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A new species of the genus *Pachybrachis* Chevrolat, 1832 from Pakistan and notes on similar Asian species

(Coleoptera: Chrysomelidae: Cryptocephalinae)

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Abstract: So far, the genus *Pachybrachis* Chevrolat, 1832 was not recorded from Pakistan. In this study, a new species, *Pachybrachis chitralensis* **n. sp.** from the Kalash valleys of the Chitral area is described and illustrated. The new species is compared with other species of *Pachybrachis* with similar dorsal colouration. The spermathecal duct is described for the first time for the following taxa: *Pachybrachis scripticollis* Faldermann, 1837, *P. issykensis issykensis* Jakobson, 1901, *P. transbaicalicus* Medvedev, 1974, *P. scriptidorsum* Marseul, 1875, *P. mitjaevi* Lopatin & Kulenova, 1982, *P. mongolensis* Medvedev & Rybakova, 1980, and *P. heptapotamicus* Lopatin, 1997. The spermathecal duct is shown to provide characters for species identification. The male genitalia of *Pachybrachis transbaicalicus* Medvedev, 1974 and *P. mongolensis* Medvedev & Rybakova, 1980 are illustrated from type specimens. The following synonymy is proposed: *Pachybrachis scripticollis* Faldermann, 1837 = *P. persa* Suffrian, 1860 **syn. nov.**; *P. heptapotamicus* Lopatin, 1997 is recorded for the first time from Uzbekistan.

Key words: Coleoptera, Chrysomelidae, Cryptocephalinae, Pachybrachini, *Pachybrachis*, Palaearctic, Asia, Pakistan

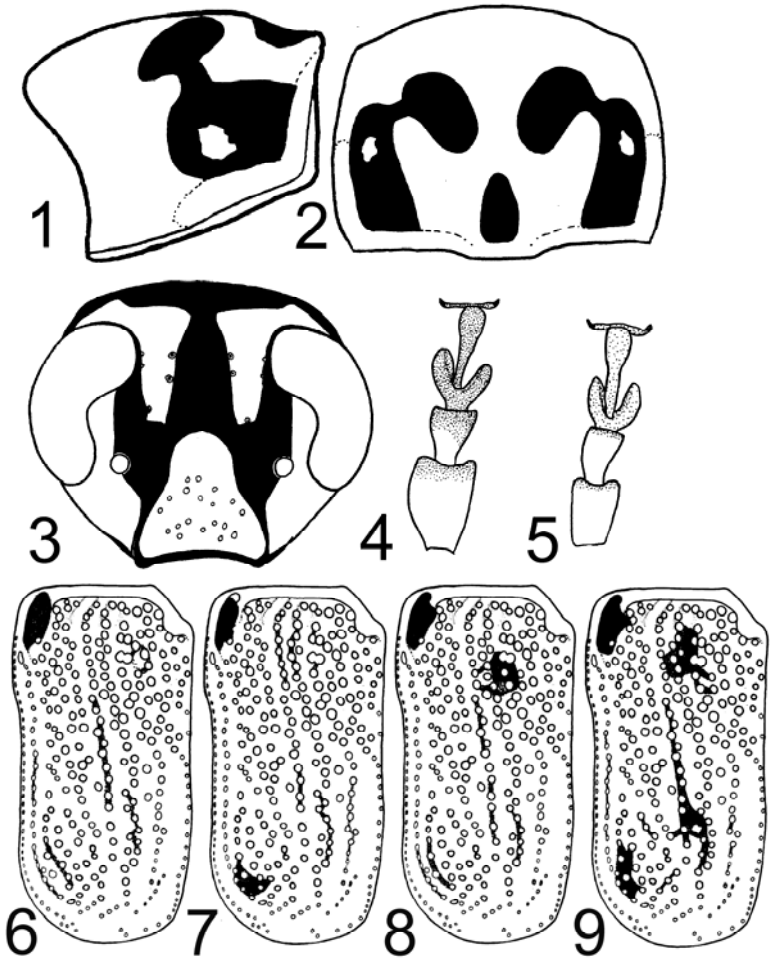
Introduction

The genus *Pachybrachis* Chevrolat, 1832 is distributed with more than 350 species in the Palaearctic (WARCHAŁOWSKI 2008). For the purpose of determination, the species with yellowish or testaceous elytra without well-delimited black pattern except for a humeral spot only are

