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ELMIDAE: I. Taxonomic revision of the genus *Macronychus* Müller (Coleoptera)

F. Čiampor & J. Kodada

Abstract

The genus *Macronychus* Müller (Coleoptera: Elmidae) is revised taxonomically. Six new species are described from Southeast Asia: *M. jaechi* sp.n., *M. jendeki* sp.n., *M. kubani* sp.n., *M. reticulatus* sp.n., *M. sulcatus* sp.n. and *M. ultimus* sp.n. A key and a catalogue with main references, synonyms and distribution is given. Three species groups are proposed: *quadrituberculatus* group, *glabratus* group and *indicus* group. *Macronychus* is recorded for the first time from Laos and Thailand.

Key words: Coleoptera, Elmidae, *Macronychus*, taxonomy, morphology, China.

Introduction

The elmid genus *Macronychus* occurs in the Palearctic, Nearctic and Oriental realms. *Macronychus* was described by P.W. Müller (1806) based on *M. quadrituberculatus* collected from Glan river flowing through Odenbach in Germany (Rheinland-Pfalz). Subsequently, several other species were described between 1824 and 1980, though not all of them were congeneric with *Macronychus* (see catalogue below).

The biology and immature stages of the west Palearctic *Macronychus quadrituberculatus* and the Nearctic *M. glabratus* Say are well known (e.g. Contarini 1832, Dufour 1862, Perez 1863, Olmi 1976, Le Sage & Harper 1976a, b, 1977). The adults of these widely distributed species seem to be unusually long-living elmids, as it appears from laboratory observations: *M. glabratus* survived in an aerated aquarium more than 10 years (Brown 1973), and *M. quadrituberculatus* 5 years (Kodada, unpublished). *Macronychus quadrituberculatus* normally prefers unpolluted larger streams and rivers but it can also survive several months in stagnant waters in riverside pools left after flooding. Larvae and adults are usually found in large numbers on submerged water-logged wood, however, the Central European populations are currently confined mainly to a few unregulated and unpolluted streams and rivers.

The centre of the species diversity in *Macronychus* seems to be continental Southeast Asia. The biology, as well as immature stages of these species remain still unknown. The Asian *Macronychus* are rather rare and in spite of numerous field trips (e.g. Jäch & Ji 1995, 1998), during which nine species were discovered, only three were collected in large numbers. The specimens disposable to our study allow us to describe six new species and to provide a more detailed diagnosis of the genus.

Material and methods

Material examined is deposited in the following collections:

CASS Chinese Academy of Sciences, Institute of Applied Ecology, Shenyang
CBB Coll. Boukal, České Budějovice

CKB Coll. Kodada, Bratislava
MHNG Muséum d'Histoire naturelle, Genève
NMW Naturhistorisches Museum, Wien
NHM The Natural History Museum, London
SNM Slovenské Národné Múzeum, Bratislava
TMB Természettudományi Múzeum, Budapest, Hungary
ZIL Zoological Institute Academy of Sciences, St. Petersburg, Russia

Specimens prepared for detailed morphological study were cleared of soft tissues in hot 10% potassium hydroxide, washed in distilled water, and stained in Congo Red. They were then disarticulated and studied under Amplival microscope at magnifications up to 600x as temporary glycerine slides. Dry preparations of other specimens were studied under Wild M3Z stereomicroscope with diffuse lighting at magnifications up to 60x. All drawings were made with the aid of a drawing tube. Metric characters were measured under a Wild M3Z with ocular grid to nearest 0.05 mm. The following measurements are presented in text: head width (HW), maximum width including eyes; interocular distance (ID); pronotal length (PL), along midline in dorsal view; pronotal width at base (BW); maximum pronotal width (MW); anterior pronotal width (AW); elytral length (EL), length along suture from scutellar basis to elytral apices; elytral width (EW), maximum width combined. Calculated length (CL), is the sum of PL and EL. Measured values lacking means are invariant in specimens examined. Other acronyms and symbols used: CWBS = China Water Beetle Survey; hw (hand-written); p (printed); ø = mean value ± standard deviation.

For scanning electron microscopy, specimens were dehydrated in graded ethanol series and air-dried from absolute ethanol, mounted on stubs with Tempfix, sputter coated with gold and then viewed in Jeol 2000 at 15 kW.

Morphological terms generally follow LAWRENCE & BRITTON (1994) and KUKALOVÁ-PECK & LAWRENCE (1993).

List of the CWBS localities where *Macronychus* was collected:

CWBS loc. 30: **Hunan Province**; Huaihua Prefecture; Huitong County; Guangping Township; Moshao Village, ca. 15 km W Guangping Township; ca. 5 km N of upper Research Station of Academia Sinica; small stream, flowing through planted forest (Chinese fir, *Cunninghamia lanceolata*) and rice fields, slightly polluted, ca. 350 m a.s.l.; 4.XI.1993; leg. Schönmann, Schillhammer & Ji; [locality number on label: 10].

CWBS loc. 188: **Hainan Province**; Qiongzhong County; Baihua Ling [= Hundred Flowers Mountain], ca. 7 km W Qiongzhong City [= Yinggen]; river, ca. 5 m wide, flowing through degraded forest, large boulders, sand, cataracts, ca. 300 m a.s.l.; 16.I.1996; leg. Jäch, Ji & Wang (see JÄCH & JI 1988: Fig. 2).

CWBS loc. 189: **Hainan Province**; Qiongzhong County; small tributary to CWBS loc. 188, ca. 1 m wide, densely shaded; 16.I.1996; leg. Ji.

CWBS loc. 193: **Hainan Province**; Qiongzhong County; Wuzhi Shan [= Five Finger Mountain] Resort, ca. 2 km from Wuzhi Shan Village, ca. 30 km E Maoyang Town; small stream, ca. 2 - 3 m wide, shaded, flowing through degraded primary forest, below Wuzhi Shan Resort, ca. 600 m a.s.l.; 17./18.I.1996; leg. Jäch, Ji & Wang (see JÄCH & JI 1998: Fig. 3).

CWBS loc. 194: **Hainan Province**; Qiongzhong County; stream, ca. 5 m wide, densely shaded, flowing partly through deep gorge, through primary forest, above Wuzhi Shan Resort; ca. 700 - 800 m a.s.l.; 18.I.1996; leg. Jäch, Ji & Wang.

CWBS loc. 204: **Hainan Province**; Ledong County; foot of Jianfeng [= Sharp Peak] Mountain, ca. 4 km E Jianfeng Town; river, ca. 5 - 10 m wide, fast flowing, through secondary forest, with big boulders, margins with rock pools, springfed pools and some seepage water, ca. 150 m a.s.l.; 22./24.I.1996; leg. Jäch, Ji & Wang.

CWBS loc. 205: **Hainan Province**; Ledong County; Jianfeng Mountains; Jianfeng Forest Reserve, ca. 5 km NE Tian Chi Village; river, ca. 5 m wide, flowing through very dense primary forest, banks with stones and sand, ca. 800 m a.s.l.; 22.I.1996; leg. Jäch, Ji & Wang (see Jäch & Ji 1998: Figs. 7, 9).

CWBS loc. 215: **Hainan Province**; Wanning County; ca. 15 km SW Dongxing Town, ca. 1 km W Jianfeng Village; river, ca. 5 m wide, with sand and gravel, flowing through cultivated land, ca. 70 m a.s.l.; 25.I.1996; leg. Jäch, Ji & Wang.

CWBS loc. 235: **Sichuan Province**; Yaan City Region; Tianquan County; ca. 20 km W Tianquan City; Dayu Xi [= Big Fish Brook] (tributary of Tianquan He), ca. 4 - 5 m wide, cold and rather fast flowing through open area, with cobbles, very clean, ca. 1200 m a.s.l.; 13.VI.1996; leg. Ji & Wang.

CWBS loc. 299: **Anhui Province**; Anqing Prefecture; Yuexi County; Dabie Shan; ca. 50 km NW Yuexi City, Huang Liyan Village, near Baojia Village; two streams, ca. 0.5 - 1.0 m wide, in steep and narrow forested valleys, mainly running over rock, small sandy pools with decaying leaves, densely shaded, 1000 - 1050 m a.s.l.; 8.XI.1997; leg. Schönmann & Wang.

CWBS loc. 306: **Jiangxi Province**; Yicun Prefecture; Jiuling Shan; Fengxin County; 18 km NW Shangfu City, near Jiu Xian Village, on slope of Wumei Shan (1740 m); two very steep mountain streams, 2 - 3 m wide, surrounded by dense forest (bamboo, *Cunninghamia* and various broadleaf trees), high waterfalls, deep and sandy pools, granitic boulders, 800 m a.s.l.; 15.XI.1997; leg. Schönmann & Wang (see Jäch & Ji 1998: Fig. 21).

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Taxonomy

Macronychus Müller

Macronychus Müller, 1806: 207. Designated by monotypy.

Type species: *Macronychus quadrituberculatus* Müller, 1806: 215.

Diagnosis: The genus *Macronychus* is characterised within Macronychini by combination of the following features: (1) antennae 7-segmented; (2) pronotum with two, more or less large admedian prebasal gibbosities; (3) anterior margin of pronotum translucent; (4) ninth elytral interval carinate; (5) third elytral interval moderately elevated, carinate or tuberculate; (6) elytral plastron between lateral margin and ninth interval.

Redescription: Body form moderately elongate or obovate (Figs. 1 - 12). Length (CL) 1.8 - 3.5 mm, width (EW) 0.7 - 1.5 mm. Colour dark brown to black except of usually brown or reddish-

brown venter, legs, mouth parts, antennae, anterior margin of pronotum and prosternum. Plastron on: genae and in some species on epicranium (Figs. 50, 63), elytra between lateral margin and carina on ninth interval, hypomera, prosternum except middle, epipleura, lateral portions of meso- and metasternum, meso- and metepisterna, ventrites except middle of ventrite I, partly on coxae, femora and in some species on tibiae (Figs. 59 - 61). Dorsal vestiture of pronotum and elytra with two types of hair-like setae: (1) short, thin setae in narrow sockets; (2) long, conspicuous, more or less flattened, semi-erect or erect setae in larger sockets. Short setae usually regularly spaced and rather regularly distributed. Long setae on: anterior pronotal half, pronotal gibbosities and elytral tubercle (on both latest forming more or less distinct tufts, Figs. 29, 37), sutural and unpaired intervals; long setae displaying interspecific variability in size and surface structure (see Figs. 37, 57, 77, 100). Setae usually associated with a fine pore near socket (probably opening of a cuticular gland, Fig. 77). Surface of older specimens frequently covered with secretion and diatoms (*Cocconeis* sp. and *Achnanthes* sp. identified in *M. quadrituberculatus*, Fig. 33).

Head retractable into prothorax. Labrum (Figs. 14, 15) about as long as clypeus, wider than long; lateral angles rounded, with strong yellow setae; surface punctate across middle third, reticulate across posterior third; punctures smaller than facet, setigerous; connecting membrane wide (Fig. 89); lateral and median tormal processes long; epipharynx with mesally directed admedian microtrichial brushes and two admedian, nearly triangular areas of mesally directed setae on anterior third (Fig. 15). Each mandible (Figs. 17, 18) with 3 large apical teeth; mandibular outline finely excised on outer margin at apical 0.3; prostheca large, extending nearly to basal teeth, apical part with a few strong spines (Fig. 19), mesal portion with moderately long setae; molar part asymmetrical, large. Clypeus wider than long, arcuate on lateral sides; sculpture of surface varies within species; fronto-clypeal suture deeply impressed, straight or slightly arcuate in dorsal view (Figs. 13, 50, 88). Frons usually slightly impressed near antero-lateral angles, margin finely raised around eyes; antennal foveae small, antennal base not concealed from above. Antenna 7-segmented (Figs. 16, 91), short; scape about as long as wide; pedicel nearly twice as long as scape, with sensilla on apical portion; segment 3 about as long as pedicel; segments 4-6 short, wider than long, their combined length subequal to segment 3; terminal segment (Figs. 16, 92, 93) longer than segments 4-6 combined, distinctly widened at middle, with sensillar tufts at apical part. Eyes large, moderately prominent, elliptical or nearly round in lateral view. Antennal sub-ocular groove short and shallow, about as long as terminal segment. Maxilla (Figs. 20 - 22, 94): cardo large, basistipes nearly triangular, subequal in size with palpifer; palpi four-segmented, terminal segment as long as three preceding segments, moderately asymmetrical, outer outline more strongly arched than inner; lacinia nearly rhomboidal, ca. twice as long as wide, apex with rows of strong bent setae, mesal portion with densely arranged strong setae; basigalea shorter than basal palpomere; distigalea moderately shorter than combined lengths of palpomeres 1-3, widest distally, ca. twice as wide as long, with rows of strong setae along apex. Labium (Figs. 23 - 25, 27, 54, 95, 96) with 3-segmented palpi, segment 1 and 2 subequal in length; segment 3 ca. as long as preceding segments combined, widest at middle, strongly arcuate on outer outline, slightly arcuate on mesal outline; palpigers narrowly separated. Ligula about as long as palpi, widest near apex; antero-lateral portion rounded, moderately prominent; baso-median half strongly sclerotised; apical half membranous, with numerous sensilla (Fig. 23). Mentum (Figs. 27, 95) ca. twice as wide as long, with a few long strong setae; mental apodemes long and narrow. Submentum about as long and as wide as mentum; hypopharynx (Fig. 26) with strongly sclerotised and posteriorly bifurcate medial bar, suspensoria small, surface with numerous short setae. Gula about as long as mentum, ca. as wide as terminal segment of labial palpus, densely setose. Tentorium hardly distinguished; tentorial bridge thin, with two admedian short anterior apodemes; dorsal tentorial arms absent. Cervicalia very short and narrow, rather indistinct (Fig. 28).

Thorax: Pronotum widest at basal third or at base; slightly longer than wide, lateral margin not or very finely explanate; anterior margin showing interspecific variability in lateral 0.2: from straight

to slightly or distinctly sinuate (Figs. 29 - 31, 50, 63, 64); anterior 0.1 paler, partly translucent; anterior half (Figs. 29, 51, 64, 73, 97) more or less domed, bordered posteriorly by transverse, deep or shallow depression (depression absent in *M. glabratus*); posterior half with two admedian prebasal gibbosities separated by mesal gap, gibbosities as well as gap variable in size; mesal longitudinal portion between anterior pronotal half and gibbosities forming a median keel (Fig. 74) in some species interrupted by depression; sublateral carinae: (1) long and reaching from base to middle of pronotum, (2) present near base and near middle of pronotum, (3) reduced to indistinct elevation near baso-lateral third, (4) absent; posterior pronotal margin tri-sinuate, setose; prescutellar pits (Fig. 74) fine or deep; posterior angles acute. Hypomera elongate, narrowed on posterior portion, rounded on antero-ventral angle (Fig. 32); trochantin large. Prosternal process (Figs. 54, 78, 101) narrowed posteriad, impressed posteriorly; apex slightly arcuate or truncate; lateral margins moderately raised around coxae; sublateral prosternal ridges distinct; prosternum in front of procoxae about as long as prosternal process. Mesosternum about as long as prosternal process (Fig. 78); lateral margins and posterior margin strongly raised, nearly carinate; groove for apex of prosternal process deep; mesonotum as in Fig. 116. Mesosternal spiracle ovate; peritreme medially prolonged, as long as spiracular opening; filter apparatus with numerous very fine spines; intersegmentalia short, membranous, with setal patch. Scutellum flat, subtriangular. Metasternum (Figs. 35, 55, 67, 68, 79, 103 - 105) with more or less large macropunctures, impressed on disc; longitudinal suture impressed or raised, with internal flange strongly raised; transverse suture distinct, in some species marked by macropunctures, its internal flange moderately raised. Metendosternite (Fig. 118, 225) with rather short stalk and wide arms. Metepisternum (Fig. 34) long and narrow, metepimeron with small patch of short hair-like setae on anterior third. Metanotum (Figs. 117, 102) long, shorter in brachypterous species (e.g. in *M. kubani*); prescutum about one third as long as scutum and well sclerotised in macropterous specimens, shorter and less sclerotised in brachypterous specimens; scuta large, each with oblique rows of hair-like setae; postnotum short. Elytra (Figs. 36, 56, 80) subparallel or obovate, usually with more or less deep transverse depression near sides of sutural interval at anterior 0.2; lateral sides more or less strongly serrate along whole length or only posteriorly; apex rounded or emarginate; elytra in cross-section with sides nearly straight and rather steeply declivous or arcuate between sutural and ninth interval; elytral striae 1-8 usually well developed, striae 9 and 10 fine, indistinct and concealed by plastron (Fig. 108); third interval with longitudinal prominent tubercle in anterior 0.2, or carinate at anterior 0.5, or nearly flat; fifth interval carinate on anterior 0.6 (in *M. jaechi*) or flat; ninth interval serrate and carinate at anterior 0.75 - 0.90; elytral flanks wide or narrow, more or less visible in dorsal view; epipleura wide. Venter of elytron (Figs. 38, 109), sublateral carina and lateral margin form a groove for reception of raised laterosternites 1-2; mesal portion of sublateral carina with binding spicules; baso-lateral elytral patch of binding spicules ellipsoidal, well demarcated (Fig. 39); subapical portion with rows of densely spaced hair-like setae (Fig. 40). Metathoracic wings (examined in *M. quadrituberculatus, M. indicus* and *M. kubani*) - if fully developed - about 2.7 times as long as wide, venation reduced (Figs. 119, 120); apical field longer than medial field, with two variably sclerotised and pigmented strips (secondary sclerotizations or branches of radius posterior); precosta (PC) fused with costa (C); costa slightly pigmented, hardly discernible; subcosta posterior (ScP) and radius anterior (RA) fused near basal 0.25 into pigmented radial bar (rb) extending about to middle of wing; a fine pigmented strip present beneath rb; pterostigma lacking bordering veins, sclerotised and pigmented, with a few hair-like setae; radial cross-vein (r4) with sides pigmented, interrupted near middle; radius posterior (RP) short pigmented strip near connection with radio-medial cross-vein (rp-mp2); medial bar (mb) strong, becoming darker distad; medial spur (ms) with three hair-like setae; medial field with two indistinct unbraced veins, first probably representing remains of cubitus anterior (CuA), second (absent in some examined wings) very short, probably reduced anal anterior (AA); anal field with rather distinct anal posterior (AP3+4). Wing polymorphism corresponding with size of humeral protuberances (Figs. 1, 2) and frequent within local populations in specimens of both sexes. Coxae large, widely

separated mesally, pro- and mesocoxa nearly globular, metacoxa transverse; trochanters small, subtriangular. Legs long; femora (Figs. 41, 58, 82, 110, 111) moderately or strongly widened (clavate), sparsely granulate, with subbasal longitudinal patch of densely arranged yellowish long setae (Fig. 42), these rather distinct on antero-dorsal portion of profemur, more finer and more adpressed on postero-dorsal portion of mesofemur. Tibiae (Figs. 43, 59, 60, 61, 112) rather thin, widened in distal half; protibiae of some species more strongly widened in males than in females, tibial cleaning fringe on anterior and posterior ventro-distal part of pro- and mesotibia and on posterior ventro-distal part of metatibia (Fig. 84); tibial spurs short and fine. Tarsi (Figs. 44, 62) long, 5-segmented, length of tarsomere 5 usually subequal to combined lengths of preceding ones, protarsomere 5 with ventro-apical setal tufts in males (Fig. 114). Claws strong, robust and curved, without denticle; empodium short, squamose, lacking setae (Figs. 83, 113).

Abdomen (Figs. 45, 85, 103, 105): with five moderately curved ventrites, first and second connate; ventrite I with admedian carinae extending to posterior margin, or reduced and effaced before posterior margin (Fig. 49); abdominal intercoxal process wide, with sides moderately raised; ventrites III and IV produced postero-laterad (Figs. 48, 85, 86); apex of ventrite V rounded, with a few microgranules and numerous stout setae (Fig. 46). Tergites darker pigmented along midline, with densely, rather regularly arranged microtrichia and a few hair-like short setae near posterior tergal margins; microtrichia pointed posteriad along midline and away from midline in admedian portions of tergites; tergites 3 and 4 with ventro-lateral sclerotizations near anterior margin. Laterosternites on segments 3-7, strongly raised on segment 3 (Fig. 47), slightly raised on segments 4 and 5, moderately raised and strongly sclerotised on anterior portion of segments 6 and 7. Spiracles on abdominal segments 1-7; spiracles of segment 1-5 in pleural membrane, with atrium large and subatrial apodeme long; spiracles of segment 6 and 7 (Fig. 86) in laterosternites, with elliptical spiracular opening and with tracheae very wide.

Males: Sternite VIII with long median apodeme (Fig. 124), tergite VIII without apodeme (Fig. 126); genital segments generally as in Fig. 125. Aedeagus (e.g. Figs. 121 - 123) long and slender; penis subparallel or widened across apical 0.3, rounded at apex, fibula and corona absent, in *glabratus* species group penis with bar-like sclerotizations (e.g. Fig. 133); membranous ventral sac short and developed near apical third of penis or long and developed near apical half of penis; endophallus laterally bordered by a short and wide, or long and narrow sclerotised band, surface with various spines or scales (Fig. 87) arranged usually in rows; parameres fused with penis tube partly (thus their ventro-apical portion discernible, e.g. Figs. 133, 134) or entirely; phallobasis short.

Females: Sternite VIII with a long median apodeme (Fig. 130), tergite VIII rounded apically. Ovipositor (e.g. Figs. 128, 129, 139, 141): terminal segment more or less short, usually straight, with small apical sensilla; preterminal segments vary from short to long, mesally pubescent; apico-lateral portion of preterminal segments more or less produced laterad, rounded, bilobate or truncate; ventral fulcrum distinctly longer than preterminal segment.

