging in the Sahel, and *P. sellatus*, diffused in India, Pakistan, Burma, and expanded to southern India. This complex is relatively similar to the previous group, from which it mainly differs in the sub-erect, relatively long setae on the body, the bifid scales, and the presence of a supraorbital tubercle. This group probably diffused to the Indian subcontinent originating from sub-Saharan habitats, along the steppe or eremic regions of Arabia; its present day disjunct range may have been determined by local extinction in the intermediate habitats. The relationships between faunas of East Africa – or the Sahel – with those of western India and Pakistan are well known (Harzhauser *et al.*, 2007), and this group represents a typical example of such a biogeographic distribution pattern, with a further expansion to south India of *P. sellatus*.

Pachycerus opimus and *P. hippali* sp. nov. differ from all of the other *Pachycerus* because of the peculiar shape of their pronotum, which only shares similarities with two species recently described from the Arabian Peninsula, referred to *Rhabdorrhynchus*, and differentiated by several other traits. The similarities may thus be homoplastic, possibly resulting from parallelism (Meregalli, 2008), or retained plesiomorphic traits. *Pachycerus opimus* and *P. hippali* sp. nov., respectively occur along the Atlantic and the Red Sea coasts, and can be regarded as relicts of a formerly more widespread taxon.

The two remaining taxa do not show any clear affinity with other species.

Pachycerus somaliensis is a micropterous taxon (the only one in the genus), with a very restricted distribution in the semi-desert habitats of southern Somalia: it presents a large number of autapomorphic states, which were likely to have been determined by adaptive pressure. On closer examination, the morphology of the rostrum and pronotum, and the presence of conical tubercles above the eyes, may indicate distant relationships with the *P. opimus* group; this would also be consistent with its distribution.

Pachycerus barclayi sp. nov., with its convex body, broad pronotum, raised, very distinct, and nearly bare

elytral intervals, is the most isolated species in the genus. Several of its traits are apparently plesiomorphic, suggesting a very basal position in the *Pachycerus* clade. Its range in southern India supports this opinion: the other basal taxa of the tribe Cleonini, including the sister taxa, are in fact exclusive to Southern Africa and the Indian subcontinent, with the implication, confirmed by a likelihood inference of lineage geohistory, according to Ree *et al.* (2005) and Ree & Smith (2008), that this is probably the region where the *Pachycerus* clade differentiated (M. Meregalli and D. Silvestro, unpubl. data). *Pachycerus barclayi* sp. nov. is probably a relict species, maintaining many of the primitive characters expressed by the ancestral forms.

The Sahel band was an important centre of radiation for the genus *Pachycerus*: here we find in fact four species, belonging to three species groups: *P. vestitus*, *P. sahelicus* sp. nov., *P. opimus*, and *P. hippali* sp. nov. The first two have a broad, more or less continuous range along the Sahelian stripe; *P. opimus* and *P. hippali* sp. nov. have restricted ranges at the eastern and western borders of this region, respectively, but are very likely to have derived from an ancestor distributed across the whole Sahel. This wide range was probably determined by the quite uniform ecological characters of these territories. According to the classification of the terrestrial ecoregions (Olson *et al.*, 2001), they belong to the 'South Saharan Steppe and woodlands' (PA1329), the 'Sahelian Acacia savannah' (AT0713), and, for the Arabian population of *P. hippali* sp. nov., the 'Red Sea Nubo-Sindian tropical desert and semi-desert' (PA1325). The first ecoregion covers a narrow band on the southern edge of the Sahara Desert, from central Mauritania to the Red Sea, whereas the second stretches across the widest part of the African continent, from Senegal on the Atlantic Coast to Sudan, Ethiopia, and Eritrea, on the Red Sea; the last ecoregion occupies large sectors of the Arabian Peninsula (World Wildlife Fund, 2001). Interestingly, the first and last ecoregions (PA1329 and PA1325) are included in the Palaearctic realm, whereas the Sahelian ecoregion (AT0713) is part of the Afrotropical realm. Thus, these species of *Pachycerus* show a peculiar biogeographic pattern, bridging between the two regions. *Pachycerus opimus*, never found very far from the coast, may have different biological or ecological requirements, preventing it from colonizing further inland, into drier habitats. It is well known from palaeobotanical and ethnological evidence that the present-day extremely arid conditions follow more humid cyclic phases, which allowed the existence of lakes, even of very broad extension, in various parts of Sahara (Geyh & Thiedig, 2008, and several other references,

not reported here): the ancestor of *P. opimus* and *P. hippali* sp. nov. should have had a more or less continuous range through the southern part of the Sahara during the phases of more humid conditions. After isolation at the eastern and western extremes of the range, speciation of the two sister taxa occurred. Also *P. somaliensis*, associated with the 'Somali Acacia-Commiphora bushlands and thickets' (AT0715), an ecoregion in which the climate and habitat is analogous to the Sahel, should be added to this group of 'Sahelian' species of *Pachycerus*.

Most of the habitats colonized by *P. sellatus* are similar, dry savannah-type ecosystems, with low rainfall and high mean temperatures, dominated by dry deciduous forests and thorny scrubs, often Acacias, belonging to the 'Northwestern thorn scrub forest' (IM1303), and, in southern India, to the 'Deccan thorn scrub forest' (IM1301).

The last species treated in this paper, *P. simonae* sp. nov., is related to a Mediterranean taxon, *P. segnis*, and represents a geographical link between the Mediterranean and the African fauna, expanding the southern limit of the Palaearctic fauna to southern Morocco, in the western Sahara. Along the Moroccan western coasts there is enough water, and the ocean influence allows for richer vegetation than is found in the Sahara desert, so that a partial ecological continuity with the Mediterranean coasts is assured. This ecoregion, the 'Atlantic coastal desert' (PA1304), represents a unique transition zone encompassing Palaearctic elements, at their extreme southern range, together with Afrotropical elements and old relicts of the Macaronesian fauna.

The biology and host plants of all of these species of *Pachycerus* are unknown. The single citation of *P. sahelicus* sp. nov., indicated as collected on rice stems, needs confirmation, as no other Cleonine weevils have been undoubtedly documented as being associated with monocots. Some of the Palaearctic taxa of *Pachycerus* and those of the sister genus *Rhabdorrhynchus* live on Boraginaceae, but data on the apparently more derived Palaearctic species cannot be extrapolated to the Indo-African elements of the genus.

It can be concluded that the range of the genus *Pachycerus* (sub-Saharan Africa, Madagascar, Mediterranean region, Central Asia, and India), and the presence of several highly differentiated species groups, particularly in the Indo-African region, do not contradict the preliminary results of the cladistic hypothesis, suggesting that this may be a very ancient genus, which probably diversified in Africa, and subsequently diffused in the arid and steppe habitats of India, the Mediterranean region, and Central Asia.

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