grouped (*Pachybrachis glycyrrhizae*-species-group, BREIT 1921; group 1, BURLINI 1968; Group A, WARCHAŁOWSKI 2008). The species with this dorsal colouration are distributed from the North Sahara via the Balearic Islands, Sardinia, Israel, Turkey, Iran, Kazakhstan, NW China and Tibet to Mongolia (WARCHAŁOWSKI 2008). Within this group, several species show a pronotum with five sharply delimited black spots that are usually fusing to a M-shaped pattern. Such a species new to science is described, it is the first species of *Pachybrachis* recorded from Pakistan. Both male and female genitalia are figured in this work, and characters to discriminate both males and females from similar species are given.

Materials and Methods

Included in this study are specimens located in the following collections.
AWPC = Andrzej WARCHAŁOWSKI personal collection, Wroclav, Poland.
DEI = Deutsches Entomologisches Institut, Müncheberg, Germany (L. ZERCHE).
DSPC = Davide SASSI personal Collection.
FFPC = Frank FRITZLAR personal collection, Jena, Germany.
IBOL = Insektensammlung Biologiezentrum in den Oberösterreichischen Landesmuseen, Linz, Österreich (F. GUSENLEITNER).
ILPC = Igor LOPATIN personal Collection, Minsk, Belarus.
IRPP = Iranian Research Institute of Plant Protection, Insect Taxonomy Research Department, Tehran, Iran (S. SERRI).
JBPC = Jan BEZDEK personal collection, Budweis, Czech Republic.
MAKB = Museum Koenig, Bonn, Germany (M. SCHMITT).
MESC = Matthias SCHÖLLER personal collection, Berlin, Germany.
MLUH = Martin-Luther-Universiät Halle/Saale, Wissenschaftsbereich Zoologie (Karla SCHNEIDER).
NHMB = Naturhistorisches Museum Basel, Schweiz, M. BRANCUCCI.
NMPC = National Museum Prague collection (J. HAJEK).
NMW = Naturhistorisches Museum Wien, Austria (H. SCHÖNMANN, H. SCHILLHAMMER).
SMF = Senckenberg, Gesellschaft für Naturforschung, Frankfurt am Main, Germany (D. KOVAC).
UHPC = Uwe HEINIG personal collection, Berlin, Germany.
ZMHUB = Museum für Naturkunde der Humboldt-Universität, Berlin (J. FRISCH, M. UHLIG).
+ Linz
Abbreviations used: spms = specimens; m = male, f = female.



Figs 1–9: *Pachybrachis chitralensis* **n. sp.**, 1) pronotum lateral; 2) pronotum dorsal; 3) head; 4) left fore tarsus male; 5) left fore tarsus female; 6-9) left elytron, variability.

The spermathecal duct can be prepared as follows: (1) the dry female Cryptocephaline beetle specimen is soaked in warm water over night, the abdomen is completely removed with the help of an insect pin (size 1 to