Distribution: Nearctic, Palearctic and Oriental Regions (Figs. 250 - 252). Despite the wide distribution of the genus, there is a distinct centre of the species diversity: southeast China and Vietnam. Four of the 11 species of *Macronychus* are recorded from SE China, three are known from Vietnam.

Key to species of *Macronychus*

1 Frons, epicranium and tibiae with plastron (Figs. 50, 59 - 61, 63); admedian pronotal gibbosities small or indistinct (Figs. 51, 64); transverse pronotal depression fine or absent; anterior angles of pronotum distinctly protruding (Figs. 50, 63); parameres fused partly with penis tube, their ventro-apical portion discernible (Figs. 133, 134); penis with three distinct, bar-like sclerotizations in proximal half; latero-apical portion of preterminal segment of ovipositor moderately produced, rounded (Figs.

139 - 141, 156, 157) ..... **2 *glabratus* group**

- Frons, epicranium and tibiae without plastron (Figs. 13, 43, 72, 82, 88, 112); admedian pronotal gibbosities large, convex (Figs. 29, 30, 73, 97, 98); transverse pronotal depression deep; anterior angles of pronotum moderately or not protruding (Figs. 29, 30, 72, 97); parameres fused entirely with penis tube, not discernible (e.g. Figs. 121, 122); penis without three distinct, bar-like sclerotizations in proximal half; latero-apical portion of preterminal segment of ovipositor strongly produced, bilobate or truncate (e.g. Figs. 115, 129) **4**

2 Admedian prebasal gibbosities indistinct (Fig. 51); transverse pronotal depression absent; pronotum without microgranules; punctures of elytral striae fine (Fig. 56), intervals broad; elytra in cross-section with sides nearly straight and steeply declivous between sutural and ninth intervals; ninth elytral interval strongly carinate; prosternal process except raised margins shiny (Fig. 54); meso- and metasternal disc shiny (Fig. 55); aedeagus as in Figs. 133, 134; ovipositor as in Figs. 139 - 141... ..... ***M. glabratus***

- Admedian prebasal gibbosities distinct, small (Figs. 64, 65); transverse pronotal depression present, fine; pronotum with microgranules (Figs. 65, 66); punctures of elytral striae large and deep, intervals narrow (Figs. 69, 70); elytra in cross-section with sides arcuate, moderately steeply declivous between sutural and ninth intervals; ninth elytral interval moderately carinate; prosternal process, disc of meso- and metasternum microreticulate (Figs. 67, 68) **3**

3 Elytra almost flat behind middle in lateral view, humeri moderately prominent; lateral sides of elytra not sinuate subapically; aedeagus and ovipositor as in Figs. 150, 151, 156, 157..... ***M. vietnamensis***

- Elytra convex behind middle in lateral view, humeri prominent; lateral sides of elytra sinuate subapically (Fig. 145); aedeagus: Fig. 146 ..... ***M. levanidovae***

4 Clypeus rugose; medial pronotal keel flat, with sides slightly declivous (Figs. 29, 30, 32); prebasal pits fine; pronotal surface rugose (except of shiny admedian gibbosities) and more or less microgranulate on posterior half (Figs. 29, 30); elytra usually deeply transversally impressed at anterior 0.3 near sutural interval; elytral cross-section frequently with sides nearly straight and rather steeply declivous between sutural and ninth interval; admedian macropunctures of metasternum small, indistinct (Fig. 35); femora moderately enlarged, not clavate (Fig. 41); carinae on ventrite I not reaching posterior margin (Figs. 45, 47, 49); ventrites I - IV with microgranules concealed by plastron (Fig. 49); lateral sclerotised bands of endophallus long and narrow; ventral sac long reaching almost middle of penis; aedeagus and ovipositor (Figs. 121 - 123, 128, 129) .... ***quadrituberculatus* group: *M. quadrituberculatus***

- Clypeus shiny, micropunctate or reticulate; medial pronotal keel high, with sides steeply declivous (Figs. 73, 74); prebasal pits strong; pronotal surface shiny or reticulate on posterior half; elytra finely transversally impressed at anterior 0.3 near sutural interval; elytral cross-section with sides more or less arcuate, moderately declivous between sutural and ninth interval; admedian macropunctures of metasternum large; femora strongly enlarged, clavate (Figs. 82, 110, 111); ventrites I - IV without microgranules; lateral sclerotised bands of endophallus short and wide (e.g. Figs. 161, 173, 187, 197); ventral sac short, confined to apical 0.3 of penis ..... **5 *indicus* group**

5 Median keel of pronotum with sulcus (Figs. 73, 74); body form obovate: elytral sides gradually arcuately widened to ca. 0.6 of elytral length (Figs. 6, 7) **6**

- Median keel of pronotum without sulcus (fine sulcus found only in several specimens of *M. indicus* from Thailand); body form moderately elongate: elytral sides subparallel to ca. 0.6 of elytral length (Figs. 5, 8 - 12) **7**

6 Admedian pronotal gibbosities mesally nearly confluent and separated by narrow sulcus only; puncture interstices of median keel shiny; third elytral interval tuberculate on anterior 0.15, fifth slightly convex, ninth carinate along anterior 0.7; elytral flanks invisible in dorsal view, concealed by ninth interval; penis (Figs. 173 - 175) with a few long lateral setae and numerous short lateral setae, basal apophyse is long; endophallus without transverse rows of semi-lunar sclerites; ovipositor as in Figs. 180, 181..... ***M. sulcatus* sp.n.**

- Admedian pronotal gibbosities separated mesally by distance about half of ID (Figs. 73, 74); puncture interstices of median keel finely reticulate (Fig. 76); third elytral interval carinate along anterior 0.5, fifth carinate along anterior 0.6, ninth carinate along anterior 0.9 (Fig. 80); elytral flanks well visible in dorsal view; penis (Figs. 186, 187) with numerous long lateral setae, short lateral setae absent, basal apophyse is short; endophallus with transverse rows of semi-lunar sclerites (Fig. 185); ovipositor as in Figs. 192, 193 ..... ***M. jaechi* sp.n.**

7 Short and narrow species (CL = 1.8 - 2.2 mm, EW = 0.7 - 0.9 mm); pronotal surface of posterior half distinctly reticulate (except admedian gibbosities); pronotal sublateral carinae indistinct; apical 0.25 of penis with a narrow transverse hyaline strip (Figs. 161, 162); ovipositor as in Figs. 168, 169 ..... ***M. reticulatus* sp.n.**

- Longer and wider species (CL = 2.5 - 3.4 mm, EW = 1.1 - 1.5 mm); pronotal surface of posterior half: shiny on interstices, rugose on median keel, shiny or rugose in transverse depression; pronotal sublateral carinae distinct at least near base and near middle of pronotum; hyaline strip near apex of penis absent (Figs. 197, 212, 237) **8**

8 Admedian prebasal gibbosities of pronotum separated mesally by distance about 0.5 of ID; frons with two distinct longitudinal lateral depressions; surface of pronotal transverse depression shiny; prosternal process and metasternum impunctate, shiny; transverse suture with single macropuncture; elytral apex rounded; lateral sides of elytra finely explanate, ninth intervals strongly serrate, prominent and subparallel, thus elytral flanks very narrow in dorsal view; long, hair-like setae of penis arranged between apical 0.7 - 0.8 of penis length (Figs. 226, 227); ovipositor (Figs. 232, 233) with preterminal segment long, ventral fulcrum about 1.5 times as long as preterminal segment ..... ***M. jendeki* sp.n.**

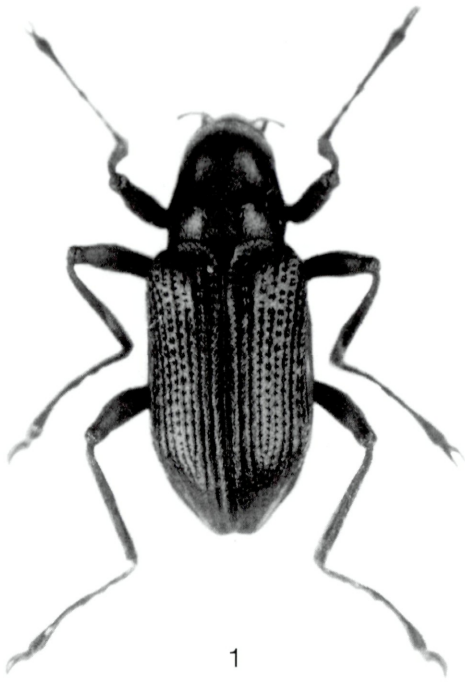
- Admedian prebasal gibbosities of pronotum separated mesally by distance about 0.25 of ID or smaller (Fig. 97); frons lacking distinct longitudinal lateral depressions (Fig. 88); surface of pronotal transverse depression rugose (Fig. 99); prosternal process and metasternum reticulate, irregularly punctate or irregularly grooved (Figs. 101, 103 - 105); transverse suture with at least two macropunctures; elytral apex more or less emarginate; lateral sides of elytra moderately explanate, ninth intervals finely serrate, moderately prominent and subparallel or slightly sinuate, thus elytral flanks wider in dorsal view; long, hair-like setae of penis arranged between apical 0.3 (0.7) - 0.9 of penis length (Figs. 197, 212, 237); ovipositor with preterminal segment short (Figs. 205, 206, 220, 245), ventral fulcrum ca. 1.8 - 3.0 times as long as preterminal segment **9**

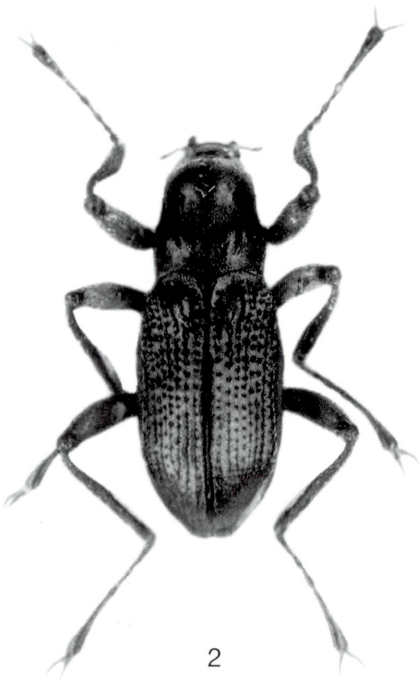
9 Frons and epicranium shiny on interstices (Fig. 88); disc of metasternum irregularly longitudinally grooved, or irregularly punctate (Figs. 103 - 105); admedian pronotal gibbosities with numerous flattened setae (Fig. 99); penis parallel-sided (Figs. 212 - 214); terminal segment of ovipositor very short, about as long as wide (Fig. 222) ..... ***M. kubani* sp.n.**

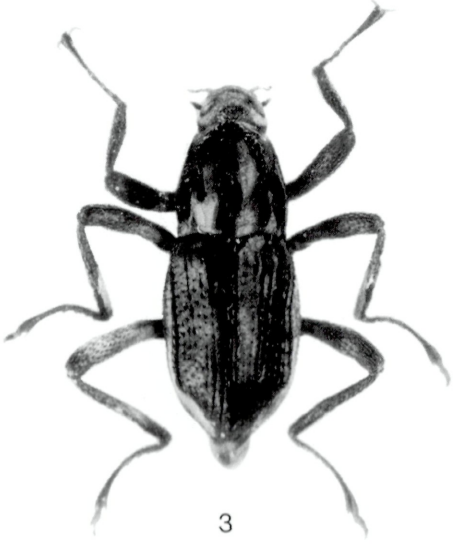
- Frons and epicranium densely micropunctate on interstices; disc of metasternum reticulate; admedian pronotal gibbosities without or with a few flattened setae only; penis enlarged (Fig. 197) or constricted (Fig. 231) in apical 0.3; terminal segment of ovipositor distinctly longer than wide (Figs. 207, 208, 246) **10**

10 Sublateral pronotal carinae along posterior half of pronotum, distinct on gibbosities; elytral apex finely emarginate; protibiae of males moderately widened distally; penis (Figs. 197 - 199) enlarged in apical 0.3; long lateral setae of penis bluntly ended (Fig. 200); endophallus with very fine spines in transverse rows; preterminal segment of ovipositor produced apically and on latero-apical portion dorsally and ventrally, thus nearly three-lobate (Figs. 207, 208); ventral fulcrum ca. 1.8 times as long as preterminal segment (Figs. 205, 206) ..... ***M. indicus***

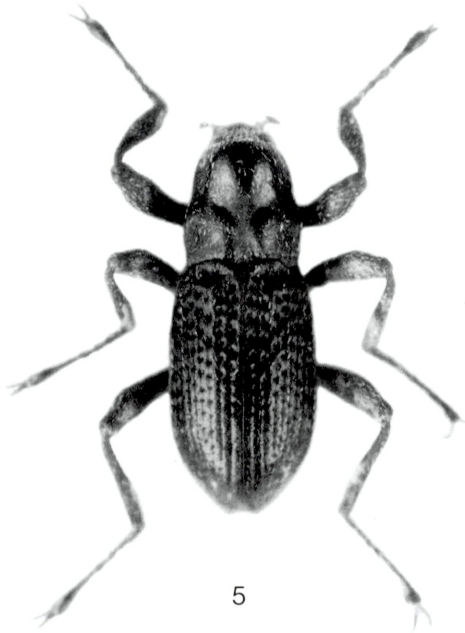
- Sublateral pronotal carinae near base and near middle of pronotum, absent on gibbosities; elytral apex strongly emarginate; protibiae of males strongly widened distally; penis (Figs. 231 - 239) slightly constricted in apical 0.3; long lateral setae of penis acuminate (Fig. 246); endophallus with relatively large, widely spaced scales; apico-lateral portion of preterminal segment produced dorsally and ventrally, bilobate (Fig. 246); ventral fulcrum ca. 3 times as long as preterminal segment (Fig. 245) ..... ***M. ultimus* sp.n.**







Figs. 1 - 4: Habitus of 1) *Macronychus quadrituberculatus*, macropterous female, length 3.1 mm; 2) *M. quadrituberculatus*, brachypterous male, length 2.8 mm; 3) *M. glabratus*, brachypterous male, length 2.5 mm; 4) *M. vietnamensis*, macropterous female, length 3.0 mm.



Figs. 5 - 8: Habitus of 5) *Macronychus reticulatus* sp.n., male paratype from China (hind wings not examined), length 2.1 mm; 6) *M. sulcatus* sp.n., female paratype (hind wings not examined), length 2.5 mm; 7) *M. jaechi* sp.n., female paratype (hind wings not examined), length 2.5 mm; 8) *M. indicus*, female paratype (hind wings not examined), length 3.3 mm.

Figs. 9 - 12: Habitus of 9) *Macronychus kubani* sp.n., brachypterous female, paratype, length 3.0 mm; 10) *M. jendeki* sp.n., macropterous female, paratype, length 3.2 mm; 11) *M. ultimus* sp.n., male, holotype (hind wings not examined), length 2.8 mm; 12) *M. ultimus* sp.n., female (hind wings not examined), paratype from northern Laos, length 2.8 mm.

Macrynychus quadrituberculatus species group

Members: *M. quadrituberculatus.*

Diagnosis: The *M. quadrituberculatus* group is characterised by the following features: (1) medial pronotal keel flat, sides slightly declivous; (2) metasternal macropunctures reduced, small or nearly absent; (3) carinae of ventrite I reduced, not reaching posterior margin of ventrite; (4) elytra usually transversally impressed near sides of sutural interval in anterior third.

Macronychus quadrituberculatus MÜLLER
(Figs. 1, 2, 13 - 49, 116 - 132, 250)

Macronychus quadrituberculatus P.W. MÜLLER, 1806: 215.

Type locality: Glan river, Odenbach, Rheinland-Pfalz, western Germany.

Material examined: 15 ♂♂, 23 ♀♀ (CKB, NMW, SNM, MHNG) : "SLOVAKIA, VII. 1991, Latorica river, env. Leles, Kodada & Holecová lgt."; 7 ♂♂, 19 ♀♀ (NMW): "CSFR-Slovakei, Latorica (2), leg. Jäch, 18.X.1991"; 1 ♀ (NMW): "CS: Slow. b.or.m.: Latorica-Aue bei Leles 2.-3.7.1992 Leg. L. Behne"; 1 ♂, 1 ♀ (CKB): "Slovakia, 27. V. 1997, Ipel riv., env. Chlaba, T. Derka Lgt."; 2 ♂♂, 4 ♀♀ (NMW): "A-Burgenland : 15.8.1996, 5 km E Fürstenfeld, 230 m, Lafnitz bei Dobersdorf, leg. Jäch (1)"; 2 ♂♂, 2 ♀♀ (NMW): "Austria/Bgld., Rabnitz/Piringsdf., leg. Jäch, 29.5.83"; 2 ♂♂, 2 ♀♀ (NMW): "Raab, L. Strauss"; 1 ♂ (NMW): "Koglicht 28"; 1 ♂, 3 ♀♀ (NMW): "Dessau"; 3 ♂♂, 2 ♀♀ (NMW): "Bar 1917, L. Strauss"; 34 ex. (NMW): withouth locality data; 8 ♂♂, 6 ♀♀ (NMW): "BRD, 15.VI.1994, Bayern, Grieshaus Isarmündung, leg. Hebauer"; 3 ♂♂, 3 ♀♀ (NMW): "D-Bayern: 6.8.1996, NE Dachau, Amper bei Ampermoching, leg. Jäch (4)"; 1 ♂, 1 ♀ (NMW): "D, Bay, Lkr. DEG: 1.9 km SO Isarmünd., Hinterb. Mühlbach (28). Hess, Heckes & Haft leg. 16.07.94"; 1 ♀ (NMW): "GR-Pramoritsa W Florina 13.IX. leg. Sondermann 92"; 1 ♀ (NMW): "I - Viterbo Ponte d. Abbadia Fiume Fiora 28. VIII. 1992 leg. Schönmann".

Diagnosis: Recognised among other *Macronychus* by following characters in combination: (1) pronotal median keel flat, with sides slightly declivous; (2) pronotal surface densely, rugosely punctate except of pronotal gibbosities; (3) elytra usually deeply transversally depressed near sides of sutural interval in anterior 0.3; (4) carinae of ventrite I not reaching posterior margin.

Redescription: Habitus (Figs. 1, 2). Body form moderately elongate, 2.27 - 2.62 times as long as wide (CL/EW). Length (CL) in ♂♂ = 2.59 - 2.91 mm (ø = 2.70 ± 0.09), in ♀♀ = 2.90 - 3.50 mm (ø = 3.22 ± 0.17), width (EW) in ♂♂ = 1.03 - 1.17 mm (ø = 1.08 ± 0.04), in ♀♀ = 1.16 - 1.42 mm (ø = 1.29 ± 0.07). Elytra, pronotum, dorsum of head and terminal segment of maxillary palpus dark brown to black; venter, legs and mouth parts brown to dark brown; antennae, labial palpi, anterior margin of pronotum and prosternum, as well as claws reddish-brown.

Head (Figs. 13 - 27): Clypeus with punctation variable: (1) sparsely punctate, punctures coarser than on labrum, setigerous, interstices finely micropunctate or microreticulate, (2) irregularly, nearly rugosely punctate. Fronto-clypeal suture deeply impressed, straight. Frons slightly impressed near antero-lateral angles; surface irregularly, rugosely punctate with a few coarser setigerous punctures. Eyes large, elliptical in lateral view; antero-posterior length in ♂♂ = 0.23 - 0.30 mm (ø = 0.25 ± 0.02), in ♀♀ = 0.22 - 0.31 mm (ø = 0.28 ± 0.02), ID in ♂♂ = 0.26 - 0.29 mm (ø = 0.27 ± 0.01), in ♀♀ = 0.30 - 0.35 mm (ø = 0.33 ± 0.01); HW in ♂♂ = 0.51 - 0.58 mm (ø = 0.53 ± 0.02), in ♀♀ = 0.56 - 0.65 mm (ø = 0.61 ± 0.03).