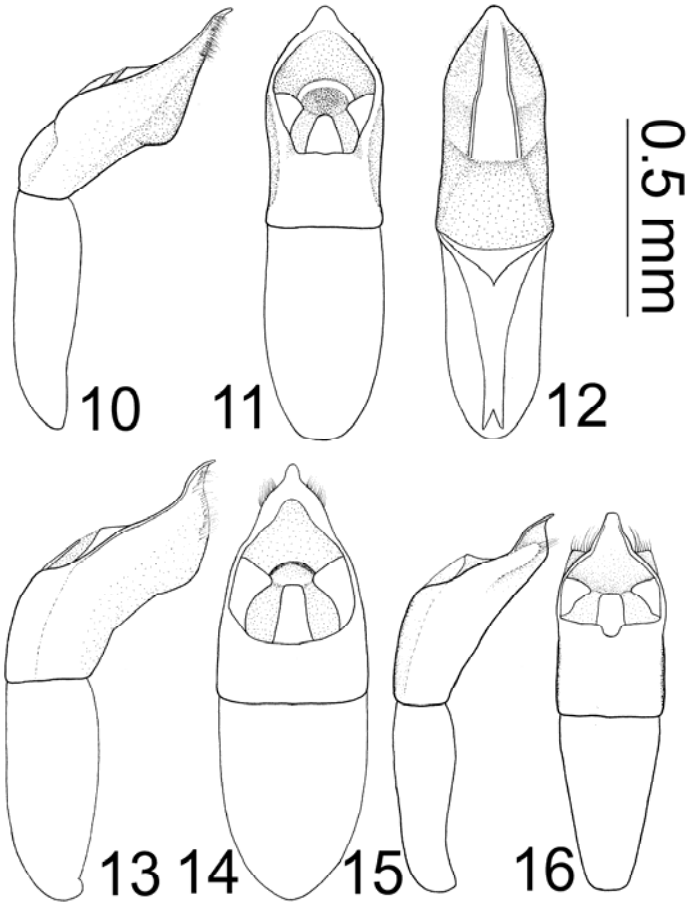
3, depending on size of the beetle) (2) if the content of the abdomen is hard and attached to the tergites and sternites, the whole abdomen is soaked in a cold saturated KOH-water-solution over night, and dissected the next day (3) the abdomen from step 2, or an abdomen with soft content is prepared by gently detaching the content from the tergites with the help of an insect pin size 1 (4) the abdomen is dissected by separating the tergites and sternites at the intersegmental membrane with the help of a fine dissecting scissor or an insect pin (size 0 to 1, depending on size of the beetle) (5) the content together with the tergites is bend upwards (6) the pygidium is gently separated from the last sternite, thus the tergites and sternites are completely separated, this may be the most difficult step because the ovipositor may be strongly attached to the pygidium and last sternite (7) the abdominal content is separated from the pygidium and last tergite, and again soaked in cold diluted KOH for 30 min to 24 h until muscles and binding tissues are disintegrated (8) the remaining gut with kotpresse, ovipositor and spermatheca is transferred to water, this must be done very gently because the spermathecal duct may be fragile, and left there for ca. 15 minutes to dilute the remaining KOH (9) the gut is cut below the rectal suture (10) the gut is placed with ventral side up, still under water, and the vaginal sac is bend up- and downwards until spermatheca and gut are in one level (11) if necessary, the spermathecal duct is gently pulled away from the ovipositor in order to stretch it for measuring, however, not to strong, as a coiled spermathecal duct may end up in an unnatural condition (12) the spermathecal duct, together with ovipositor and gut, can be glued with common insect glue on the cardboard together with the specimen, ideally in the stretched way described above, and studied there under a drop of water.

Results

Pachybrachis (*Pachybrachis*) *chitralensis* n. sp.

Holotypus (male, ZMHUB): – Type locality: Pakistan, North-West Frontier Province (NWFP), Kalash valleys, Bamburet valley (=Bumboret Gol), Brun vill. (35°74' N, 71°44' E). 29.7.-6.8.1998, L. Černý lgt. [white] / Holotypus *Pachybrachis chitralensis* des. Matthias Schöller [red] /. 29 Paratypes: 1m 1f (AWPC), 1m 1f (DEI), 1m 1f (DSPC), 1m (FFPC), 3m 4f (JBPC), 2m 2f (MESC), 1 f 1m (NHMB), 1m (NMPC), 1m (NMW),

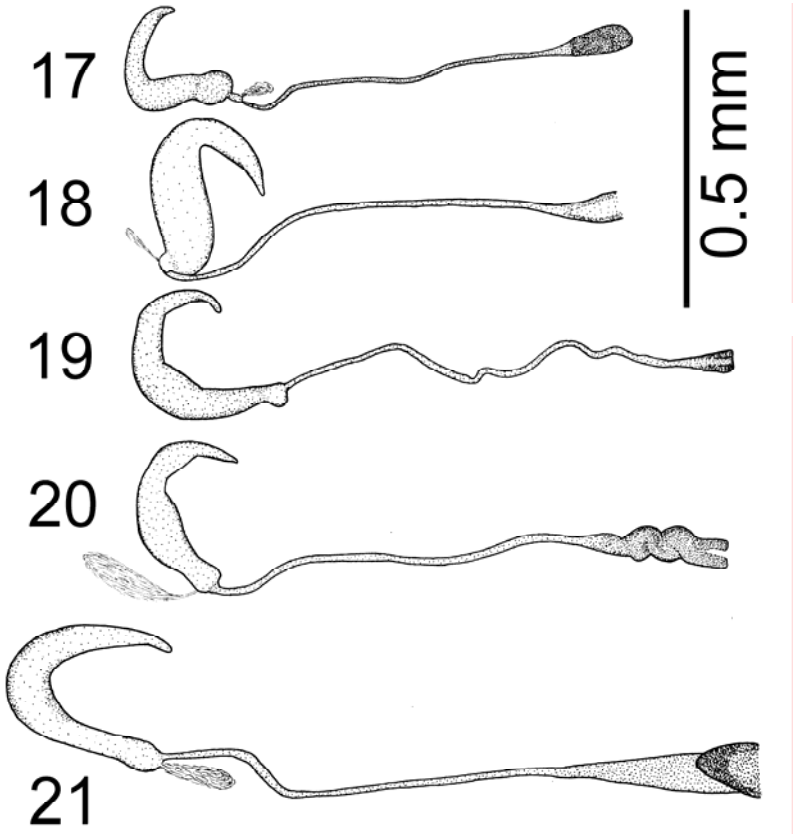
1m (ILPC), 1f (SMF), 1m 1f (UHPC), 2 f 1m (ZMHUB), 1f (Linz): same label as holotype / all with my label Paratypus *Pachybrachis chitralensis* des. Matthias Schöller.



Figs 10–16: Aedeagus; 10-12) *Pachybrachis chitralensis* **n. sp.**; 10) lateral, 11) dorsal, 12) ventral; 13–14) *P. issykensis issykensis* Jakobson, 1901, 13) lateral, 14) dorsal; 15-16) *P. transbaicalicus* Medvedev, 1974, 15) lateral, 16) dorsal.

Diagnosis

A medium-sized yellowish brown species with dorsum bare, pronotum with five black spots forming a sharply delimited M-shaped pattern, elytra without black pattern and partly irregular rows of black punctures, aedeagus with apex triangular in dorsal view and ventral side strongly convex in lateral view, base of spermathecal duct rotund and strongly pigmented.



Figs 17–21: Spermatheca and spermathecal duct; 17) *Pachybrachis chitralensis* **n. sp.**; 18) *P. scripticollis* Faldermann, 1837; 19) *P. transbaicalicus* Medvedev, 1974; 20) *Pachybrachis mitjaevi* Lopatin & Kulenova, 1982; 21) *P. issykensis issykensis* Jakobson, 1901.

Description of holotype (male)

Habitus: Body medium-sized, shape cylindrical, size [mm]: length 3.1, width of elytra at humeri 1.6, length of pronotum 1.05, width 1.45.

Head: Yellowish with black markings as in Fig. 3, puncturation sparse and coarse, on black markings long white setae, eyes large and upper lobes close, therefore ratio of minimum distance between upper lobes to eye length 1.0 : 1.56; antenna longer than pronotum, length 2.2 mm, antennal segments 1–5 dark yellowish, 6–11 black.