Thorax (Figs. 29 - 35, 116 - 118): Pronotum broadest at basal third or at base; lateral margin very finely explanate; lateral sides subparallel in posterior 0.4 then gradually convergent anteriad; anterior margin slightly sinuate in lateral 0.2; anterior half domed; transverse depression deep; median keel wide, flat, with lateral sides slightly declivous; admedian prebasal gibbosities more or less strongly convex, widely separated mesally (by distance of about half of ID), with distinct setal tufts, puncture interstices glabrous and shiny; sublateral carinae absent or indistinct near basolateral third; prescutellar pits fine or absent; pronotal surface densely, rather rugosely punctate, with microgranules near pronotal base or on posterior half; AW in ♂♂ = 0.60 - 0.66 mm

(ø = 0.62 ± 0.02), in ♀♀ = 0.68 - 0.78 mm (ø = 0.72 ± 0.04), BW in ♂♂ = 0.74 - 0.86 mm (ø = 0.78 ± 0.03), in ♀♀ = 0.84 - 1.01 mm (ø = 0.92 ± 0.05); MW in ♂♂ = 0.77 - 0.88 mm (ø = 0.82 ± 0.03), in ♀♀ = 0.88 - 1.06 mm (ø = 0.96 ± 0.05); PL in ♂♂ = 0.83 - 0.95 mm (ø = 0.87 ± 0.03), in ♀♀ = 0.94 - 1.13 mm (ø = 1.03 ± 0.06). Prosternal process as long as wide, narrowed posteriad, impressed posteriorly; apex slightly arcuate or truncate; lateral margins moderately raised around coxae, microreticulate; surface rugosely punctate; sublateral ridges reaching nearly prosternal middle. Mesosternum about as long as prosternal process; lateral margins and posterior margin strongly raised, nearly carinate; midline and posterior margin of groove for prosternal process slightly elevated. Metasternum longer than prosternum, with longitudinal medial depression in posterior 0.6 and with transverse depression in anterior 0.3; longitudinal suture raised along posterior 0.6; transverse suture finely impressed, not marked by macropunctures; metasternal intercoxal process wide, raised and microreticulate on lateral sides, depressed near antero-lateral angles, grooved or finely punctate; macropunctures small or indistinct; disc irregularly, more or less strongly grooved. Scutellum flat, subtriangular, as wide as long or slightly longer than wide; lateral sides arcuate; surface glabrous or microreticulate. Elytra (Figs. 36 - 40) subparallel between anterior 0.15 - 0.65, then gradually convergent to apices, usually deeply transversally impressed near sides of sutural interval in anterior 0.3 (all dorsal view); lateral sides finely serrate on anterior 0.5, more strongly on posterior 0.5, moderately explanate; apex rounded or finely emarginate; in lateral view elytra more or less convex, with highest point at 0.5; elytral cross-section with sides nearly straight and rather steeply declivous between sutural and ninth interval (very distinct in small, brachypterous specimens); EL in ♂♂ = 1.76 - 1.98 mm (ø = 1.85 ± 0.07), in ♀♀ = 2.00 - 2.44 mm (ø = 2.24 ± 0.12); macropunctures round, deeply impressed, largest on disc, separated by distance of 1 - 3 puncture diameter, progressively smaller and shallower towards apex and epipleura. Intervals as wide as striae or narrower, punctate and finely irregularly transversally grooved; third interval with longitudinal prominent tubercle in anterior 0.2, tubercle with tuft of semi-erect strong setae; sutural interval finely raised, with row of long, strong setae; ninth intervals slightly sinuate (dorsal view), finely serrate and carinate in anterior 0.75, then abruptly ended, with long, strong setae; remaining intervals flat, with rows of short, prone setae; elytral flanks wide, well visible in dorsal view, at widest point half as wide as ID; epipleura effaced at middle of ventrite V. Metathoracic wings fully developed (Fig. 120) or frequently reduced. Legs slightly longer or as long as body (CL); femora (Figs. 41, 42) widest at middle, not clavate. Tibiae (Fig. 43) thin, widened in distal half; protibiae more strongly widened in males than in females; length of tibiae subequal to 1/3 of CL: protibia in ♂♂ = 0.92 - 1.05 mm (ø = 0.95 ± 0.04), in ♀♀ = 0.94 - 1.18 mm (ø = 1.08 ± 0.08); mesotibia in ♂♂ = 0.88 - 1.00 mm (ø = 0.93 ± 0.03), in ♀♀ = 0.88 - 1.16 mm (ø = 1.08 ± 0.08); metatibia in ♂♂ = 0.97 - 1.12 mm (ø = 1.05 ± 0.04), in ♀♀ = 1.04 - 1.30 mm (ø = 1.15 ± 0.09). Tarsi (Fig. 44) moderately longer than tibiae, length of tarsomere 5 subequal to combined length of preceding ones, protarsomere 5 with ventro-apical setal tufts in males.

Abdomen (Figs. 45 - 49): Ventrites with plastron and flat granules concealed by plastron, except of median portion of ventrite I; abdominal intercoxal process with sides moderately raised, surface irregularly longitudinally grooved or punctate; admedian carinae moderately prominent or nearly absent, not reaching ventrite II; apex of ventrite V rounded, with a few microgranules (Figs. 127, 132). Aedeagus (Figs. 121 - 123): penis about 4 times as long as phallobasis, subparallel, apex rounded; long, widely spaced, acuminate hair-like setae along apical 0.4; membranous ventral sac developed in apical half of penis; endophallus laterally bordered by a long sclerotised band, surface with very small spines arranged in short, regularly spaced rows. Male sternite VIII and tergite VIII as in Figs. 124, 126, genital segments as in Fig. 125. Ovipositor (Figs. 128, 129): terminal segment about 0.1 times as long as preterminal, almost straight; preterminal segment thick, with apico-lateral portion produced laterad; ventral fulcrum about 1.8 times as long as preterminal segment. Female sternite VIII and tergite VIII as in Figs. 130, 131.

Sexual dimorphism: Females generally larger, with protibiae moderately widened and their protarsomere 5 lacking ventro-apical setal tufts.

Distribution (Fig. 250): Western, Central and southern Europe, Finland (BERTHÉLEMY 1979), northern Africa: Morocco (DOLLFUS 1925).

Habitat: Larger streams and rivers (hyporhithral, epipotamal, metapotamal, MOOG & JÄCH 1995), mainly in submerged wood.

Macronychus glabratus species group

Members: *M. glabratus*, *M. levanidovae*, *M. vietnamensis*.

Diagnosis: Species of the *glabratus* group are recognised by the following combination of characters: (1) frons and epicranium with plastron; (2) tibiae with plastron; (3) lateral sides of elytra distinctly, rather strongly serrate on entire length; (4) penis in basal half with three longitudinal bar-like sclerotizations.

Macronychus glabratus SAY
(Figs. 3, 50 - 62, 133 - 144, 251)

Macronychus glabratus SAY, 1825: 187.

Macronychus lateralis MELSHEIMER, 1846: 99, syn.

Type localities: *Macronychus glabratus*: United States, SAY (1925) gives no exact locality. *Macronychus lateralis*: Pennsylvania, United States.

Material examined: 1 ♂ (NMW): "Devil's Den., Okla., 6.18.-60, H. P. Brown"; 1 ♀ (NMW): "OKLA: Lukfata Cr., w. Broken Bow, 73/7/12, H. Brown"; 1 ♀ (NMW): "Kraatz, 1868"; 1 ♀ (NMW): "Pöpp, 853"; 1 ♂, 1 ♀ (NMW): without locality data; 1 ♀ (NMW): "USA: MARYL., Montgommery Co. 10km NW Wash. D. C., 23.6.1998 Potomac River, Plummers Isl. black light, leg. Jäch"; 2 ♂♂, 2 ♀♀ (CKB): "OK: Johnston Co. 8mi E Reagan, 6. VI. 1984 Blue River WDS - A - 299, W.D. Shepard leg".

Diagnosis: *Macronychus glabratus* differs from *M. vietnamensis* and *M. levanidovae* as follows: (1) pronotum with indistinct admedian prebasal gibbosities, these not clearly separated from anterior part; (2) pronotal surface lacking microgranules, shiny or very finely micropunctate on interstices; (3) elytral striae finer and intervals broader, (4) elytra in cross-section with sides nearly straight and more steeply declivous between sutural and ninth intervals; (5) ninth elytral interval strongly prominent and serrate; (6) disc of meso- and metasternum shiny.

Redescription: Habitus (Fig. 3). Body form moderately elongate, 2.29 - 2.55 times as long as wide (CL/EW). Length (CL) in ♂♂ = 2.56 - 2.78 mm (ø = 2.71 ± 0.13), in ♀♀ = 3.06 - 3.16 mm (ø = 3.11 ± 0.07), width (EW) in ♂♂ = 1.09 - 1.22 mm (ø = 1.13 ± 0.07), in ♀♀ = 1.29 - 1.30 mm (ø = 1.29 ± 0.01). Elytra, pronotum, venter and legs except tarsi brown to piceous; head black; mouth parts, antennae, palpi, anterior margin of labrum, anterior margin of pronotum and prosternum, as well as claws paler.

Head (Fig. 50): Clypeus sparsely punctate, punctures smaller than facets, interstices finely micropunctate or smooth. Fronto-clypeal suture slightly arcuate. Eyes rather small, elliptical or nearly round in lateral view; antero-posterior length in ♂♂ = 0.19 - 0.23 mm (ø = 0.22 ± 0.02), in ♀♀ = 0.22 mm; ID in ♂♂ = 0.29 mm, in ♀♀ = 0.32 - 0.34 mm (ø = 0.33 ± 0.01); HW in ♂♂ = 0.51 - 0.56 mm (ø = 0.53 ± 0.03), in ♀♀ = 0.60 mm. Frons flat, except of raised margin around eyes; epicranium and frons with plastron and with sparse setigerous granules smaller than facets (Fig. 50).

Thorax: Pronotum (Figs. 51 - 53) widest slightly posterior to middle, domed in lateral view but lacking distinct transverse depression which separates indistinct admedian prebasal gibbosities

from anterior half; surface punctate, punctures smaller than facets, separated by 2 - 4 times facet diameter, interstices shiny or very finely microreticulate (reticulation confined to area before and between admedian gibbosities as in Fig. 53, and near fine sublateral carinae); anterior margin distinctly sinuate in lateral 0.2, thus anterior angles distinctly produced; lateral margins moderately explanate and in some specimens indistinctly crenulate, slightly divergent or subparallel in basal 0.4 then strongly convergent anteriad; admedian prebasal gibbosities inconspicuous, mesally and anteriorly separated by fine, indistinct depressions only, setal tufts present; BW in ♂♂ = 0.83 - 0.95 mm (ø = 0.88 ± 0.06), in ♀♀ = 0.94 - 0.96 mm (ø = 0.95 ± 0.02); MW in ♂♂ = 0.90 - 1.03 mm (ø = 0.94 ± 0.07), in ♀♀ = 1.04 - 1.05 mm (ø = 1.05 ± 0.01); AW in ♂♂ = 0.58 - 0.64 mm (ø = 0.61 ± 0.03), in ♀♀ = 0.70 mm (ø = 0.70); PL in ♂♂ = 0.95 - 1.06 mm (ø = 0.99 ± 0.06), in ♀♀ = 1.12 - 1.16 mm (ø = 1.14 ± 0.03). Prosternal process (Fig. 54) wider than long, narrowed posteriad and abruptly constricted before truncate apex; lateral margins raised along coxae, microreticulate; surface grooved and depressed in anterior half, interstices shiny. Mesosternum (Fig. 55) shorter than prosternal process, surface glabrous, shiny; lateral margins raised, microreticulate; posterior margin elevated medially. Metasternum (Fig. 55) shiny on disc, with wide and deep longitudinal, median depression in posterior 0.6; admedian macropunctures fused and forming longitudinal pit; longitudinal suture fine; mesocoxal process strongly raised and microreticulate along coxae; transverse suture with large admesal macropuncture. Scutellum flat, narrow, twice as long as wide, shiny. Elytra (Fig. 56, 57) widened from base to anterior third, subparallel along middle third, then convergent to apices (dorsal view); in lateral view moderately domed, with highest point near middle, outline not interrupted by transverse depression across anterior third; in cross-section sides steeply declivous; lateral sides serrate, widely explanate; apex rounded or slightly emarginate; each elytron with round, finely impressed macropunctures in 8, sometimes hardly visible rows, punctures slightly coarser than facets, widely separated; intervals wider than striae, with rows of yellow setae, which are longest, erect and most conspicuous on sutural interval; interval 3 with moderately elevated tubercle at anterior 0.15, tubercle with tuft of setae; intervals 9 serrate and strongly prominent along anterior 0.7, sinuate in dorsal view; EL in ♂♂ = 1.60 - 1.72 mm (ø = 1.67 ± 0.06), in ♀♀ = 1.98 - 2.02 mm (ø = 2.00 ± 0.03); elytral flanks as wide as 0.5 of ID; epipleura effaced at middle of ventrite V. Legs slightly longer than body (CL); tibiae moderately widened, with plastron, granules and setae (Figs. 59 - 61); length of tibiae subequal to PL, protibia in ♂♂ = 0.97 - 1.03 mm (ø = 1.00 ± 0.03), in ♀♀ = 1.06 - 1.09 mm (ø = 1.08 ± 0.02); mesotibia in ♂♂ = 0.91 - 0.96 mm (ø = 0.94 ± 0.03), in ♀♀ = 1.04 - 1.05 mm (ø = 1.05 ± 0.01); metatibia in ♂♂ = 0.97 - 1.10 mm (ø = 1.06 ± 0.07), in ♀♀ = 1.17 - 1.25 mm (ø = 1.21 ± 0.06). Femora (Fig. 58) moderately widened distally; tarsi (Fig. 62) in length subequal to tibiae, tarsomere 5 slightly longer than combined length of preceding segments, protarsomere 5 with ventro-apical setal tufts in males.

Abdomen: Ventrite V with a few granules, apex truncate. Apex of abdomen, sternite VIII, tergite VIII and genital segments as in Figs. 135 - 138, 142 - 144. Aedeagus (Figs. 133, 134): penis about 8 times as long as phallobasis, narrowed apically, with hair-like setae along lateral sides, setae longest along middle; apex rounded; surface finely grooved; ventro-apical portion of parameres discernible; ventral sac long, developed in apical half; endophallus laterally bordered by a long sclerotised band, penis with three longitudinal bar-like sclerotizations and median sclerite. Ovipositor (Figs. 139 - 141): terminal segment short, slender, with sides almost straight; preterminal segment ca. 10 times longer than terminal, its apico-lateral portion moderately produced laterad, rounded; ventral fulcrum about 1.8 times as long as preterminal segment.

Sexual dimorphism: Females generally larger, lacking ventro-apical tuft of setae on protarsomere 5.

Distribution (Fig 251)**:** Widely distributed in the eastern half of the United States (Sanderson 1953; Brown 1983).

Habitat: On submerged wood in streams (Brown 1972).

Macronychus levanidovae LAFER
(Figs. 145 - 149, 252)

Macronychus levanidovae LAFER, 1980: 50.

Type locality: Kamenka river, Ussurijskij reserve, Primorye Territory, eastern Russia.

Material examined: Holotype ♂ (ZIL): "Primorje, r. [= reka] Kamenka, Uss. z-k[= Ussurijskij zapovednik], 3.8.'972[=1972], Levanidova" [hw] \ "Holotypus Macronychus levanidovae G. Lafer det. m. [hw]" \ "(ZIL) Zool. Ins. St. Petersburg" [p] \ *"Holotypus"* [p]. We removed the holotype from the original card and dissected it, terminalia, abdomen and specimen were then glued together on another card. The musculature of the aedeagus is well fixed and thus the endophallus structure is hardly visible.

Diagnosis: Externally, this species is very similar to *M. vietnamensis* from which it differs as follows: (1) elytra more domed behind the middle and slightly shorter and broader; (2) ninth elytral intervals more prominent anteriorly and thus humeri more prominent; (3) scutellum longer and narrower; (4) lateral sides of elytra sinuate subapically; (5) granules on ventrites coarser.

Redescription: Body form moderately elongate (Fig. 145), 2.2 times as long as wide (CL/EW). Length 2.75 mm (CL), width 1.25 mm (EW). Head black dorsally; elytra, pronotum and venter brown; antennae, mouth parts, anterior margin of labrum and pronotum as well as tarsi paler.

Head: Clypeus very finely, irregularly punctate, interstices shiny. Fronto-clypeal suture deep, moderately arcuate. Width between antennal acetabula 0.25 mm. Eyes large, nearly round in lateral view, their dorso-ventral length subequal to ID (0.25 mm), HW= 0.55 mm. Frons and epicranium flat except of raised margin around eyes, with plastron and with elliptical, flat granules; granules half as coarse as facets, separated by 1 - 3 facet diameters.

Thorax: Pronotum widest at base, MW= 0.9 mm; lateral margin narrowly explanate, lateral sides subparallel in posterior 0.4 then gradually convergent anteriad; AW= 0.6 mm, PL= 0.9 mm; anterior margin paler, distinctly sinuate laterally, anterior angles protruding; anterior half domed, bordered posteriorly by oblique, moderately deep depression, finely and sparsely punctate, with highest point at anterior third (lateral view); posterior half flattened except of prebasal admedian gibbosities, these nearly confluent mesally, only slightly convex, each about as wide as 0.5 of interocular distance, with setal tufts, separated from convex anterior half by transverse depression; prescutellar pits absent; sublateral carinae reduced to feeble flat prebasal tubercles; pronotal surface with ellipsoidal granules mainly on posterior half except of admedian gibbosities, granules slightly smaller than facets, irregularly, but densely arranged. Prosternal process broad, lateral sides raised, apical portion abruptly constricted, apex moderately arcuate, surface with a pair of admedian rounded depressions, microreticulate; sublateral ridges reaching about middle of prosternum in front of procoxae. Mesosternum raised around coxae, short, with median keel. Metasternum as long as prosternum, with longitudinal suture raised; plastron area granulate, bordered by subcoxal and admedian row of large, deep macropunctures, surface lacking plastron posteriorly to transverse suture. Scutellum about 2 times as long as wide, narrow, glabrous. Elytra depressed across anterior third then gradually elevated posteriad, with highest point at second third (lateral view); EL= 1.9 mm; humeri prominent; lateral sides serrate, explanate, subparallel between anterior 0.2 and posterior third, slightly sinuate before apices; each elytron with 8 visible rows of deeply impressed punctures, these coarser than facets, largest on disc, becoming progressively smaller toward apex; interval 2 as wide as 2nd stria, remaining intervals becoming narrower laterally; interval 3 with a small prebasal tubercle with setal tufts, interval 9 carinate and serrate along anterior 0.75; intervals 5, 6, 7 with very small, flat granules; all intervals with rows of prone yellow setae; elytral flanks half as wide as ID; epipleura reaching anterior margin of ventrite V. Legs longer than body (CL); femora not clavate; protibia slightly longer than pronotum (PL) and slightly shorter than meso- and metatibia; tibia with plastron and granules; tarsi slightly shorter than tibiae, terminal tarsomere subequal in length to combined length of tarsomeres 1-4.

Abdomen: Ventrites with plastron, sparsely granulate except of area bordered by admedian carinae on ventrite I, granules as coarse as those on pronotum; abdominal intercoxal process slightly wider than prosternal process, with a few large macropunctures anteriorly, anterior margin raised. Apex of abdomen, sternite VIII and genital segments as in Figs. 147 - 149. Aedeagus (Fig. 146): phallobasis very short; penis long, slightly widened across apical 0.6 and narrowed in apical 0.1, its apex rounded (all in dorsal view); shorter and longer hair-like setae along lateral sides in apical third and along middle on ventral side; ventro-apical portion of parameres discernible; ventral sac long; endophallus similar to that of *M. vietnamensis* and *M. glabratus*.

Sexual dimorphism: Female unknown.

Distribution (Fig. 252)**:** Presently known only from the Kamenka river in Primorye Territory, Russian Far East.

Habitat: Small, partly shaded river flowing through forest, about 5 - 7 m wide, with stones, gravel, sand and submerged wood.

Macronychus vietnamensis DELÈVE
(Figs. 4, 63 - 71, 150 - 160, 252)

Macronychus vietnamensis DELÈVE, 1968: 179.

Type locality: Nghe-An province, northern Vietnam.

Material examined: Holotype ♂ (TMB): "Prov. Nghe-An, 23. VIII. 1963". **Paratype** ♀ (TMB): "Prov. Ha-Tinh 14. VIII. 1963".

Additional material examined: 1 ♂ (CBB): "Vietnam, Hoa binh, 4.-7.6.1986 Ha son binh prov. Jan Horák lgt."; 1 ♀ (CKB): "Vietnam, Hoa binh, 4.-7.6.1986 Ha son binh prov. Jan Horák lgt."; 2 ♀♀ (CKB, NMW): "N VIETNAM (Tonkin) pr. Hoang Lien Son YEN BAI 10. V.1990, Vít Kubáň lgt."; 26 ♂♂, 28 ♀♀ (CKB, NMW, CBB, MHNG): "Vietnam-N (Ban En) 180 km SSW Hanoi, 40 m SW Than Hoa, Ban En Nat. Park 27.8.1997, h=50 m, Lg. A. Napolov".

Diagnosis: Similar to *M. levanidovae,* differences are given above.

Redescription: Habitus (Fig. 4). Body form moderately elongate, 2.34 - 2.37 times as long as wide (CL/EW). Length (CL) in ♂♂ = 1.94 - 2.41 mm (ø = 2.17 ± 0.09), in ♀♀ = 2.19 - 2.59 mm (ø = 2.36 ± 0.07), width (EW) in ♂♂ = 0.87 - 1.00 mm (ø = 0.92 ± 0.03), in ♀♀ = 0.92 - 1.12 mm (ø = 0.99 ± 0.03). Head black; elytra, pronotum, venter and legs except of tarsi brown to dark brown; antennae, mouth parts, anterior margin of labrum and pronotum as well as tarsi paler.

Head (Fig. 63): Clypeus sparsely, finely punctate; interstices shiny, larger than facets. Fronto-clypeal suture deep, moderately arcuate. Eyes large, nearly round in lateral view; antero-posterior length in ♂♂ = 0.21 - 0.26 mm (ø = 0.23 ± 0.01), in ♀♀ = 0.19 - 0.26 mm (ø = 0.23 ± 0.01); ID in ♂♂ = 0.16 - 0.22 mm (ø = 0.19 ± 0.01), in ♀♀ = 0.18 - 0.26 mm (ø = 0.22 ± 0.01); HW in ♂♂ = 0.42 - 0.49 mm (ø = 0.46 ± 0.02), in ♀♀ = 0.45 - 0.55 mm (ø = 0.49 ± 0.02). Frons and epicranium flat, with plastron and sparse setigerous granules smaller than facets; narrow margin around eyes glabrous, raised.