Thorax: pronotum transverse, width 1.4 times length, yellow with five distinct black spots fused into a M-shaped pattern (Fig. 2), large lateral black spot enclosing a small yellow spot elevated over surface (Fig. 1), with a transverse impression close to hind margin, glabrous, shiny, puncturation coarse and moderately dense; along lateral margin a regular row of small punctures followed by a puncture-free area; lateral margins of black prothorax yellow, meso- and metathorax black, epimeron of mesothorax yellow, venter covered with long white setae except for disc of metathorax and centre of last sternite; scutellum yellow with black margins; elytra glabrous, basal margin of elytra swollen, elytra with nine disturbed rows of punctures (Fig. 6), completely confused around scutellar row, punctures black at base, interstices partly darkened as in Figs 7–9, legs yellow, except for brown last tarsomeres and claw segment (Fig. 4), fore coxa yellow, mid- and hind coxae black, fore femur with a dorsal ridge, tibiae simple, fore- and mid-tibiae with tibial spurs, first segment of fore tarsus moderately widened (Fig. 4), first tarsomere of hind tarsus as long as following tarsomeres (without claw segment).

Abdomen: Black, basal angle of ventrite I (fused sternites II and III) yellow, ventrites II-IV with a narrow yellow stripe laterally, and basal and lateral margins of ventrite V (sternite VII) are broadly yellow, its apical margin with a shallow impunctate and shiny fovea at centre, covered with long white setae; length of aedeagus 1.2 mm, aedeagus in lateral view gradually bent with thickening of ventral side distant from apex present (Fig. 10), apex of aedeagus triangular, ostium at widest point wider than base of aedeagus, a pair of lateral triangular frenulae present, an semicircular endosclerite visible (Fig. 11), apex ventrally with a broad planar median keel (Fig. 12).

Female: First tarsomere of fore leg only slightly broader than second tarsomere (Fig. 5), abdomen with ventrites yellow except for black ventrite I with basal and lateral margins broadly yellow only, and centre of eimörser on ventrite V black, tergites black except for broad yellow

apical margin of last tergite, pygidium yellow except for a pair of small brown lateral spots; eimörser moderately deep, as wide as long; spermatheca hook-shaped, receptacle longer than pump, inner margin regularly rounded in lateral view, spermathecal duct straight, its strongly pigmented base rotund, extended in basal 1/5, 1.1 mm long, 4.5 times longer than spermatheca (Fig. 17); kotpresse strongly pigmented and sclerotized, shaped as in generic type species *P. hieroglyphicus*.

Variability: The blackened areas on the elytra may be extended, forming additionally to the black humerus an apical spot (Fig. 7), a central basal spot (Fig. 8), or an apical spot plus a central basal spot plus an extended longitudinal black stripe on disk (Fig. 9); ventrite I may be completely yellow laterally; size [mm] (mean±SD (max., min., n)): length of male 3.21±0.097 (3.40, 3.10, 12), female 3.53±0.127 (3.80, 3.30, 12), width of elytra at humeri in male 1.59±0.029 (1.65, 1.55), female 1.73±0.092 (1.85, 1.60), length of elytra in male 2.04±0.077 (2.15, 1.90), female 2.27±0.086 (2.45, 2.15), length of pronotum in male 1.10±0.052 (1.20, 1.05), width 1.48±0.033 (1.55, 1.45), length of pronotum in female 1.17±0.054 (1.25, 1.05) and width 1.57±0.058 (1.65, 1.45), length of antennae in male 2.43±0.078 (2.55, 2.35), female 1.94±0.11 (2.15, 1.80). Males are significantly smaller than females (t-test, t = -6,855; DF = 22, p <0.001), are significantly narrower at humeri (Mann-Whitney Rank Sum Test, T = 93; p = 0.001), have a significantly shorter pronotum (t-test, t = -3.084, DF = 22, p = 0.005) and narrower pronotum (Mann-Whitney Rank Sum Test, T = 94.5; p = 0.001), males have significantly shorter elytra (t-test, t = -6.970, DF = 22, p = 0.001), but males have significantly longer antennae (t-test, t = 10.838, DF = 14, p < 0.001) than females. The ratio length of antennae / body length in females (mean: 0.55) is also significantly different from this ratio in males (mean: 0.76) (t-test, t = 17.364, DF = 14, p < 0.001).