Thorax: Pronotum (Figs. 64 - 66) widest at basal third, its highest point at anterior third (lateral view); lateral margins slightly divergent at basal third, then gradually convergent anteriad (dorsal view); anterior margin paler, distinctly sinuate at lateral 0.3; anterior angles protruding; anterior half domed, posteriorly bordered by a pair of oblique shallow depressions; admedian prebasal gibbosities small, nearly confluent mesally, moderately convex, with setal tufts, sparsely and finely punctate, shiny on interstices, each about half as wide as ID, separated anteriorly by a moderately deep, short depression; sublateral prebasal tubercles indistinct; pronotal surface with small, sparse setigerous punctures and shiny interstices on anterior part and with densely arranged microgranules on posterior half; AW in ♂♂ = 0.48 - 0.56 mm (ø = 0.51 ± 0.02), in

♀♀ = 0.52 - 0.60 mm (ø = 0.56 ± 0.01); BW in ♂♂ = 0.61 - 0.74 mm (ø = 0.67 ± 0.03), in ♀♀ = 0.68 - 0.79 mm (ø = 0.73 ± 0.03); MW in ♂♂ = 0.65 - 0.77 mm (ø = 0.70 ± 0.03), in ♀♀ = 0.71 - 0.83 mm (ø = 0.76 ± 0.02); PL in ♂♂ = 0.53 - 0.84 mm (ø = 0.71 ± 0.06), in ♀♀ = 0.72 - 0.88 mm (ø = 0.80 ± 0.04). Prosternal process broader than long, about twice as wide as coxal width, with transverse keel at posterior third and with two admedian round depressions posterior of keel; apex arcuate; lateral margins raised along coxae; posterior half and margins microreticulate; sublateral ridges reaching middle of prosternum; surface in front of procoxae lacking plastron on median area, sparsely and finely punctate, interstices shiny. Mesosternum (Fig. 67) short, microreticulate, lateral and anterior margins raised; midline flat. Metasternum (Figs. 67, 68) as long as prosternum; subcoxal and admedian macropunctures large; disc microreticulate, longitudinal suture raised and lying in depression in posterior half; surface lacking plastron along transverse suture; transverse suture with admedian macropuncture. Scutellum about 1.5 times as long as wide, shiny. Elytra (Figs. 69, 70) slightly depressed across apical third, almost flat dorsally, with highest point near middle (all in lateral view); humeri moderately prominent; apices rounded, not emarginate; EL in ♂♂ = 1.41 - 1.5 mm (ø = 0.46 ± 0.03), in ♀♀ = 1.47 - 1.72 mm (ø = 1.56 ± 0.04); lateral sides slightly explanate, serrate, subparallel between anterior 0.2 and 0.7, then convergent; each elytron with 8 rows of deeply impressed punctures between sutural and ninth interval, which is carinate and serrate along anterior 0.75; punctures coarser than facets, largest on disc, becoming smaller, shallower and more widely separated toward apex; intervals narrow, third with small prebasal tubercle with setal tufts; intervals 1, 3, 5, 7 and 9 with rows of longer setae and 5, 6, 7, 8 with a few microgranules; elytral flanks half as wide as ID; epipleura reaching anterior margin of ventrite V. Legs a bit longer than body (CL); protibia longer than pronotum: in ♂♂ = 0.87 - 0.99 mm (ø = 0.92 ± 0.03), in ♀♀ = 0.84 - 1.00 mm (ø = 0.92 ± 0.03); mesotibia slightly shorter than protibia: in ♂♂ = 0.78 - 0.90 mm (ø = 0.84 ± 0.03), in ♀♀ = 0.81 - 0.96 mm (ø = 0.86 ± 0.03); metatibia longest, in ♂♂ = 0.88 - 1.01 mm (ø = 0.95 ± 0.03), in ♀♀ = 0.91 - 1.06 mm (ø = 0.97 ± 0.03); tibiae and femora with plastron and sparse, small, setigerous granules; femora moderately widened distad, not clavate. Tarsi moderately shorter than tibiae; tarsomere 5 subequal in length to combined length of preceding tarsomeres, protarsomere 5 with ventro-apical setal tufts in males.

Abdomen (Fig. 71): Ventrites with plastron, sparse granules and setae; medial portion of ventrite I bordered by admedian carinae without plastron; surface without plastron microreticulate and coarsely punctate on anterior half and finely, sparsely punctate on posterior half; apex of ventrite V rounded in females, truncate in males. Apex of abdomen, sternites VIII, tergites VIII and genital segments as in Figs. 152 - 155, 158 - 160. Aedeagus (Figs. 150, 151): phallobasis about 0.1 times as long as penis; penis in dorsal view nearly parallel-sided along basal 0.3, then moderately constricted in 0.4 and in 0.7 of penis length, apical 0.1 gradually narrowed, apex rounded; hair-like setae arranged sparsely along lateral sides; ventro-apical portion of parameres discernible; ventral sac long, developed in apical half; endophallus laterally bordered by a sclerotised band reaching proximal 0.4 of penis, penis with three longitudinal bar-like sclerotizations and with median sclerite in basal half. Ovipositor (Figs. 156, 157): terminal segment about 0.14 times as long as preterminal, slender, almost straight. Preterminal segment long and slender, pubescent mesally, apico-lateral portion not produced, with prone sensilla; ventral fulcrum about 1.5 times as long as preterminal segment.

Sexual dimorphism: Females larger than males, lacking ventro-apical setal tufts of protarsomere 5, apex of ventrite V rounded.

Distribution (Fig. 252)**:** So far known only from northern Vietnam.

Habitat: Unknown, all specimens were collected at light.

Macronychus indicus species group

Members: *M. reticulatus, M. sulcatus, M. jaechi, M. indicus, M. kubani, M. jendeki, M. ultimus.*

Diagnosis: Species of the *M. indicus* group are recognised by the following combination of characters: (1) pronotal median keel prominent, sides steeply declivous; (2) femora clavate; (3) ventral sac and lateral sclerotised bands of penis short, confined to about apical 0.3 of penis.

Macronychus reticulatus sp.n.
(Figs. 5, 161 - 172, 252)

Type locality: River, ca. 40 km E Muang Paksong, Province Champasak, south Laos.

Material examined: Holotype ♂ (NMW): "S-LAOS: Prov. Champasak ca. 40 km E Muang Paksong 25. 5. 1996, ca. 800 m lgt. Schillhammer (7)". **Paratypes:** 1 ♂, 1 ♀ (NMW): with same data as holotype; 1 ♀ (NMW): "N-LAOS: Prov. Lg. Nam Tha ca. 30 km NW Lg. Nam Tha 16./18. 6. 1996, 800 m lgt. Schillhammer (28, 30)"; 2 ♂♂ (CASS, NMW): "CHINA, SW-Hunan 1993 SW Huitong 4. 11. Umg. Guangping 350 m leg. Schillhammer (10)" [CWBS loc. 30].

Etymology: From Latin *reticulum*, in reference to reticulate pronotum.

Diagnosis: Recognised among other *Macronychus* species by: (1) pronotum reticulated in posterior half; (2) small and very narrow body; (3) penis with a narrow transverse hyaline strip near apical 0.25.

Description: Habitus (Fig. 5). Body form moderately elongate, 2.44 - 2.55 times as long as wide (CL/EW). Length (CL) in ♂♂ = 1.82 - 2.06 mm (ø = 1.94 ± 0.11), in ♀♀ = 2.13 - 2.25 mm (ø = 2.19 ± 0.09), width (EW) in ♂♂ = 0.73 - 0.83 mm (ø = 0.78 ± 0.05), in ♀♀ = 0.84 - 0.91 mm (ø = 0.88 ± 0.05). Elytra, pronotum and venter dark brown to piceous; head black; mouth parts, antennae, palpi, anterior margins of labrum, pronotum and prosternum, as well as tarsi and claws reddish.

Head: Clypeus sparsely punctate and microreticulate, punctures smaller than facets, setigerous; fronto-clypeal suture slightly arcuate. Frons and epicranium flat, except of raised margin around eyes; surface densely, finely rugosely punctate, with prone, flattened yellow setae. Eyes rather small, elliptical in lateral view; antero-posterior length in ♂♂ = 0.16 - 0.17 mm (ø = 0.17 ± 0.01), in ♀♀ = 0.18 mm; ID in ♂♂ = 0.19 - 0.21 mm (ø = 0.20 ± 0.01), in ♀♀ = 0.22 - 0.23 mm (ø = 0.23 ± 0.01); HW in ♂♂ = 0.34 - 0.36 mm (ø = 0.35 ± 0.01), in ♀♀ = 0.39 - 0.40 mm (ø = 0.40 ± 0.01).

Thorax: Pronotum widest at basal third, narrowed more strongly anteriorly than posteriorly; lateral margins nearly straight in anterior half and slightly sinuate in posterior half, finely explanate; surface punctate, punctures setigerous (with numerous flattened, longer setae), smaller than facets, separated by 2 - 4 times facet diameter, interstices shiny in anterior half, very distinctly microreticulate in posterior half; anterior margin straight; lateral margins finely explanate; admedian prebasal gibbosities convex, separated mesally by about 0.25 of ID, setal tufts indistinct; median keel reticulate, widest anteriorly; prebasal pits round and deep; sublateral carinae absent or indistinct and present only near base; transverse depression deep, reticulate; AW in ♂♂ = 0.40 - 0.44 mm (ø = 0.42 ± 0.02), in ♀♀ = 0.48 - 0.49 mm (ø = 0.49 ± 0.01); BW in ♂♂ = 0.52 - 0.60 mm (ø = 0.56 ± 0.04), in ♀♀ = 0.62 - 0.65 mm (ø = 0.64 ± 0.02); MW in ♂♂ = 0.56 - 0.65 mm (ø = 0.60 ± 0.05), in ♀♀ = 0.68 - 0.70 mm (ø = 0.69 ± 0.02); PL in ♂♂ = 0.62 - 0.73 mm (ø = 0.67 ± 0.05), ♀♀ = 0.71 - 0.74 mm (ø = 0.73 ± 0.02). Prosternal process about as long as wide; lateral sides subparallel and raised along coxae, abruptly constricted before arcuate apex; surface reticulate, depressed near apex; median prosternal surface bordered by short, sublateral ridges reticulate. Mesosternum as long as prosternal process, raised along coxae and around depression for prosternal process; midline moderately raised in posterior half; surface reticulate. Metasternum

reticulate on disc, depressed on anterior half and along midline; macropunctures large, distributed near mesocoxae, on disc and near posterior margin between metacoxae; longitudinal suture finely marked; transverse suture with admedian macropuncture. Scutellum flat, narrow, twice as long as wide, microreticulate, anterior margin rounded. Elytra subparallel along anterior 0.6, then convergent to apices (dorsal view); in lateral view moderately convex, with highest point near middle; lateral sides finely explanate, indistinctly serrate near apex; apex strongly emarginate; elytral cross-section moderately arcuate; striae with round, deeply impressed, rather irregularly spaced macropunctures, punctures largest on disc, becoming gradually smaller apically and laterally; intervals narrower than striae, third with inconspicuous prebasal tubercle with setal tufts, intervals 1, 3, 5, 7 and 9 with rows of longer flattened setae, remaining intervals with shorter setae, sutural interval with fine transverse grooves, ninth moderately prominent and serrate along anterior 0.8, subparallel; EL in ♂♂ = 1.20 - 1.36 mm (ø = 1.28 ± 0.08), in ♀♀ = 1.40 - 1.48 mm (ø = 1.44 ± 0.06); elytral flanks distinctly narrower than 0.5 of ID; epipleura moderately narrowed, effaced near anterior margin of ventrite V. Legs about as long as body (CL); femora clavate, widened along proximal 0.8, then constricted. Tibiae microreticulate, all widened moderately in distal half, only protibiae of males widened strongly; length of tibiae subequal to MW: protibia in ♂♂ = 0.61 - 0.68 mm (ø = 0.65 ± 0.03), in ♀♀ = 0.65 - 0.70 mm (ø = 0.68 ± 0.04); mesotibia in ♂♂ = 0.58 - 0.65 mm (ø = 0.62 ± 0.03), in ♀♀ = 0.64 - 0.65 mm (ø = 0.64 ± 0.01); metatibia in ♂♂ = 0.62 - 0.65 mm (ø = 0.63 ± 0.01), in ♀♀ = 0.65 - 0.70 mm (ø = 0.68 ± 0.04). Tarsi in length subequal to tibiae, length of tarsomere 5 as long as combined length of preceding; protarsomere 5 with two ventro-apical tufts of long hair-like setae in males.

Abdomen: Ventrites with plastron except of median portion of ventrite I; admedian carinae of ventrite I prominent, reaching anterior margin of ventrite II; ventrite V with a few granules and short, thick setae near apex; apex rounded; sternite VIII and genital segments as in Figs. 164 - 167, 170 - 172. Aedeagus (Figs. 161 - 163): penis about 3.7 - 3.9 times as long as phallobasis, slightly constricted at apical 0.3, then subparallel, apical 0.25 with a narrow transverse hyaline strip; long acuminate lateral setae along apical half; apex rounded; ventral sac short, developed at apical 0.25; endophallus with densely arranged, relatively large scales. Ovipositor (Figs. 168, 169): terminal segment short, slender, with sides almost straight; preterminal segment with apico-lateral portion produced laterad and ventrad: bilobate; ventral fulcrum about 2.4 times as long as preterminal segment.

Sexual dimorphism: Protibiae strongly widened in males, moderately widened in females; protarsomere 5 with two ventro-apical tufts of long hair-like setae in males.

Distribution (Fig. 252)**:** So far known only from Laos and southern China.

Habitat (holotype)**:** River, ca. 5 - 10 m wide, with coarse flat basalt rocks, without fine sediment, flowing through open woodland with pastures.

Macronychus sulcatus sp.n.
(Figs. 6, 173 - 184, 252)

Type locality: Stream in secondary forest, 16 km N Dalat-Ankroet, 1400 m a.s.l., 12°05'N 108°24'E, southern Vietnam.

Material examined: Holotype ♂ (NMW): "S-VIETNAM: 15. 4. 1995 16 km N Dalat-Ankroet 1400m 12° 05' N 108° 24' E Pacholatko & Dembicky". **Paratype** ♀ (NMW): "S-VIETNAM, Dalat. env., 1200m, 20.5.1993".

Etymology: From the Latin *sulcus,* in reference to the sulcate median keel of the pronotum.

Diagnosis: This species differs from all *Macronychus* species except *M. jaechi* in obovate body form and sulcate median pronotal keel. From *M. jaechi* it may be distinguished by nearly flat elytral intervals 3 and 5, as well as by the male and female genitalia.

Description: Habitus (Fig. 6). Body form obovate, 2.13 - 2.29 times as long as wide (CL/EW). Length (CL) in ♂ = 2.22 mm, in ♀ = 2.38 mm, width (EW) in ♂ = 0.97 mm, in ♀ = 1.12 mm. Head black dorsally; pronotum dark brown to black, with anterior margin paler; elytra dark brown to piceous; legs, mouth parts, antennae, palpi and anterior margins of labrum reddish.

Head: Clypeus sparsely punctate, punctures smaller than facets, interstices microreticulate; fronto-clypeal suture moderately arcuate. Eyes rather small, elliptical in lateral view; antero-posterior length in ♂ = 0.18 mm, in ♀ = 0.18 mm; ID in ♂ = 0.23 mm, in ♀ = 0.30 mm; HW in ♂ = 0.42 mm, in ♀ = 0.45 mm. Frons impressed near antennal base; densely, finely rugosely punctate, with intermixed, coarser, setigerous punctures.

Thorax: Pronotum widest at basal third; anterior margin straight; lateral margins finely explanate, with elongate flat granules, narrowed anteriorly and posteriorly in slightly sinuate lines; admedian prebasal gibbosities large and convex, separated by narrow, deep sulcus mesally; anterior transverse depression deep, shiny; median keel with deep longitudinal sulcus; prebasal pits deep, round; sublateral carinae moderately prominent, short and narrow near pronotal middle and near base, obsolete on gibbosities; pronotal surface punctate, punctures smaller than facets (most of pronotal setae of specimens examined are missing), separated by 2 - 3 times facets diameter, interstices shiny; AW in ♂ = 0.51 mm, in ♀ = 0.57 mm; BW in ♂ = 0.70 mm, in ♀ = 0.75 mm; MW in ♂ = 0.74 mm, in ♀ = 0.79 mm; PL in ♂ = 0.81 mm, in ♀ = 0.83. Prosternal process wider than long, with transverse subapical depression; sides subparallel or narrowed posteriad, abruptly constricted before apex; apex moderately arcuate; lateral margins raised along coxae; surface shiny, raised margins and apex microreticulate; sublateral ridges of prosternum short. Mesosternum as long as prosternal process, raised around coxae and along lateral sides of groove for prosternal process; posterior half with fine median keel; surface shiny, sparsely punctate, raised margins and groove for prosternal process microreticulate. Metasternum shorter than prosternum; disc depressed, shiny, sparsely and finely punctate; longitudinal suture impressed; transverse suture with macropunctures becoming gradually smaller laterad; admedian macropunctures large. Scutellum flat, narrow, about 1.4 times as long as wide, glabrous; anterior margin almost straight. Elytra short and wide; lateral sides gradually, moderately, arcuately widened to 0.6 of elytral length, then convergent to apices, indistinctly serrate at posterior 0.4 (all in dorsal view); in lateral view moderately domed, with highest point near middle; humeri rounded; elytral cross-section strongly arcuate; apex emarginate in female (missing in male); striae with elongate macropunctures, punctures largest on disc, separated by about puncture diameter, progressively smaller and widely spaced toward apex and epipleura; intervals moderately convex, as wide as striae, sutural interval transversally grooved, third with prominent longitudinal tubercle at anterior 0.15, ninth arcuate and prominent along anterior 0.8, slightly serrate along middle third; EL in ♂ = 1.44 mm, in ♀ = 1.56 mm; elytral flanks concealed by ninth interval in dorsal view; epipleura moderately narrowed, effaced near apex. Legs moderately shorter than body (CL); femora clavate, widest across distal 0.4. Tibiae microreticulate, moderately widened in distal half; protibiae of male more strongly widened than in female; tibial length: protibia in ♂ = 0.77 mm, in ♀ = 0.77 mm; mesotibia in ♂ = 0.70 mm, in ♀ = 0.73 mm; metatibia in ♂ = 0.83 mm, in ♀ = 0.83 mm. Tarsi in length subequal to tibiae; length of tarsomere 5 as long as combined length of preceding tarsomeres, protarsomere 5 with two ventro-apical tufts of long hair-like setae in male.

Abdomen: Ventrites with plastron except of median portion of ventrite I; admedian carinae prominent, reaching posterior margin of ventrite I, intercarinal area finely sparsely punctate; apex of ventrite V with a few granules in female, lacking granules in male, rounded. Ventrite V, sternite VIII and genital segments as in Figs. 176 - 179, 182 - 184. Aedeagus (Figs. 173 - 175): penis 3.4 times as long as phallobasis, lateral sides subparallel, apical 0.4 with a few long acuminate lateral setae, and with numerous short lateral setae; ventral sac short; endophallus with densely arranged, relatively large scales. Ovipositor (Figs. 180, 181): terminal segment

0.16 times as long as preterminal, slender, almost straight; preterminal segment thick, apico-lateral portion strongly produced dorsad and ventrad, bilobate; ventral fulcrum about 2.25 times as long as preterminal segment.

Sexual dimorphism: Female larger, with protibiae moderately widened and their protarsomere 5 lacking ventro-apical tufts of long hair-like setae.

Distribution (Fig. 252)**:** To date known only from southern Vietnam.

Habitat: The holotype was collected on submerged wood, in a shallow, narrow stream flowing through secondary forest.

Macronychus jaechi sp.n.
(Figs. 7, 72 - 87, 185 - 196, 252)

Type locality: Hainan (CWBS loc. 194).

Material examined: Holotype ♂ (CASS): "CHINA: Hainan (194) 30km E Maoyang, 18. 1. Wuzhi Shan Resort 1996 700-800 m, leg. Jäch". **Paratypes**: 6 ♂♂, 9 ♀♀ (CASS, NMW, CKB) with same data as holotype; 1 ♂ (NMW): "CHINA: Hainan (194) 30km E Maoyang, 18. 1. Wuzhi Shan Resort 1996 700-800 m, Ji & Wang"; 1 ♂, 1 ♀ (NMW): "CHINA: Hainan (193) 30km E Maoyang, 600 m Wuzhi Shan Resort, 17/18. 1., Ji & Wang"; 1 ♂ (NMW): "CHINA: Hainan (193) 30km E Maoyang, 600 m Wuzhi Shan Resort, 17/18. 1., leg. Jäch"; 7 ♂♂, 7 ♀♀ (NMW): "CHINA: Hainan (188) 7km W Qiongzhong Baihua Ling, 300 m, 16. 1. 1996, leg. Jäch"; 1 ♀ (NMW): "CHINA: Hainan (189) 7km W Qiongzhong Baihua Ling, 300 m, 16. 1. 1996, leg. Ji"; 1 ♀ (NMW): "CHINA: Hainan (188) 7km W Qiongzhong Baihua Ling, 300 m, 16. 1. 1996, Ji & Wang"; 1 ♀ (NMW): "CHINA: Hainan (205) Jianfeng Mts., 800 m, 5km NE Tian Chi 22.1.1996, leg. Jäch"; 1 ♀ (NMW): "CHINA: Hainan (204) 4km E Jianfeng, 150 m Jianfeng Mt., 1996, 22./24.1., leg. Jäch"; 1 ♂ (NMW): "CHINA: Hainan (215) 15km SW Dongxing 1,5 km W Jianfeng, 70m 25. 1. 1996, leg Jäch".

Etymology: Named in the honour of Manfred Jäch, enthusiastic coleopterologist, collector of this remarkable species and good old friend of second author.

Diagnosis: Recognised among other *Macronychus* species by elytral intervals strongly carinate: third on anterior 0.5, fifth on anterior 0.6 and ninth on anterior 0.9 of elytral length. *Macronychus jaechi* is similar to *M. sulcatus* in obovate body form and sulcus on pronotal median keel.

Description: Habitus (Fig. 7). Body form obovate, 2.11 - 2.29 times as long as wide (CL/EW). Length (CL) in ♂♂ = 2.09 - 2.38 mm (ø = 2.21 ± 0.07), in ♀♀ = 2.31 - 2.63 mm (ø = 2.48 ± 0.10); width (EW) in ♂♂ = 0.96 - 1.08 mm (ø = 1.02 ± 0.03), in ♀♀ = 1.04 - 1.18 mm (ø = 1.12 ± 0.05). Elytra, pronotum and cranium dark brown to black; antennae, mouth parts, anterior part of pronotum, venter and legs reddish.

Head (Fig. 72): Clypeus with sparse, fine setigerous punctures; interstices densely micropunctate. Fronto-clypeal suture moderately arcuate. Frons slightly longitudinally impressed near raised margins of eyes; surface with sparse, setigerous punctures smaller than facets, interstices rugose. Eyes moderately prominent, elliptical in lateral view; antero-posterior length in ♂♂ = 0.16 - 0.19 mm (ø = 0.17 ± 0.01), in ♀♀ = 0.17 - 0.21 mm (ø = 0.19 ± 0.01); ID in ♂♂ = 0.21 - 0.25 mm (ø = 0.23 ± 0.01), in ♀♀ = 0.25 - 0.30 mm (ø = 0.26 ± 0.01); HW in ♂♂ = 0.38 - 0.42 mm (ø = 0.41 ± 0.02), in ♀♀ = 0.42 - 0.45 mm (ø = 0.44 ± 0.01).

Thorax: Pronotum (Figs. 73 - 77) widest across basal 0.4, strongly narrowed anteriorly in slightly sinuate lines, posteriorly subparallel; lateral margins finely explanate; anterior margin straight; admedian prebasal gibbosities large and convex, separated by about 0.25 of ID mesally, with a few flattened setae, interstices shiny, about as wide as facet; transverse depression deep; median keel microreticulate, with fine, distinct longitudinal sulcus; sublateral carinae strongly prominent near pronotal middle and near base, almost obsolete on gibbosities, microreticulate; remaining pronotal surface punctate, punctures setigerous, smaller than facets, separated by 1 - 3 facet diameters, interstices shiny or microreticulate (near anterior and lateral margin); AW in

♂♂ = 0.48 - 0.52 mm (ø = 0.49 ± 0.01), in ♀♀ = 0.52 - 0.57 mm (ø = 0.55 ± 0.02); BW in ♂♂ = 0.65 - 0.70 mm (ø= 0.67 ± 0.01), in ♀♀ = 0.69 - 0.79 mm (ø = 0.74 ± 0.03); MW in ♂♂ = 0.68 - 0.73 mm (ø = 0.69 ± 0.01), in ♀♀ = 0.70 - 0.83 mm (ø = 0.78 ± 0.04); PL in ♂♂ = 0.71 - 0.78 mm (ø = 0.75 ± 0.02), ♀♀ = 0.77 - 0.88 mm (ø = 0.82 ± 0.04). Prosternal process (Fig. 78) about as long as wide, narrowed posteriad, transversally depressed near apex; margins raised around coxae; apex rounded; surface glabrous on disc, microreticulate on sides; sublateral ridges short. Mesosternum (Figs. 78, 79) slightly longer than prosternal process, strongly raised near coxae, moderately on posterior margin of groove for prosternal process; midline impressed; macropunctures near coxae and posterior margin; surface microreticulate. Metasternum (Fig. 79) strongly depressed on disc; macropunctures near mesocoxae, metacoxae and on each side of disc, their diameter equal to width of metatibial apex or smaller, macropunctures confluent on disc in some specimens; longitudinal suture finely elevated, anteriorly and posteriorly in depression; disc glabrous, finely sparsely punctured; transverse suture with at least two macropunctures. Scutellum flat, subovate, longer than wide; anterior margin almost straight; surface finely grooved. Elytra (Figs. 80, 81) short and wide; lateral sides explanate, gradually, moderately arcuately widened to middle, then convergent to apices (dorsal view); in lateral view elytra convex with highest point near middle; humeri rounded; elytral cross-section moderately arcuate; apices emarginate, EL in ♂♂ = 1.40 - 1.64 mm (ø = 1.47 ± 0.06), in ♀♀ = 1.56 - 1.76 mm (ø = 1.66 ± 0.06); elytral striae with round macropunctures, these deeply impressed and largest on disc, smaller, shallower and more widely spaced laterally and apically; intervals narrow, micropunctate or irregularly and finely grooved (sutural), sparsely setose; intervals 3, 5, 9 strongly prominent, carinate (third on anterior 0.5, fifth on anterior 0.6 and ninth on anterior 0.9 of elytral length); setal tufts indistinct; elytral flanks wide (ca. 0.25 of ID); epipleura moderately narrowed posteriad, effaced near middle of ventrite V. Legs subequal in length with body (CL); femora clavate, widest at distal 0.7 (Fig. 82). Tibiae (Figs. 82, 84) widened in apical half; protibiae of males more strongly widened than those of females; tibial length: protibia in ♂♂ = 0.68 - 0.78 mm (ø = 0.72 ± 0.03), in ♀♀ = 0.69 - 0.81 mm (ø = 0.75 ± 0.04); mesotibia in ♂♂ = 0.65 - 0.75 mm (ø = 0.70 ± 0.02), in ♀♀ = 0.68 - 0.78 mm (ø = 0.73 ± 0.04); metatibia in ♂♂ = 0.70 - 0.83 mm (ø = 0.77 ± 0.03), in ♀♀ = 0.74 - 0.87 mm (ø = 0.80 ± 0.04). Tarsi shorter than tibiae, length of tarsomere 5 subequal to combined length of preceding, protarsomere 5 with two ventro-apical tufts of long hair-like setae in males.

Abdomen (Figs. 85, 86): Ventrites with plastron, except of median portion of ventrite I; admedian carinae prominent, reaching posterior margin of ventrite I, intercarinal area finely sparsely punctate; ventrite V lacking granules, rounded apically. Ventrites V, sternites VIII and genital segments as in Figs. 188 - 191, 194 -196. Aedeagus (Figs. 185 - 187): penis about 4 times as long as phallobasis, slightly widened in apical 0.3, then subparallel, apical half with long acuminate lateral setae, apex rounded; ventral sac short, developed in apical 0.25; endophallus with densely arranged relatively large scales (Fig. 87), and a few transverse rows of narrow semi-lunar sclerites. Ovipositor (Figs. 192, 193): terminal segment 0.1 times as long as preterminal, slender, almost straight; preterminal segment thick, apico-lateral portion strongly produced dorsad and ventrad, bilobate; ventral fulcrum about 2.2 times as long as preterminal segment.

Sexual dimorphism: Females on average larger, with protibiae moderately widened and protarsomere 5 lacking ventro-apical tufts of long hair-like setae.

Distribution (Fig. 252)**:** So far known only from China (Hainan).

Habitat (holotype)**:** River, ca. 5 m wide, densely shaded, flowing partly through deep gorge, in primary forest.

Macronychus indicus HINTON
(Figs. 8, 197 - 211, 252)

Macronychus indicus HINTON, 1940: 118.

Type locality: Jaunsar, Uttar Pradesh, northern India.

Material examined: Holotype ♂ (NHM): "India: U.[nited] P.[rovinces] Chakrata Divn., Jaunsar, 13-V-1929, H.G. Champion". **Paratypes:** 4 ♂♂, 6 ♀♀ (NHM) with same data as holotype.

Additional material examined: 1 ♀ (NMW): "Nepal 1.3.81 Tibetan.Grenze leg.M.Jäch N31 Tatopani"; 15 ♂♂, 4 ♀♀ (CKB, NMW): "NW THAILAND, Doi Inthanon nr. Ban Khun Klang, Sirihum W-fall, 9. 01. 1998, I. Sukatcheva".

Diagnosis: Recognised among other *Macronychus* species by penis enlarged in apical 0.3 and by long hair-like, bluntly ended setae on enlarged portion. *Macronychus indicus* is similar to *M. jendeki*, *M. kubani*, and *M. ultimus* externally. From *M. jendeki* it differs in: (1) clypeus shiny, (2) admedian pronotal gibbosities more narrowly separated mesally, (3) setae on pronotal gibbosities simple, not flattened (4) elytra narrower and longer, (5) shiny medial portion of ventrite I with stronger punctation, (6) anterior margin of ventrite II and III lacking short, longitudinal grooves, (7) disc of metastesternum microreticulate; (8) long hair-like setae of penis bluntly ended, (9) ovipositor with preterminal segment shorter and wider and with ventral fulcrum longer. Differences to *M. kubani* and *M. ultimus* are given below.

Redescription: Habitus (Fig. 8). Body form moderately elongate, 2.29 - 2.38 times as long as wide (CL/EW). Length (CL) in ♂♂ = 2.75 - 2.80 mm (ø = 2.76 ± 0.03), in ♀♀ = 2.90 - 3.20 mm (ø = 3.03 ± 0.12); width (EW) in ♂♂ = 1.17 - 1.22 mm (ø = 1.2 ± 0.02), in ♀♀ = 1.25 - 1.36 mm (ø = 1.29 ± 0.04). Colour black except of rufo-piceous legs and most of ventral surface, antennae and mouth parts brownish-testaceous.

Head: Clypeus sparsely and finely punctate; punctures half to two-thirds as coarse as facets, usually separated by 1 - 3 times puncture diameter, interstices shiny; fronto-clypeal suture arched, deep. Eyes elliptical in lateral view; antero-posterior length in ♂♂ = 0.25 - 0.26 mm (ø = 0.26 ± 0.01), in ♀♀ = 0.26 - 0.27 mm (ø = 0.26 ± 0.01). Frons and epicranium finely and very densely punctate that surface appears rugose; ID in ♂♂ = 0.23 - 0.29 mm (ø = 0.26 ± 0.03), in ♀♀ = 0.27 - 0.35 mm (ø = 0.30 ± 0.03); HW in ♂♂ = 0.53 - 0.58 mm (ø = 0.56 ± 0.02), in ♀♀ = 0.58 - 0.61 mm, (ø = 0.60 ± 0.01).

Thorax: Pronotum broadest at basal third; lateral margins subparallel in basal third, more or less sinuate before posterior angles, then convergent anteriad; anterior margin almost straight; sublateral carinae moderately prominent, microreticulate near base and apex, reaching middle of pronotum; admedian prebasal gibbosities more or less convex, without tufts of conspicuous, longer flattened setae; transverse depression narrow, deep and rugose; median keel narrowed posteriad, microreticulate; prescutellar pits deep; pronotal surface sparsely punctate, punctures smaller than facets, setigerous, separated mostly by 1 - 2 facet diameters; AW ♂♂ = 0.60 - 0.66 mm (ø = 0.63 ± 0.03), in ♀♀ = 0.57 - 0.75 mm (ø = 0.68 ± 0.07); BW in ♂♂ = 0.81 - 0.86 mm (ø = 0.84 ± 0.03), in ♀♀ = 0.88 - 0.99 mm (ø = 0.92 ± 0.04); MW in ♂♂ = 0.83 - 0.87 mm (ø = 0.85 ± 0.02), in ♀♀ = 0.90 - 1.00 mm (ø = 0.95 ± 0.03); PL in ♂♂ = 0.86 - 0.94 mm (ø = 0.89 ± 0.04), ♀♀ = 0.92 - 1.08 mm (ø = 0.98 ± 0.07). Prosternal process microreticulate, as long as wide, narrowed posteriad, apex rounded, lateral margins raised along coxae; sublateral prosternal ridges reaching middle of prosternum in front of procoxae, surface shiny between ridges. Mesosternum microreticulate, as long as prosternal process, with deep fovea for reception of apex of prosternal process, margins and midline raised. Metasternum with rows of coarse macropunctures behind mesocoxae, on transverse suture and on each side of disc, macropunctures diameter equal to width of metatibial base; disc microreticulate; longitudinal suture lying in a depression becoming progressively deeper and wider posteriad. Scutellum flat, subovate, moderately longer than wide, microreticulate. Elytra with sides subparallel along anterior two third, then gradually convergent

to apices (dorsal view); lateral sides finely serrate and slightly explanate; apex finely emarginate; elytra in lateral view almost flat, finely impressed across anterior third, highest point at 0.6, humeri moderately prominent; elytral cross-section moderately arcuate; EL in ♂♂ = 1.88 - 1.94 mm (ø = 1.90 ± 0.03), in ♀♀ = 1.99 - 2.19 mm (ø = 2.1 ± 0.08); each elytron with 8 rows of rounded, deeply impressed macropunctures; macropunctures largest on disc, separated by distance of 0.5 - 1.0 times puncture diameter, becoming progressively smaller and shallower towards apex and epipleura; intervals narrower than striae, irregularly punctate, third moderately elevated in basal 0.2, distinct setal tufts absent; intervals 3, 5, 7, 9 with rows of long, yellow, flattened setae, remaining intervals with shorter setae, interval 9 serrate and prominent along anterior 0.8, moderately sinuate; elytral flanks narrower than 0.25 of ID (dorsal view); epipleura subequal in width from basal 0.10 to apical 0.33 then progressively narrowed and effaced at middle of ventrite V. Legs shorter than body (CL); femora widest near middle, clavate; tibiae slightly widened in distal half, length of tibiae subequal to length of pronotum (PL), protibia in ♂♂ = 0.86 - 0.94 mm (ø = 0.91 ± 0.04), in ♀♀ = 0.90 - 0.95 mm (ø = 0.93 ± 0.02); mesotibia in ♂♂ = 0.87 - 0.94 mm (ø = 0.91 ± 0.03), in ♀♀ = 0.91 - 1.00 mm (ø = 0.94 ± 0.04); metatibia in ♂♂ = 0.96 - 1.04 mm (ø = 0.98 ± 0.04), in ♀♀ = 0.96 - 1.05 mm (ø = 1.01 ± 0.05). Tarsi moderately shorter than tibiae, tarsomere 5 as long as combined length of preceding ones, protarsomere 5 with two ventro-apical tufts of long hair-like setae in males.

Abdomen: Ventrites with plastron, except of median portion of ventrite I; admedian carinae prominent, reaching posterior margin of ventrite I; ventrite V sparsely punctate, with fine granules on posterior part. Ventrites V, sternites VIII and genital segments as in Figs. 201 - 204, 209 -211. Aedeagus (Figs. 197 - 199): penis about 4 - 5 times as long as phallobasis, enlarged in apical 0.3, enlarged portion with long hair-like, bluntly ended setae (Fig. 200); apex of penis rounded; ventral sac confined to about apical 0.25 of penis; endophallus with very fine spines arranged in transverse rows. Ovipositor (Figs. 205 - 208): terminal segment 0.13 times as long as preterminal, slender, almost straight; preterminal segment thick, apico-lateral portion strongly produced laterad and moderately apically, distal sclerite about 1.6 times as long as proximal one; ventral fulcrum about 1.78 times as long as preterminal segment.

Sexual dimorphism: Females on average slightly larger in body size than males, terminal protarsomere lacks ventro-apical setal tufts. Males from Thailand with protibiae more strongly widened.

Distribution (Fig. 252): Known from northern India (Uttar Pradesh), Nepal (border with Tibet) and Thailand.

Note: The female from Nepal differs from the types of *M. indicus* in narrower scutellum, moderately longer ventral fulcrum and longer preterminal segments of ovipositor (Fig. 206). The males from Thailand differ from the types of *M. indicus* in more strongly widened protibiae and the females from Thailand differ in moderately longer ventral fulcrum and more produced apico-lateral portion of preterminal segment of ovipositor.

Habitat: The specimen from Nepal was collected above the border village of Tatopani (Sindhupalchok Distr.) in a small cold stream (1 - 2 m wide) flowing through degraded primary forest (ca. 1800 m a.s.l.).

Macronychus kubani sp.n.
(Figs. 9, 88 - 115, 212 - 225, 252)

Type locality: Small stream, 24°57' N, 98°45' E, Gaoligong Mountains, Yünnan, southern China.

Material examined: Holotype ♂ (NMW): "YUNNAN 2200-2500m 24.57N 98.45E, 8-16/5 GAOLIGONG mts. O. Semela leg. 1995". **Paratypes:** 77 ♂♂, 60 ♀♀ (CKB, CBB, NMW, NHM, MHNG, CASS) with same data as holotype; 2 ♂♂, 1 ♀ (CKB): "YUNNAN 1500-2500m, 25.22N 98.49E, 17-24/5 GAOLIGONG mts. O. Semela leg. 1995".

Additional material examined: 1 ♂ (NMW): CWBS loc. 235.

Etymology: Dedicated to our friend, entomologist Vít Kubáň.

Diagnosis: Differences from *M. indicus*: (1) shiny puncture interstices of frons and epicranium, (2) short sublateral pronotal carinae, (3) median pronotal keel and transverse depression strongly rugose, (4) pronotal gibbosities more globular and more shallowly separated mesally, (5) setae of pronotal gibbosities flattened, (6) penis nearly parallel-sided, (7) long hair-like setae of penis acuminate and arranged along apical half, (8) preterminal segment of ovipositor very short, (9) terminal segment of ovipositor short, as long as wide. Similar *M. ultimus* differs in: (1) interstices of frons and epicranium micropunctate, (2) pronotal setae not flattened, (3) elytral apices strongly emarginate, (4) subapical setae of penis short, (5) constriction at apical third of penis, (6) scales of endophallus larger and widely spaced, (7) distal sclerite of preterminal segment of ovipositor short and broad, (8) preterminal segment of ovipositor bilobate. Differences to *M. jendeki* are given bellow.

Description: Habitus (Fig. 9). Body form elongate, subparallel, about 2.25 - 2.50 times as long as wide (CL/EW). Length (CL) in ♂♂ = 2.56 - 2.88 mm (ø = 2.70 ± 0.08), in ♀♀ = 3.05 - 3.40 mm (ø = 3.20 ± 0.07); width (EW) in ♂♂ = 1.08 - 1.22 mm (ø = 1.15 ± 0.04), in ♀♀ = 1.28 - 1.42 mm (ø = 1.35 ± 0.03). Dorsal and ventral surface black except of anterior translucent pronotal margin; femora, tibiae and mouth parts brown to dark brown; anterior margin of labrum, antennae, palpi as well as tarsi reddish.

Head (Figs. 88 - 96): Clypeus sparsely punctate; punctures setigerous, smaller than facets, separated by about 1 - 2 facet diameters; interstices glabrous or very finely microreticulate anteriorly and laterally. Fronto-clypeal suture arcuate. Epicranium and frons flat, finely raised along margins of eyes, punctation as on clypeus, interstices shiny, glabrous. Eyes slightly prominent, elliptical in lateral view; antero-posterior length in ♂♂ = 0.21 - 0.26 mm (ø = 0.22 ± 0.01), in ♀♀ = 0.22 - 0.31 mm (ø = 0.25 ± 0.02); ID in ♂♂ = 0.25 - 0.31 mm (ø = 0.29 ± 0.01), in ♀♀ = 0.32 - 0.38 mm (ø = 0.35 ± 0.01); HW in ♂♂ = 0.49 - 0.57 mm (ø = 0.53 ± 0.02), in ♀♀ = 0.56 - 0.64 mm (ø = 0.59 ± 0.02).

Thorax: Pronotum (Figs. 97 - 100) longer than wide, widest behind middle, slightly arcuately constricted towards base, more strongly towards apex, lateral margins finely explanate; sublateral carinae reduced, confined to about basal 0.17, moderately prominent, rugosely punctured; admedian prebasal gibbosities domed, narrowly but deeply separated mesally, with tufts of flattened setae; anterior transverse depression deep, rugose; median keel rugosely punctured; prescutellar pits deep; pronotal surface sparsely punctate, punctures with thin hair-like setae and frequently with flattened, broad setae separated mostly by distance of 1 - 2 facet diameters, interstices shiny; AW in ♂♂ = 0.58 - 0.70 mm (ø = 0.64 ± 0.03), in ♀♀ = 0.69 - 0.77 mm (ø = 0.72 ± 0.02); BW in ♂♂ = 0.78 - 0.88 mm (ø = 0.82 ± 0.03), in ♀♀ = 0.88 - 1.03 mm (ø = 0.95 ± 0.03); MW in ♂♂ = 0.81 - 0.95 mm (ø = 0.87 ± 0.03), in ♀♀ = 0.94 - 1.08 mm (ø = 1.01 ± 0.03); PL in ♂♂ = 0.86 - 1.00 mm (ø = 0.92 ± 0.04), ♀♀ = 1.00 - 1.16 mm (ø = 1.07 ± 0.04). Prosternal process (Fig. 101) irregularly punctate and microreticulate, with a few indistinct lateral macropunctures; lateral margins raised; apex narrowed, truncate; prosternal sublateral ridges prominent, reaching middle of prosternum. Mesosternum as long as prosternal process, with a few macropunctures, raised on lateral margins and on midline, surface microreticulate. Metasternum (Figs. 103 - 105) with macropunctures near mesocoxae, on transverse suture and on each side of disc, macropunctures diameter equal to or slightly smaller than width of metatibial base; longitudinal suture distinct and finely raised, anteriorly and posteriorly in depression; disc glabrous, finely and sparsely punctured or finely longitudinally grooved. Scutellum subovate, longer than wide; anterior margin straight; surface glabrous on disc, finely punctate or microreticulate near sides. Elytra (Figs. 106 - 109) parallel-sided in anterior 0.60, then gradually convergent posteriad (dorsal view); lateral sides finely explanate, finely serrate at posterior 0.4;

apex rounded or finely emarginate; in lateral view elytra slightly convex, indistinctly impressed at 0.26, with highest point at 0.54; elytral cross-section moderately arcuate; EL in ♂♂ = 1.70 - 1.88 mm (ø = 1.78 ± 0.05), in ♀♀ = 2.06 - 2.28 mm (ø = 2.16 ± 0.05); striae deeply impressed, with elongate macropunctures largest on disc; punctures separated by distance of 0.5 - 1.0 puncture diameter, becoming progressively smaller and shallower towards apex and epipleura; intervals irregularly punctate or finely wrinkled, narrower than striae except of sutural and third interval, third moderately elevated in basal third, setal tufts indistinct; intervals 3, 5, 7, 9 with fine granules and rows of flattened, yellow, hair-like setae; intervals 9 subparallel, carinate along anterior 0.8; elytral flanks narrower than 0.25 of ID (dorsal view); epipleura almost equally wide from basal 0.10 to 0.75 then narrowed. Legs shorter than body (CL); femora (Figs. 110, 111) widest in apical 0.75, clavate; protibiae of males strongly widened in distal half (Fig. 112); tibial length: protibia in ♂♂ = 0.77 - 0.90 mm (ø = 0.85 ± 0.03), in ♀♀ = 0.81 - 0.96 mm (ø = 0.89 ± 0.03); mesotibia in ♂♂ = 0.77 - 0.89 mm (ø = 0.82 ± 0.04), in ♀♀ = 0.79 - 0.92 mm (ø = 0.86 ± 0.04); metatibia in ♂♂ = 0.83 - 0.95 mm (ø = 0.90 ± 0.04), in ♀♀ = 0.90 - 1.01 mm (ø = 0.95 ± 0.03). Tarsi shorter than tibiae, length of tarsomere 5 subequal to combined length of preceding ones, terminal tarsomere with ventro-apical setal tufts in males (Fig. 114).