Differential diagnosis: The aedeagus most similar to that of *P. chitralensis* **n. sp.** can be found in *P. anatolicus* Lopatin, 1985, a Turkish species known from a couple collected in 1970 only, but the tip is shorter in this species, the pronotum has blurred black markings and *P. anatolicus* is somewhat larger (3.4–3.8 mm). The aedeagus of the species in the *Pachbrachis issykensis*-species-group, i. e. *P. issykensis issykensis* Jakobson, 1901 (Figs 13, 14), *P. issykensis gussakovskii* Lopatin, 1968 and *P. laevigatus* Breit, 1921, all are apically angulated with a small denticle, while the aedeagus of *P. chitralensis* **n. sp.** is gradually widening towards

base below the denticle. *P. afghanensis* Lopatin, 1966, a species of similar size, has a much broader apex of aedeagus in dorsal view, and the ventral side of the aedeagus is feebly convex in lateral view only; in *P. mongolensis* Medvedev & Rybakova, 1980 the aedeagus is less convex in lateral view (Fig. 26); also similar to *P. tekensis* Lopatin, 1983, but tip of aedeagus in dorsal view without large, lobe-shaped lamella; elytral punctures more coarse and darker as in *P. dimorphus* Medvedev, 1978 from Afghanistan, and apex of aedeagus narrower in dorsal view. The females can be distinguished from similarly coloured species by the shape of the base of the spermathecal duct as shown below.

Etymology: The name is referring to the type region.

Distribution and biology: So far known from the type locality only. No information on the biology is available.

Pachybrachis scripticollis Faldermann, 1837

= *Pachybrachis persa* Suffrian, 1860 **syn. nov.**

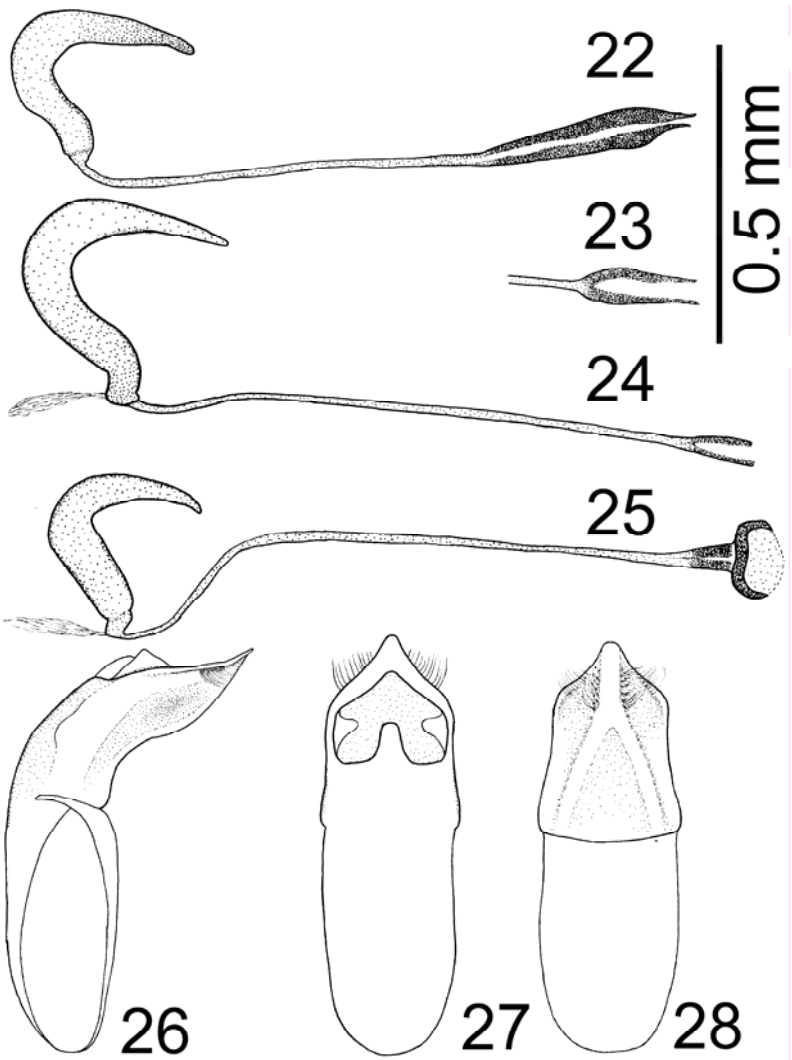
Type specimens studied:

1W (MLUH) (Lectotype, this designation): / 22175 (red ink) / Lectotype *Pachybrachis persa* Suffrian, 1860, des. Matthias Schöller 2008; 1W (MLUH) / 22176 (red ink) / Paralectotype *Pachybrachis persa* Suffrian, 1860, des. Matthias Schöller 2008; both with my label *Pachybrachis scripticollis* Faldermann, 1837 det. M. Schöller 2008.

A lectotype was designated here in order to ensure the name's proper and consistent application.

Additional specimens studied: 1f (IRPP) Tehrãn, Karaj, Arangeh, Sarziãrat, 1750m, 10.-11.VII.1996, Bar./Badii, det. Matthias Schöller; 2f 3m (NMPC): NW Iran, 20 km SE Marand, 5.-6.VII.1973, loc. no. 266, det. Lopatin 1984; 1f (MESC): Turkey, Maras, nord-östlich Adana, 25.V.1971, leg. K. Hampel; 1f (MESC): Baku, 20.VII.1979 (specimen figured).

Note: The spermathecal duct is straight, its base is Y-shaped, flat in lateral view and weakly pigmented, the spermathecal receptacle is inflated and the pump is shorter than the receptacle, inner margin narrowly triangular in lateral view (Fig. 18), total length of spermatheca and spermathecal duct combined 0.9 mm.



Figs 22–28: Spermatheca and spermathecal duct; 22) *Pachybrachis heptapotamicus* Lopatin, 1997; 23) *P. scriptidorsum* Marseul, 1875 (base only, from Tuva); 24) *P. scriptidorsum* (from Wolgograd); 25-28 *P. mongolensis* Medvedev & Rybakova, 1980, 25) spermatheca and spermathecal duct, 26) aedeagus, lateral, 27) aedeagus, dorsal, 28) aedeagus, ventral.

Pachybrachis issykensis issykensis Jakobson, 1901

Specimens studied: 1f (MESC): Kirghizia Central, Fergensky (specimen figured); 1m (MESC): Arabal-River; Syr Darja Gebt. 18, Tal Talass b. Orlow, V.1906, Fischer u. Willberg, I.K.Lopatin det. 1969.

Aedeagus with apex bulging in lateral view (Fig. 13), in dorsal view apex angulated with a narrow denticle, ostium with hollowed, convex endosclerites visible (Fig. 14).

The spermathecal duct is straight, gradually widening in basal 1/3, its base rotund, with a stronger pigmented triangular plate attached to base, the spermathecal receptacle is narrow, spermatheca widest at angle, the pump is approximately as long as receptacle, inner margin regularly rounded in lateral view (Fig. 21), total length of spermatheca and spermathecal duct combined 1.43 mm.

Pachybrachis transbaicalicus Medvedev, 1974

Specimens studied: male holotype in LMPC (labelling as in original description); 1W (MESC): Mongolia, Humragin-Gol, env. Salschit, G. Medvedev, 24.VII.1971, det. L. Medvedev.

In the original description, the ventral and lateral views of the aedeagus were given only. Fig. 15 shows the lateral view and Fig. 16 the dorsal view of the aedeagus of the holotype.

The base of the spermathecal duct is flat in lateral view, slightly expanded and stronger pigmented, spermatheca moderately pigmented, pump shorter than receptacle, inner margin angulated in lateral view (Fig. 19), length of duct and spermatheca 1.1 mm.

Pachybrachis scriptidorsum Marseul, 1875

Specimens studied: 10 spms (MAKB), Sarepta (= Wolgograd); 1m 1f (MESC): Russia, Tuva, near Kyzyl, rigth bank of Bly-Khem river, slopes of hills, 13.VI.1998, leg. S.N. & A.N. Vashchenkoov.