Abdomen: Ventrites with plastron except apical portion of ventrite V and medial portion of ventrite I, last with macropunctures near anterior margin; admedian carinae prominent, microreticulate, reaching ventrite II; ventrite V with lateral granules on apical third and sparse hair-like, yellow setae. Ventrite V, sternite VIII and genital segments as in Figs. 215, 217 - 219, 221, 223, 224. Aedeagus (Figs. 212 - 214, 216): penis about 4.6 - 4.9 times as long as phallobasis, lateral sides subparallel, finely constricted near middle; long hair-like setae acuminate, arranged ca. between 0.4 - 0.9 of penis length; apex rounded; ventral sac developed in apical 0.3; endophallus with moderately large, relatively widely spaced scales. Ovipositor (Figs. 115, 220, 222): terminal segment very short, slender, almost straight, as long as wide; preterminal segment thick, apex produced posteriad, apico-lateral portion strongly produced ventrad and dorsad, three-lobate; ventral fulcrum about 2.5 times as long as preterminal segment.

Sexual dimorphism: Males in average smaller, with protibiae widened and with two ventro-apical setal tufts on terminal protarsomere.

Distribution (Fig. 252): To date known only from China (Yünnan and Sichuan).

Habitat: The specimens from the type locality were collected on submerged wood in a small, shallow cold stream flowing through a narrow gorge.

Macronychus jendeki sp.n.
(Figs. 10, 226 - 236, 252)

Type locality: Anhui (CWBS loc. 299).

Material examined: Holotype ♂ (CASS): "CHINA: Anhui, Dabie Shan 50km NW Yuexi, 8. 11. 1997, Huang Liyan/ Baojia, 1050m leg. Schönmann (CWBS 299)". **Paratypes:** 1 ♀ (NMW): same data as holotype; 1 ♂ (NMW): "CHINA: Jiangxi, Jiuling Shan 18 km NW Shangfu, 15. 11. 1997 env. Jiu Xian, 800m, leg. M. Wang (CWBS 306)"; 2 ♀♀ (NMW): "CHINA, Hunan SE, GUDONG env., 26.-31. V. 1994, 26 04 N, 113 56 E".

Etymology: Named for our friend Eduard Jendek, coleopterologist.

Diagnosis: From similar *M. kubani* it differs in: (1) clypeus, frons and epicranium microreticulate, (2) pronotal sublateral carinae long, (3) admedian pronotal gibbosities widely separated mesally, (4) elytral interval 9 strongly prominent, (5) long, hair-like setae of penis arranged between apical 0.7 - 0.8 of penis length, (6) terminal and preterminal segment of ovipositor long. Similar *M. ultimus* differs in: (1) sublateral pronotal carinae short, (2) pronotal setae not flattened, (3) admedian pronotal gibbosities narrowly separated, (4) elytral interval 9 slightly prominent, (5)

elytral apices emarginate, (6) long, hair-like setae of penis arranged between 0.3 - 0.8 of penis length, (7) distal preterminal sclerite of ovipositor short and broad.

Description: Habitus (Fig. 10). Body form moderately elongate, 2.20 - 2.32 times as long as wide (CL/EW). Length (CL) in ♂♂ = 3.00 - 3.12 mm, in ♀♀ = 3.12 - 3.30 mm; width (EW) in ♂♂ = 1.34 - 1.40 mm, in ♀♀ = 1.34 - 1.50 mm. Head black, elytra and pronotum dark brown to black; mouth parts, antennae, palpi, anterior margin of labrum, venter and legs reddish-brown.

Head: Clypeus microreticulate, sparsely, finely punctate; punctures smaller than facets, separated by distance of about one facet diameter. Fronto-clypeal suture almost straight. Eyes slightly prominent, elliptical in lateral view; antero-posterior length in ♂♂ = 0.26 - 0.28 mm, in ♀♀ = 0.31 - 0.32 mm; ID in ♂♂ = 0.28 - 0.29, in ♀♀ = 0.32 - 0.35 mm; HW in ♂♂ = 0.58 - 0.61 mm, in ♀♀ = 0.60 - 0.68 mm. Frons with two longitudinal depressions near eyes; reticulation and punctures more distinct than on clypeus.

Thorax: Pronotum widest across basal 0.4, strongly narrowed anteriorly in slightly sinuate lines, posteriorly almost straight; lateral margins finely explanate; anterior margin straight; admedian prebasal gibbosities large and convex, separated by about half of ID mesally, with flattened setae, interstices shiny; median keel wide and rugosely punctate in anterior half, narrow and ridge-like before pronotal base; prebasal pits wide; sublateral carinae reaching middle of pronotum, microreticulate on anterior and posterior part; transverse depression deep and shiny; pronotal surface punctate, punctures setigerous, smaller than facets, separated by 1 - 3 facet diameters, interstices shiny or micropunctate (near anterior margin); AW in ♂♂ = 0.69 - 0.71 mm, in ♀♀ = 0.70 - 0.74 mm; BW in ♂♂ = 0.92 - 0.97 mm, in ♀♀ = 0.97 - 1.09 mm; MW in ♂♂ = 0.93 - 1.0 mm, in ♀♀ = 0.97 - 1.06 mm; PL in ♂♂ = 0.94 - 0.97 mm, in ♀♀ = 1.02 - 1.08 mm. Prosternal process wider than long, narrowed posteriad, constricted before arcuate apex; lateral margins raised along coxae, microreticulate; surface inconspicuously punctate, shiny; sublateral prosternal ridges prominent, arcuate anteriorly. Mesosternum as long as prosternal process, raised around coxae and around groove for prosternal process, raised parts microreticulate; midline raised; posterior surface shiny. Metasternum as long as prosternum; disc shiny, slightly impressed along midline, raised on anterior margin and along mesocoxae; admedian and subcoxal macropunctures large, nearly confluent; longitudinal suture not raised; transverse suture distinctly impressed, with admedian macropuncture. Scutellum flat, about 1.2 times as long as wide, glabrous; lateral sides arcuate. Elytra with sides subparallel along anterior 0.7, then convergent to apices; lateral sides finely explanate, serrate at posterior 0.3; in lateral view nearly flat, with fine depression in apical 0.25, highest point near middle; apex rounded; elytral cross-section moderately arcuate; each elytron with 8 rows of round, deeply impressed macropunctures, punctures largest on disc, separated by distance of 0.5 - 1.0 puncture diameter; intervals (except of interval 2, which is wider than first stria) as wide as striae, unpaired intervals with row of conspicuous flattened yellow setae; interval 3 moderately raised in anterior 0.15, setal tuft indistinct; intervals 9 subparallel, strongly prominent and serrate along anterior 0.8; humeri prominent; EL in ♂♂ = 2.12 - 2.20 mm, in ♀♀ = 2.21 - 2.37 mm; elytral flanks very narrow in dorsal view; epipleura wide, reaching apical 0.9. Legs about as long as body (CL); femora strongly clavate. Tibiae slightly widened in proximal half, microreticulate; protibiae more strongly widened in males; tibial length: protibia in ♂♂ = 1.03 - 1.09 mm, in ♀♀ = 0.96 - 1.06 mm; mesotibia in ♂♂ = 1.06 mm, in ♀♀ = 0.93 - 1.04 mm; metatibia in ♂♂ =1.25 mm, in ♀♀ = 1.00 - 1.23 mm. Tarsi in length slightly shorter than tibiae, length of tarsomere 5 as long as combined length of preceding ones.

Abdomen: Ventrites with plastron except of apical portion of ventrite V and medial portion of ventrite I, which is shiny, sparsely micropunctate, lacking macropunctures; admedian carinae prominent, narrow, reaching ventrite II; anterior margin of ventrite II and III with regularly spaced, short, longitudinal grooves; grooved area wider than distance between sublateral carinae

on ventrite II, narrower on ventrite III; ventrite V with subapical granules on lateral portion and sparse yellow setae. Ventrite V, sternite VIII and genital segment as in Figs. 228 - 231, 234 - 236. Aedeagus (Figs. 226, 227): penis about 4.5 times as long as phallobasis, lateral sides subparallel, finely constricted near middle and near apical 0.2; long, acuminate hair-like setae arranged ca. between 0.7 - 0.8 of penis length; apex rounded; ventral sac short; endophallus with very small and densely spaced scales. Ovipositor (Figs. 232, 233): terminal segment long, almost straight; preterminal segment narrow, apico-lateral portion strongly produced; ventral fulcrum about 1.5 times as long as preterminal segment.

Sexual dimorphism: Males smaller, with protibiae more strongly widened distally and with two ventro-apical setal tufts on terminal protarsomere.

Distribution (Fig. 252)**:** To date known only from China (Hunan, Anhui and Jiangxi).

Habitat: Specimens were collected in small, steep mountain streams in forest.

Macronychus ultimus sp.n.
(Figs. 11, 12, 237- 249, 252)

Type locality: Tam Dao National Park, 75 km northwest of Hanoi, northern Vietnam.

Material examined: Holotype ♂ (NMW): "VIETNAM N, 15.5. - 16.6. 75km NW FROM HANOI TAM DAO 1991 E. JENDEK LEG.". **Paratypes**: 2 ♀♀ (NMW): "N VIETNAM: Tam Dao (2) 1.- 8. 6. 1996 leg. Dembicky & Pacholatko"; 2 ♀♀ (NMW): "THAILAND 1995 (8) Chiang Mai, Doi Suthep leg. Zettel 6. XI."; 1 ♂ (NMW): "THAILAND 1995(4) Chiang Mai, Doi Suthep leg. Zettel 4. XI."; 2 ♂♂, 1 ♀ (CBB, CKB): "Nord LAOS Prov. Luang Nam Tha, 10-30 km NW Luang Nam Tha, 800m, 14. - 22. VI. 1996, leg. C. Holzschuh".

Etymology: From Latin *ultimus:* last, in reference to position within the manuscript.

Diagnosis: From *M. indicus* it differs in: (1) sublateral pronotal carinae reduced, (2) punctures on pronotum and elytral intervals coarser, (3) admedian pronotal gibbosities more flattened, (4) elytral apices distinctly emarginate, (5) protibiae more strongly widened in males, (7) penis nearly parallel-sided, (8) long hair-like setae of penis acuminate and arranged along apical half, (8) preterminal segment of ovipositor very short, and wide, with apico-lateral portion produced dorsad and ventrad. Differences to *M. kubani* and *M. jendeki* are given above.

Description: Habitus (Figs. 11, 12). Body form moderately elongate, 2.26 - 2.40 times as long as wide (CL/EW). Length (CL) in ♂♂ = 2.47 - 2.78 mm (ø = 2.60 ± 0.13), in ♀♀ = 2.94 - 3.03 mm (ø = 2.99 ± 0.05); width (EW) in ♂♂ = 1.06 - 1.20 mm (ø = 1.12 ± 0.06), in ♀♀ = 1.24 - 1.34 mm (ø = 1.28 ± 0.04). Head black; elytra, pronotum, venter and legs dark brown to black; mouth parts, antennae, palpi, anterior margin of labrum, pronotum and prosternum as well as tarsi reddish-brown.

Head: Clypeus sparsely, finely punctate, interstices microreticulate. Fronto-clypeal suture almost straight. Eyes elliptical in lateral view; antero-posterior length in ♂♂ = 0.21 - 0.26 mm (ø = 0.23 ± 0.02), in ♀♀ = 0.23 - 0.27 mm (ø = 0.26 ± 0.02); ID in ♂♂ = 0.23 - 0.26 mm (ø = 0.25 ± 0.01), in ♀♀ = 0.27 - 0.30 mm (ø = 0.29 ± 0.01); HW in ♂♂ = 0.44 - 0.51 mm (ø = 0.47 ± 0.03), in ♀♀ = 0.53 - 0.57 mm (ø = 0.55 ± 0.02). Frons and epicranium punctate as clypeus, interstices densely micropunctate; antero-lateral angles moderately impressed.

Thorax: Pronotum widest at basal third, strongly narrowed anteriorly in slightly sinuate lines, posteriorly almost straight, or finely sinuate near base; lateral margins slightly explanate; anterior margin straight; admedian prebasal gibbosities convex, narrowly separated mesally, distinct setal tufts absent, punctures setigerous, slightly smaller or as coarse as facets, separated by 1 - 2 facet diameters, interstices shiny; median keel narrowed at middle, rugosely punctate; transverse depression deep, rugosely punctate; sublateral carinae rugose, present near base and near middle of pronotum; prebasal pits deep; AW in ♂♂ = 0.56 - 0.61 mm (ø = 0.58 ± 0.02), in

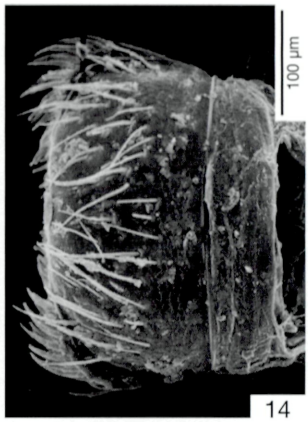
♀♀ = 0.62 - 0.66 mm (ø = 0.64 ± 0.02); BW in ♂♂ = 0.78 - 0.84 mm (ø = 0.81 ± 0.03), in ♀♀ = 0.88 - 0.95 mm (ø = 0.91 ± 0.03); MW in ♂♂ = 0.79 - 0.84 mm (ø = 0.82 ± 0.02), in ♀♀ = 0.90 - 0.95 mm (ø = 0.92 ± 0.02); PL in ♂♂ = 0.81 - 0.90 mm (ø = 0.85 ± 0.04), ♀♀ = 0.94 - 0.97 mm (ø = 0.95 ± 0.02). Prosternal process wider than long, narrowed posteriad, abruptly constricted before truncate apex, with preapical depressions; lateral margins raised along coxae, microreticulate; surface shiny, irregularly punctate and irregularly grooved; prosternal ridges moderately prominent, short. Mesosternum microreticulate, almost as long as prosternal process, raised on midline, around coxae and around groove for prosternal process. Metasternum microreticulate on disc, except of shiny, nearly triangular area along midline, deeply impressed anteriorly and posteriorly; longitudinal suture raised; macropunctures closely spaced; transverse suture with macropunctures. Scutellum flat, about 1.25 times as long as wide, glabrous, anterior margin almost straight, sides arcuate. Elytra subparallel in anterior 0.7, then convergent to apices, with lateral sides finely serrate near apex (dorsal view); outline almost flat in lateral view, finely impressed at anterior 0.3, with highest point near middle; humeri rounded or moderately prominent; lateral sides moderately explanate; elytral cross-section moderately arcuate; apex deeply emarginate; macropunctures round, largest on disc and separated by distance of 0.5 - 1.0 puncture diameter, then gradually smaller and widely spaced toward apex and margins; intervals narrower than striae, with row of setigerous punctures, unpaired intervals with a few slightly longer and flattened setae, third with finely elevated tubercle at anterior 0.15 and inconspicuous setal tuft, ninth moderately prominent between 0.1 - 0.8, subparallel; EL in ♂♂ = 1.68 - 1.86 mm (ø = 1.75 ± 0.08), in ♀♀ = 2.00 - 2.06 mm (ø = 2.04 ± 0.03); elytral flanks narrower than 0.25 of ID; epipleura moderately narrowed towards apex, effaced at postero-lateral angle of ventrite IV. Legs about as long as body (CL); femora clavate; tibiae with setigerous punctures, microreticulate, all tibiae widened moderately in females and strongly in protibiae of males; tibial length: protibia in ♂♂ = 0.87 - 0.99 mm (ø = 0.94 ± 0.05), in ♀♀ = 0.94 - 1.00 mm (ø = 0.97 ± 0.03); mesotibia in ♂♂ = 0.88 - 1.01 mm (ø = 0.95 ± 0.07), in ♀♀ = 0.91 - 0.97 mm (ø = 0.94 ± 0.03); metatibia in ♂♂ = 0.94 - 1.08 mm (ø = 0.99 ± 0.06), in ♀♀ = 0.99 - 1.04 mm (ø = 1.02 ± 0.02). Tarsi in length slightly shorter than tibiae; tarsomere 5 as long as combined length of preceding ones, protarsomere 5 of males with two ventro-apical setal tufts.

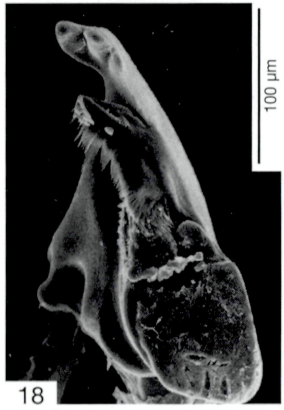
Abdomen: Ventrites with plastron except of medial portion of ventrite I and small mesal area near anterior margin of ventrite II; admedian carinae of ventrite I prominent, microreticulate, reaching ventrite II; intercarinal surface shiny, finely, sparsely punctured, impressed near antero-lateral angles; ventrite V with lateral granules near apex and sparse short strong spine-like setae. Ventrite V, sternite VIII, tergite VIII and genital segments as in Figs. 241 - 244, 247 - 249. Aedeagus (Figs. 237 - 240): penis about 4 times as long as phallobasis, lateral sides subparallel, finely constricted near apical third; long hair-like setae acuminate, arranged ca. between 0.3 - 0.8 of penis length; apex rounded; ventral sac short; endophallus with large, relatively widely spaced scales. Ovipositor (Figs. 245, 246): terminal segment short, slender, almost straight; preterminal segment thick, apico-lateral portion strongly produced ventrad and dorsad, bilobate; ventral fulcrum about 3 times as long as preterminal segment.

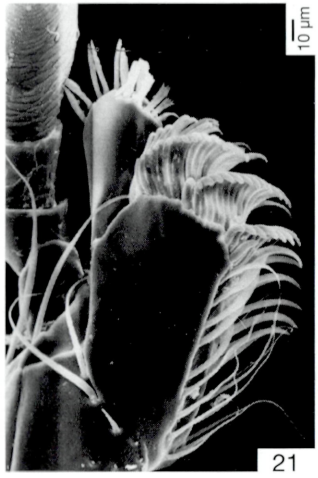
Sexual dimorphism: Males on average smaller, with protibiae strongly widened distally and with two ventro-apical setal tufts on terminal protarsomere.

Distribution (Fig. 252)**:** Known from northern Vietnam, northern Laos and Thailand.

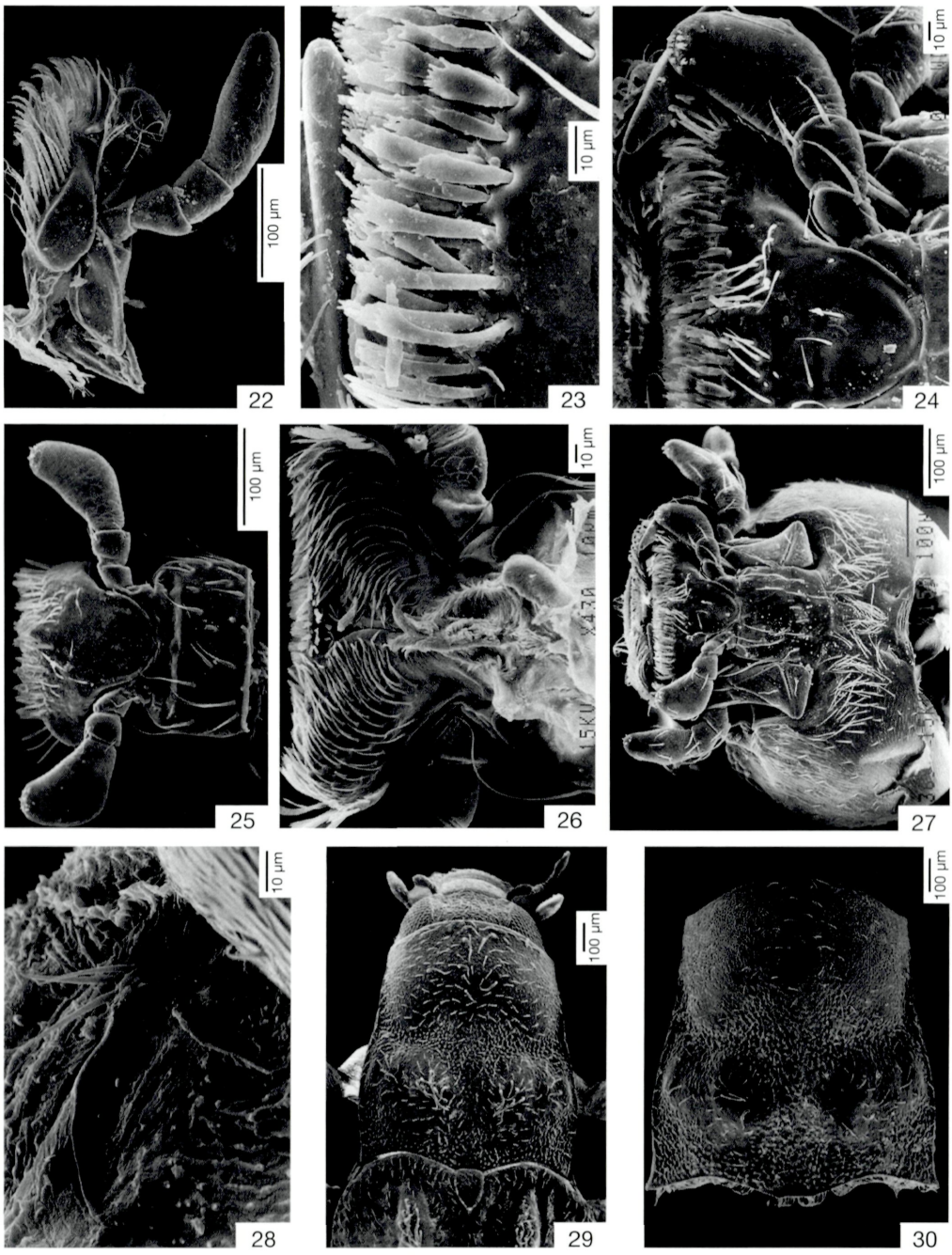
Habitat: Holotype was collected on submerged wood in small, shaded stream in primary forest.



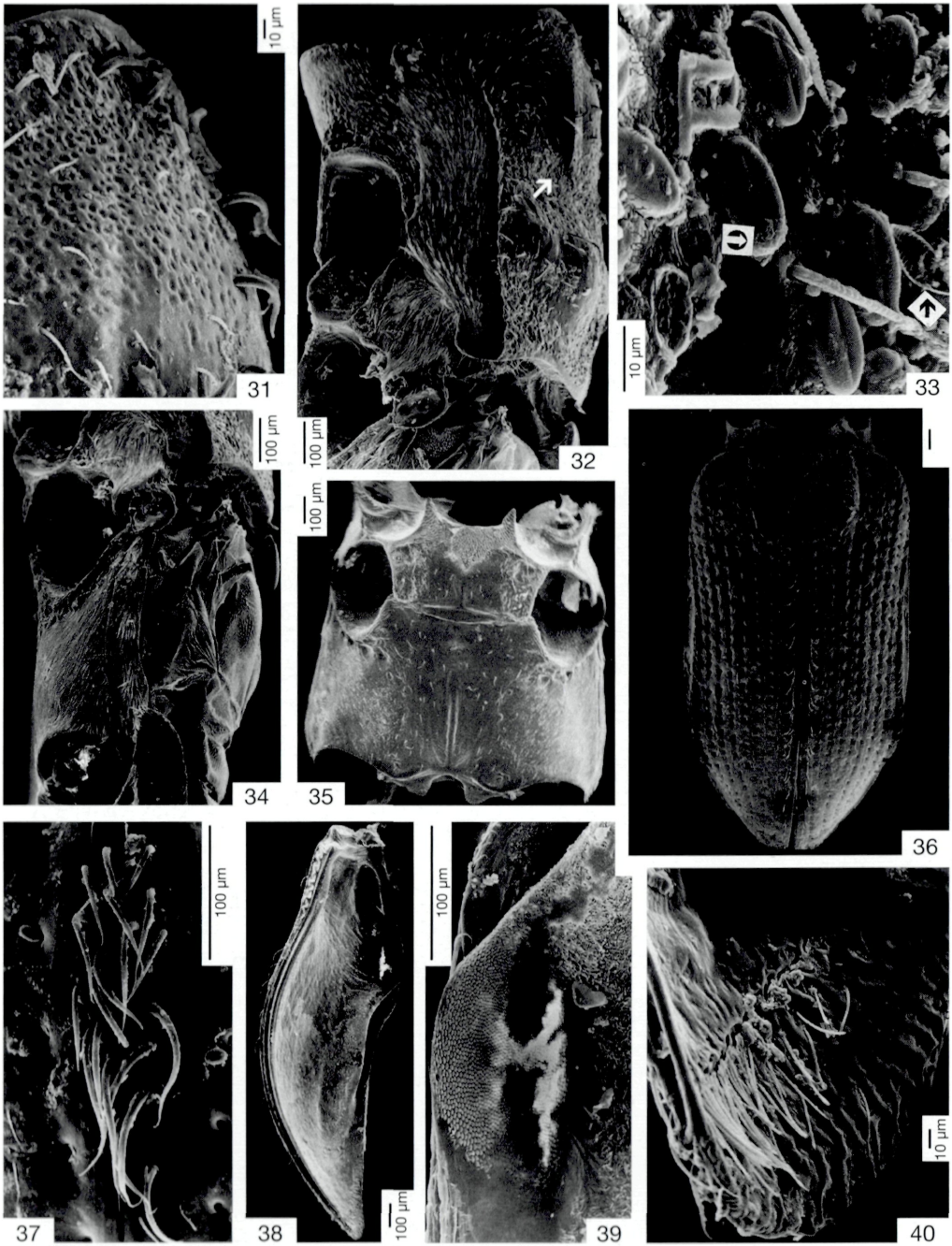




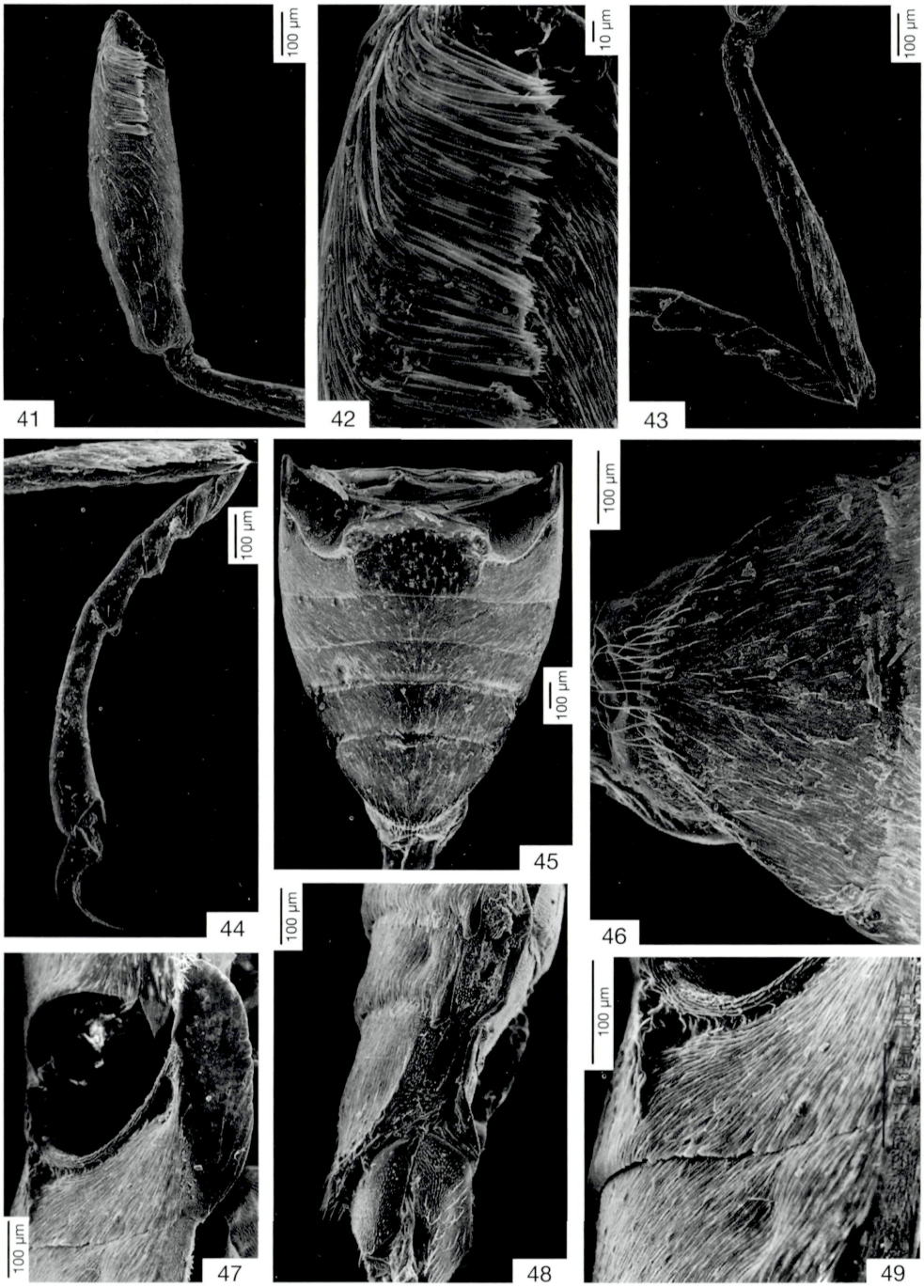
Figs. 13 - 21: *Macronychus quadrituberculatus*, 13) head, dorso-lateral view; 14) labrum, dorsal view; 15) epipharynx, ventral view; 16) antenna, dorsal view; 17) mandible, ventral view; 18) mandible, mesal view; 19) prostheca, dorsal view; 21) maxilla, ventral view; 22) lacinia and galea, ventral view.



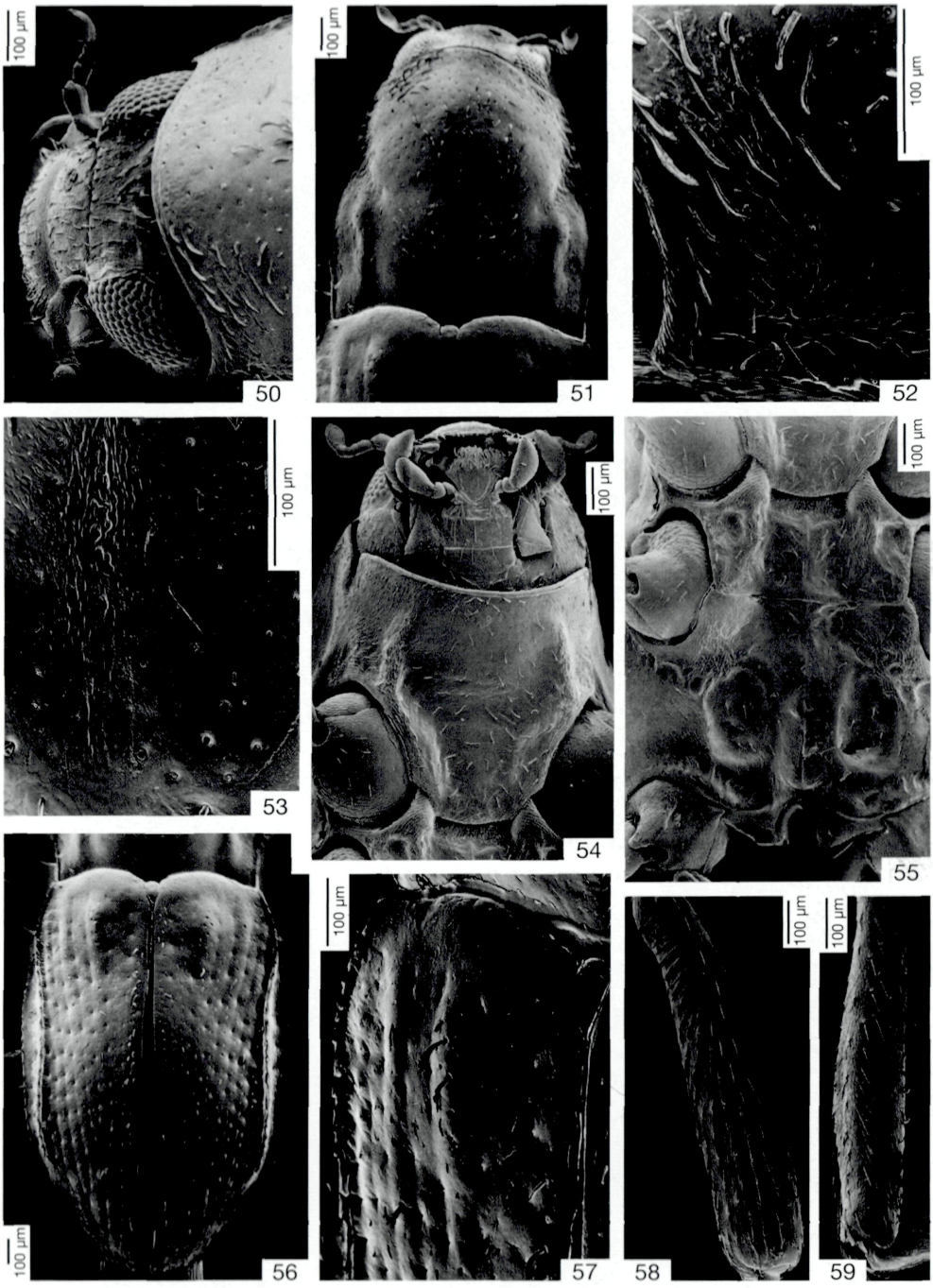
Figs. 22 - 30: *Macronychus quadrituberculatus*, 22) maxilla, ventral view; 23) sensilla on anterior portion of ligula, ventral view; 24) labium, ventral view; 25) labium, ventral view; 26) hypopharynx, dorsal view; 27) head, ventral view; 28) left cervicalia, lateral view; 29) head and pronotum with well preserved setae and strongly developed granulation, dorsal view; 30) pronotum with strongly rugulose surface in posterior half (except admedian gibbosities), numerous setae abraded, dorsal view.



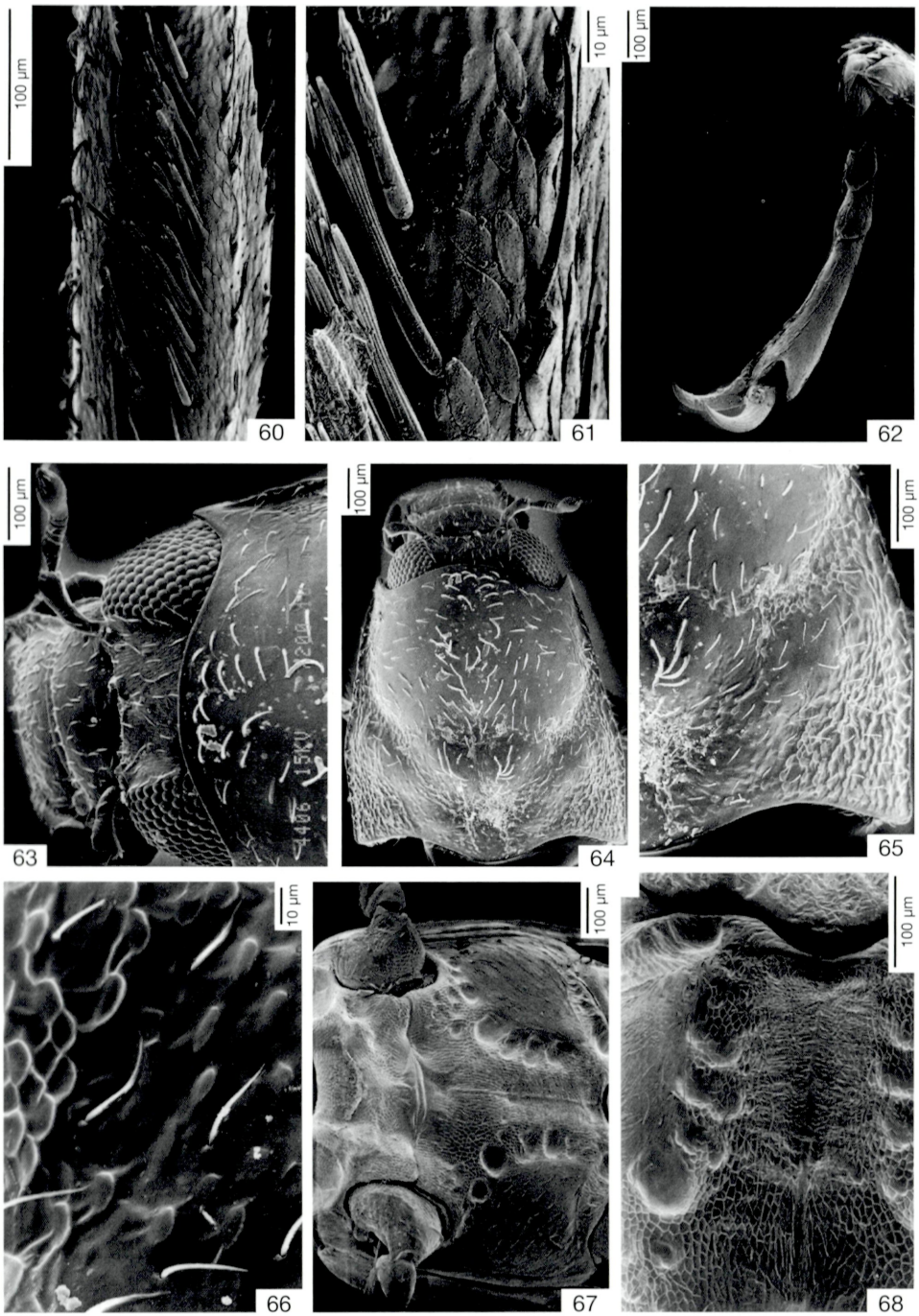
Figs. 31 - 40: *Macronychus quadrituberculatus*, 31) anterior margin of pronotum, lateral view; 32) pro- and mesonotum, arrow indicates position of diatoms, lateral view; 33) diatoms on pronotum, ➲ *Cocconeis* sp., ➔ *Achnanthes* sp., latero-dorsal view; 34) meso- and metathorax, elytra removed, lateral view; 35) meso- and metathorax, ventral view; 36) elytra, dorsal view; 37) setal tufts of elytral tubercle on third interval, dorsal view; 38) elytron, ventral side, lateral view; 39) baso-lateral elytral patch of binding spicules, lateral view; 40) apex of elytron with row of setae, ventral view.



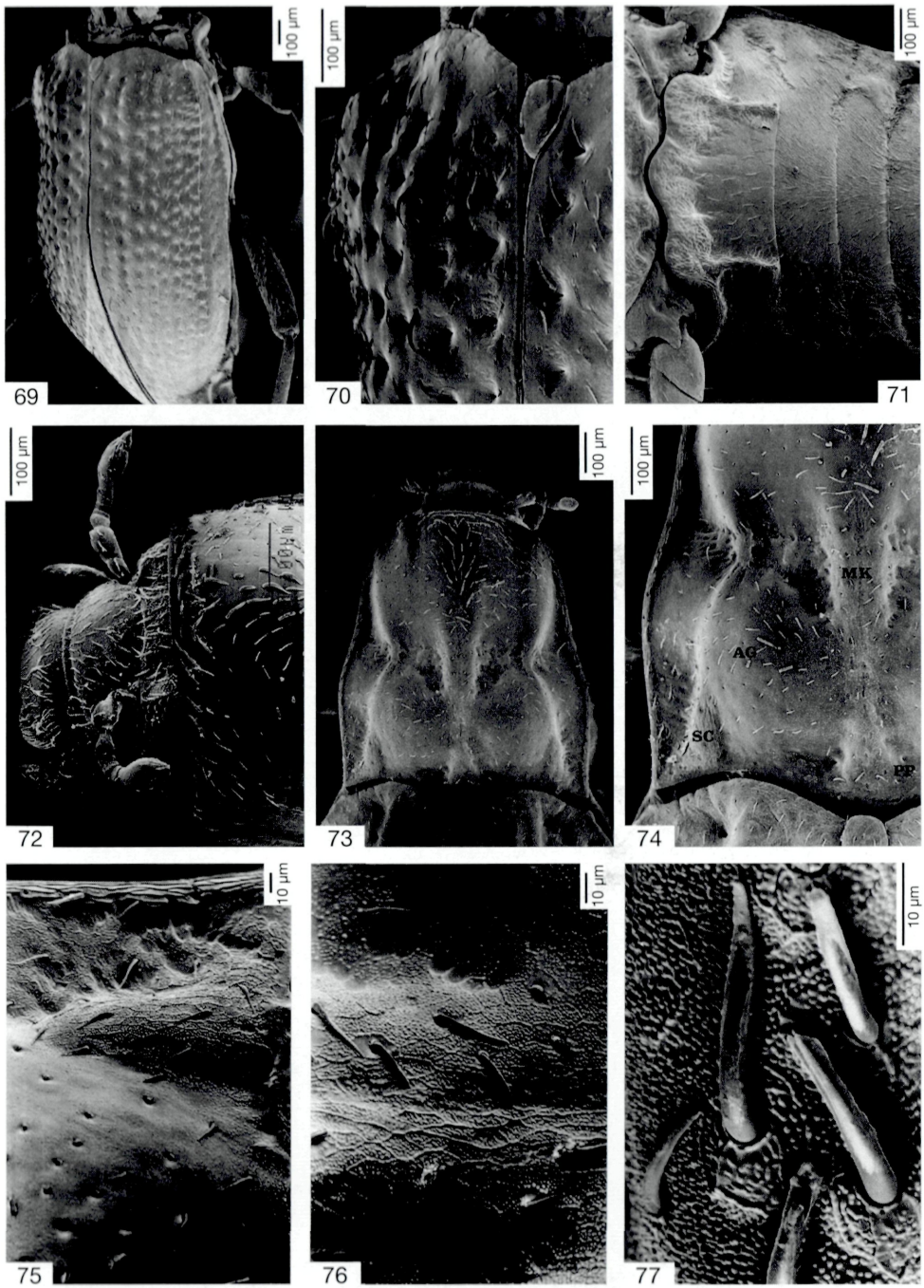
Figs. 41 - 49: *Macronychus quadrituberculatus*, 41) profemur, anterior face; 42) patch of yellowish long setae on profemur, anterior face; 43) protibia, female, anterior face; 44) protarsus, female, lateral view; 45) abdomen, female, ventral view; 46) apex of abdomen, female, ventral view; 47) first ventrite with laterosternite, elytra removed, lateral view; 48) segments V - VIII, elytra removed, lateral view; 49) first and second ventrite with plastron and microgranules, lateral view.