Spermathecal duct straight, its base abruptly Y-shaped and stronger pigmented, flat in lateral view, spermatheca moderately pigmented, pump as long as receptacle, inner margin regularly rounded in lateral view (Fig. 24), length of duct and spermatheca combined 1.1 mm, in females from Tuva the Y-shaped base was found to be comparatively wider and longer (Fig. 23).

Note: This species is frequently confused in museum collections with *P. scripticollis*.

Pachybrachis mitjaevi Lopatin & Kulenova, 1982

Specimens studied: 1m 1f, E. Kazachstan, S Tarbagatay Mt. Range, Blagodamoye, 20.-26.V.1991, leg. N. Tselikov, det. M. Schöller.

The base of the spermathecal duct is strongly pigmented and knotty thickened in basal 1/3, spermatheca lightly pigmented, receptacle widest in apical 1/3, pump slightly shorter than receptacle, inner margin angulated in lateral view (Fig. 20); total length of duct and spermatheca combined 1.4 mm.

Pachybrachis heptapotamicus Lopatin, 1997

Specimens studied: 1m (MESC): Kazachstan, Ili river, 30 km S Koktal, 700m VII.1992, leg. Benes; 1m (MESC): Uzbekistan, Chinaz (Syr-Darya), 70 km SW Tashkent, K. Majer leg.; 1m 1f (NMW): Turkestan, Taschkent, Weise, det. Lopatin (specimen figured); 1m 7f (NMW): Turkestan, Taschkent, Collect. Hauser; 1f (NMW): Turkestan, Dshisak, Collect. Hauser; 1M 3f (NMW) Turkestan, Kyndyr-Tau, Collect. Hauser; new for Uzbekistan.

The base of the spermathecal duct is strongly pigmented in basal 1/3, a longitudinally oval flat structure ending in a pair of fine tips, spermatheca light brown, pump apically stronger pigmented, pump longer than receptacle, inner margin regularly rounded in lateral view (Fig. 22), length of duct and spermatheca combined 1.2 mm.

Pachybrachis mongolensis Medvedev & Rybakova, 1980

Specimens studied: 5m 1f (Paratypes, labelling as in original description), 1f (MESC): Mongolei, Archangaj aimak, SO-Changai, Sangiin dalai noor, 8.VI. 1983, leg. Arnold; 1m, Conocharajch-gol, 13.VI.1985.

In the original description, the ventral and lateral views of the aedeagus were given only. Aedeagus with apex slightly bulging only and regularly narrowing toward apex in lateral view (Fig. 26), in dorsal view apex narrow triangular, ostium without central endosclerites visible (Fig. 27), in ventral view a pair of bulging inverse Y-shaped ridges, apically with an area covered by long setae (Fig. 28).

The base of the spermathecal duct is a transverse oval structure with apical margin strongly pigmented, spermatheca light brown, pump as long as receptacle, inner margin regularly rounded in lateral view (Fig. 25), length of duct and spermatheca combined 1.2 mm.

Discussion

Following the zoogeographic zones of Central Asia given in LOPATIN (1984), the Chitral area is closely South of the Pamir region of the Pamir-Kashgar province. Endemic Chrysomelidae were not recorded yet for this region. As the similar *P. anatolicus*, *P. chitralensis* might be a rare species, possibly with wider distribution.

In this publication, the shape of the spermathecal duct is shown to provide diagnostic characters for the *Pachybrachis* species with yellowish elytra without well-delimited black pattern and pronotum with black M-shaped pattern. The usefulness of this character for species identification was shown previously for *P. limbatus* and related species by SASSI & SCHÖLLER (2003). As now both males and females can be identified by internal characters, the intraspecific chromatic variability as well as variability in puncturation can be studied in order to find eventually additional external characters for species identification. Variability in the shape of the base of the spermathecal duct was detected in *P. scriptidorsum* between a population from Wolgograd and another one from Tuva, localities with a distance of 3500 km. *P. scriptidorsum* is a species with a wide geographical distribution ranging from Bulgaria to North Korea. This aspect requires further studies, too.

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