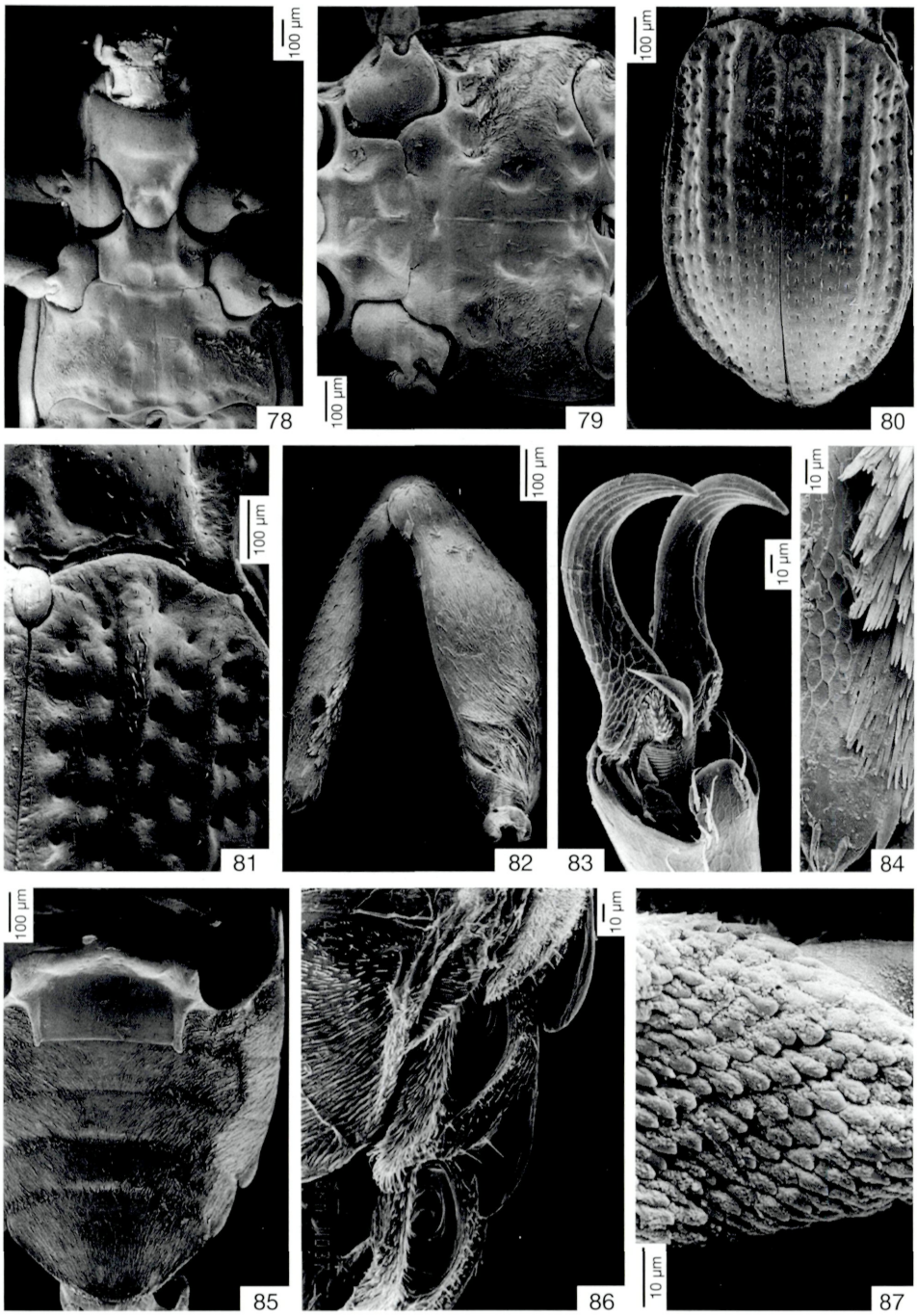
Figs. 50 - 59: *Macronychus glabratus*, male, 50) head and anterior portion of pronotum, dorso-lateral view; 51) head and pronotum, dorsal view; 52) antero-lateral portion of pronotum, lateral view; 53) medial portion of pronotum, dorsal view; 54) head and prothorax, ventral view; 55) apex of prosternum, meso- and metasternum, ventral view; 56) elytra, dorsal view; 57) left elytron, anterior third, dorsal view; 58) mesofemur, postero-dorsal face; 59) mesotibia, posterior face.



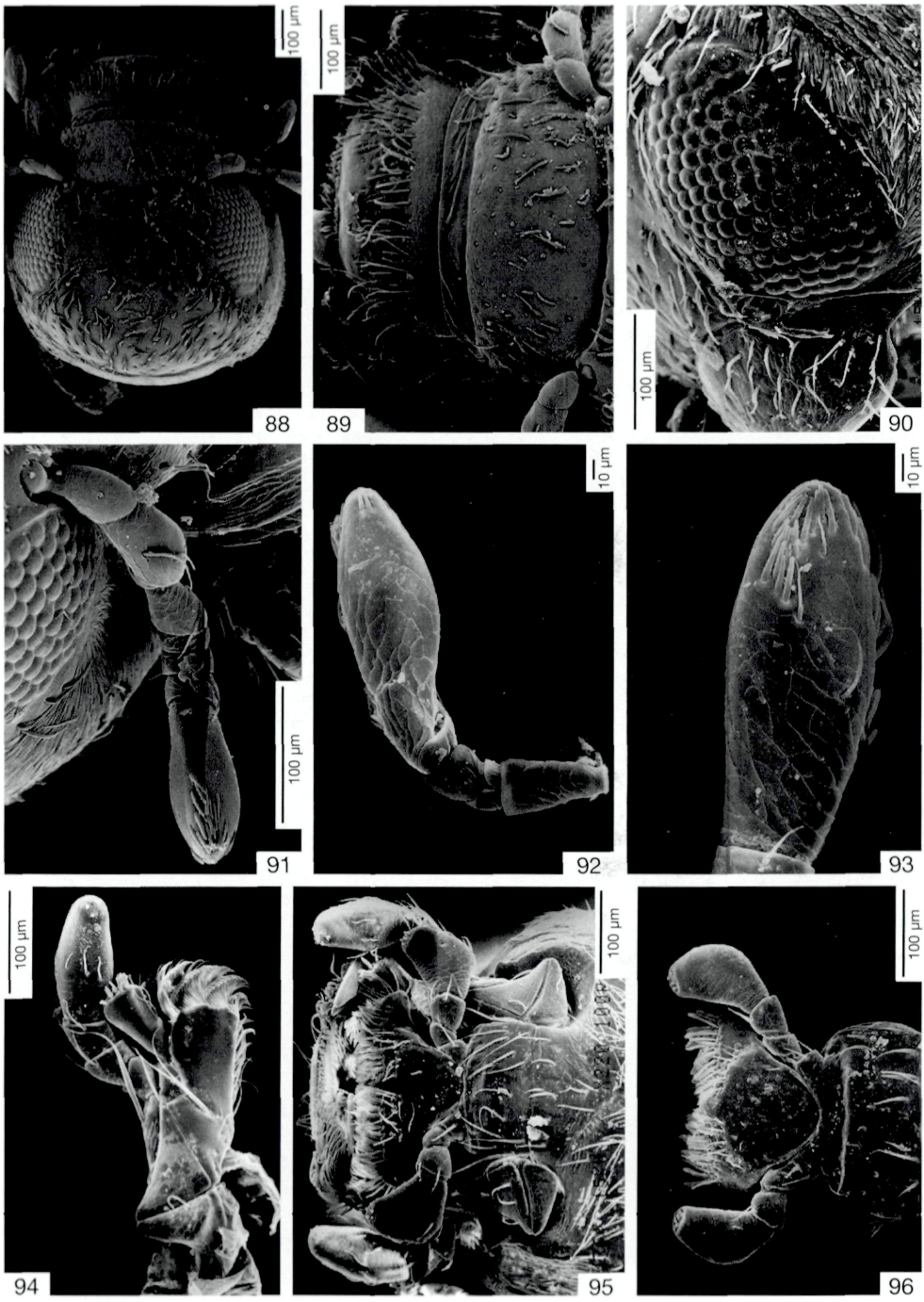
Figs. 60 - 62: *Macronychus glabratus*, male, 60) distal portion of protibia with plastron scales, anterior face; 61) same, enlarged; 62) protarsus, ventro-lateral view. Figs. 63 - 68: *M. vietnamensis*, female, 63) head and anterior portion of pronotum, dorsal view; 64) head and pronotum, dorsal view; 65) pronotum, basal portion, dorsal view; 66) flat microgranules on pronotum, dorsal view; 67) meso- and metathorax, ventro-lateral view; 68) disc of metasternum, ventral view.



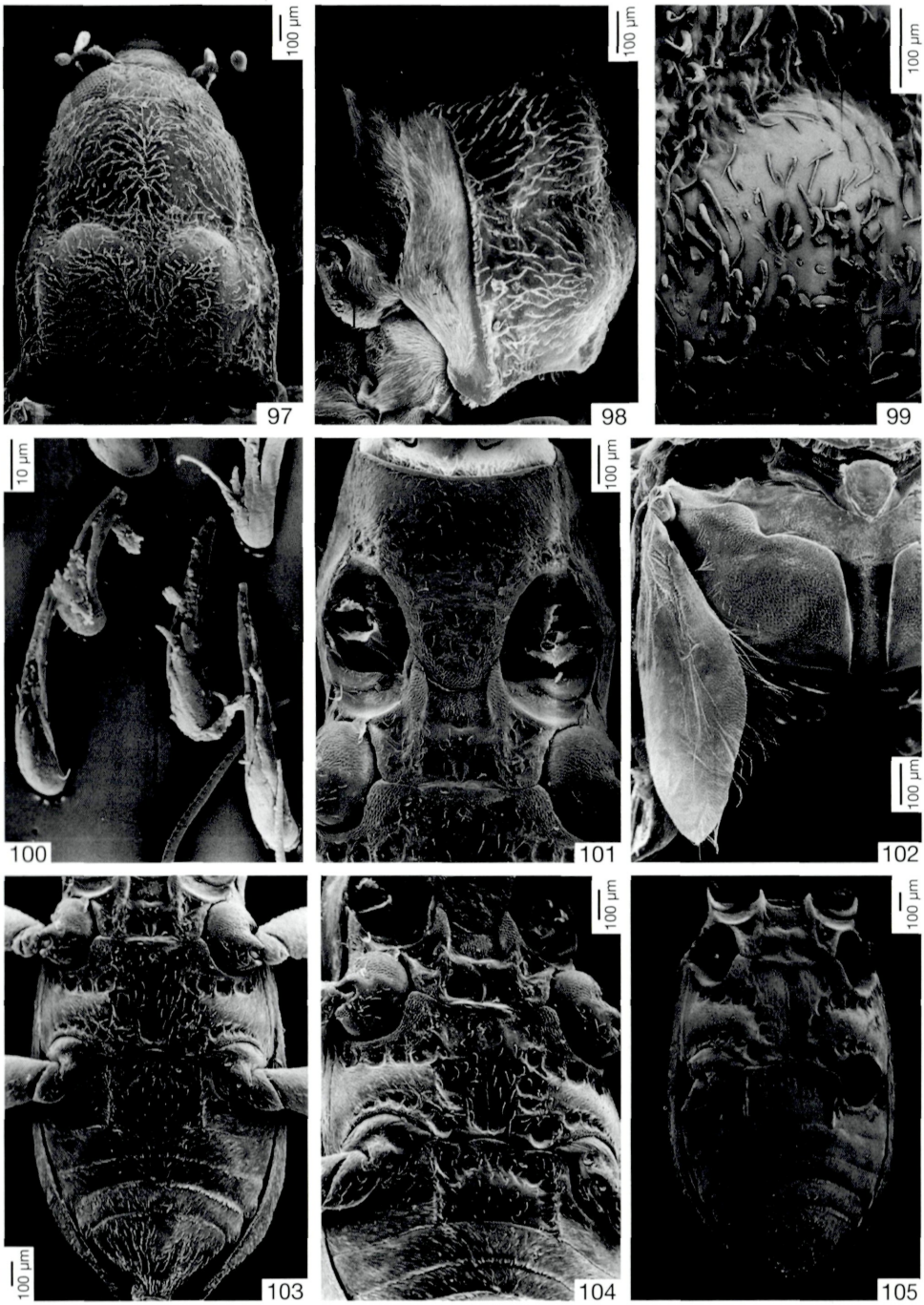
Figs. 69 - 71: *Macronychus vietnamensis*, female, 69) elytra, dorso-lateral view; 70) same, enlarged; 71) proximal ventrites of abdomen, ventral view. Figs. 72 - 77: *M. jaechi* sp.n., 72) head and anterior portion of pronotum, dorsal view; 73) head and pronotum, dorsal view; 74) pronotum, postero-lateral portion, dorsal view, MK = median keel, SC = sublateral carina, PP = prescutellar pits, AG = admedian prebasal gibbosity; 75) pronotum, postero-lateral portion with reticulated sublateral carina, dorsal view; 76) reticulation on median keel, dorsal view; 77) setae on median keel with pore near base, dorsal view.



Figs. 78 - 87: *Macronychus jaechi* sp.n., 78) pro-, meso- and metathorax, ventral view; 79) meso- and metathorax, ventral view; 80) elytra, dorsal view; 81) scutellum and anterior third of right elytron; dorsal view; 82) mesofemur and metatibia, posterior face; 83) claws and empodium of metatarsus; 84) distal portion of protibia, anterior face; 85) abdomen, ventral view; 86) lateral portion of abdominal segments V - VII with spiracular openings on segments VI and VII, dorsal view; 87) scales of endophallus, lateral view.

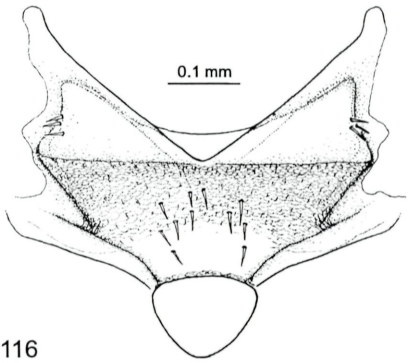


Figs. 88 - 96: *Macronychus kubani* sp.n., 88) head, dorsal view; 89) labrum and clypeus, dorsal view; 90) eye, lateral view; 91) antenna, dorsal view; 92) antenna, scape and pedicel removed, ventral view; 93) terminal segment of antenna, dorsal view; 94) maxilla, ventral view; 95) head, anterior half, ventral view; 96) labium, ventral view.



Figs. 97 - 105: *Macronychus kubani* sp.n., 97) head and pronotum, dorsal view; 98) prothorax, lateral view; 99) right admedian prebasal gibbosity, dorsal view; 100) setae on admedian prebasal gibbosity, dorsal view; 101) pro- and mesothorax, ventral view; 102) meso- and metanotum with shortened hind wing, dorsal view; 103) meso- and metathorax with abdomen, female, ventral view; 104) same enlarged; 105) meso- and metathorax with abdomen, male, ventral view.

Figs. 106 - 115: *Macronychus kubani* sp.n., 106) elytra, dorsal view; 107) anterior third of left elytron, dorsal view; 108) elytron, lateral view; 109) elytron, ventral view; 110) profemur of male, posterior face; 111) profemur of male, anterior face; 112) protibia of male, posterior face; 113) claws of protarsus in female, ventro-lateral view; 114) claws of protarsus in male, terminal tarsomere with ventro-apical tufts of setae; 115) apex of ovipositor, dorsal view.



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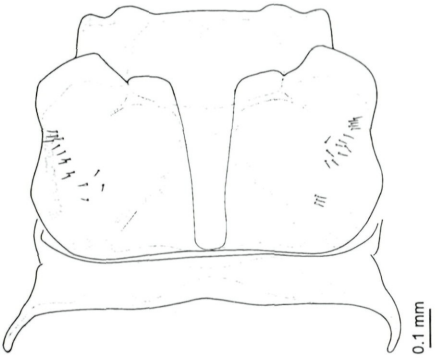

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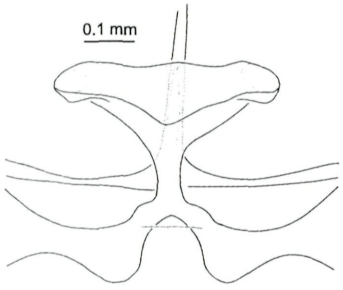

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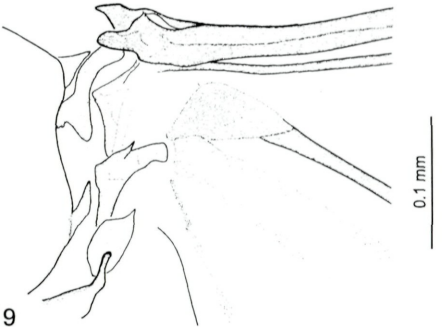

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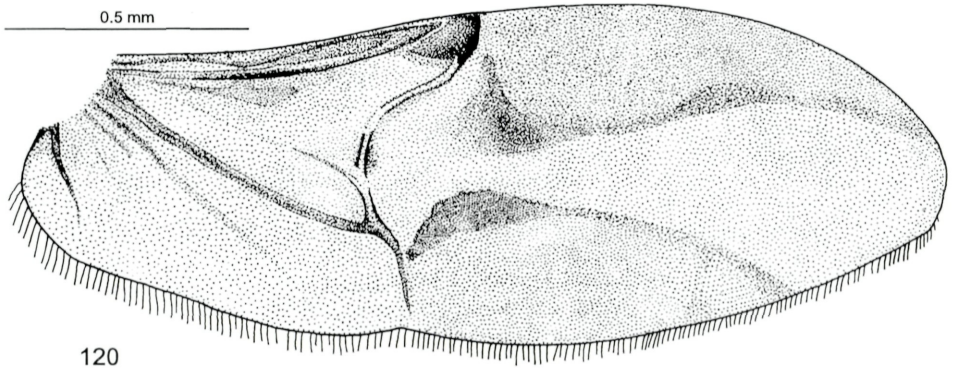

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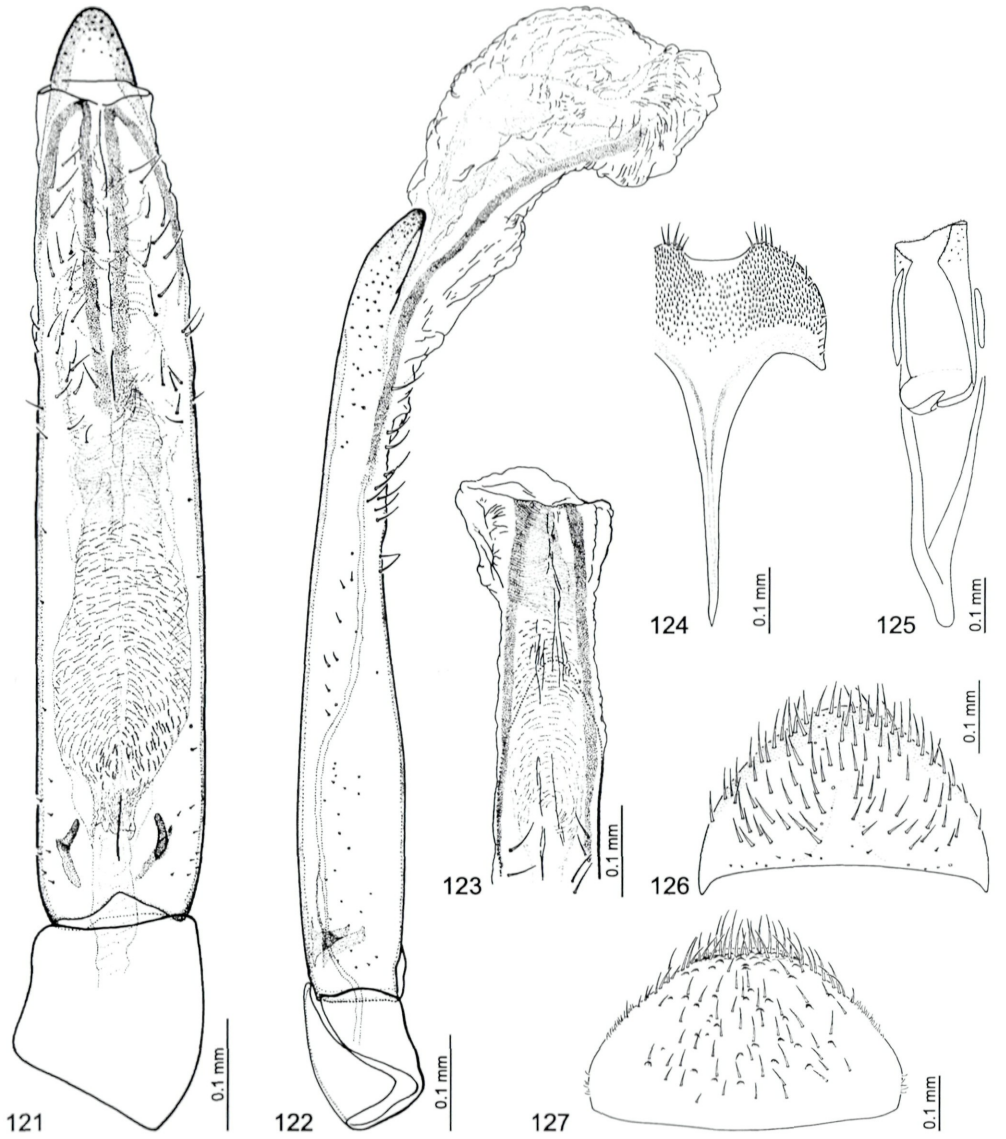
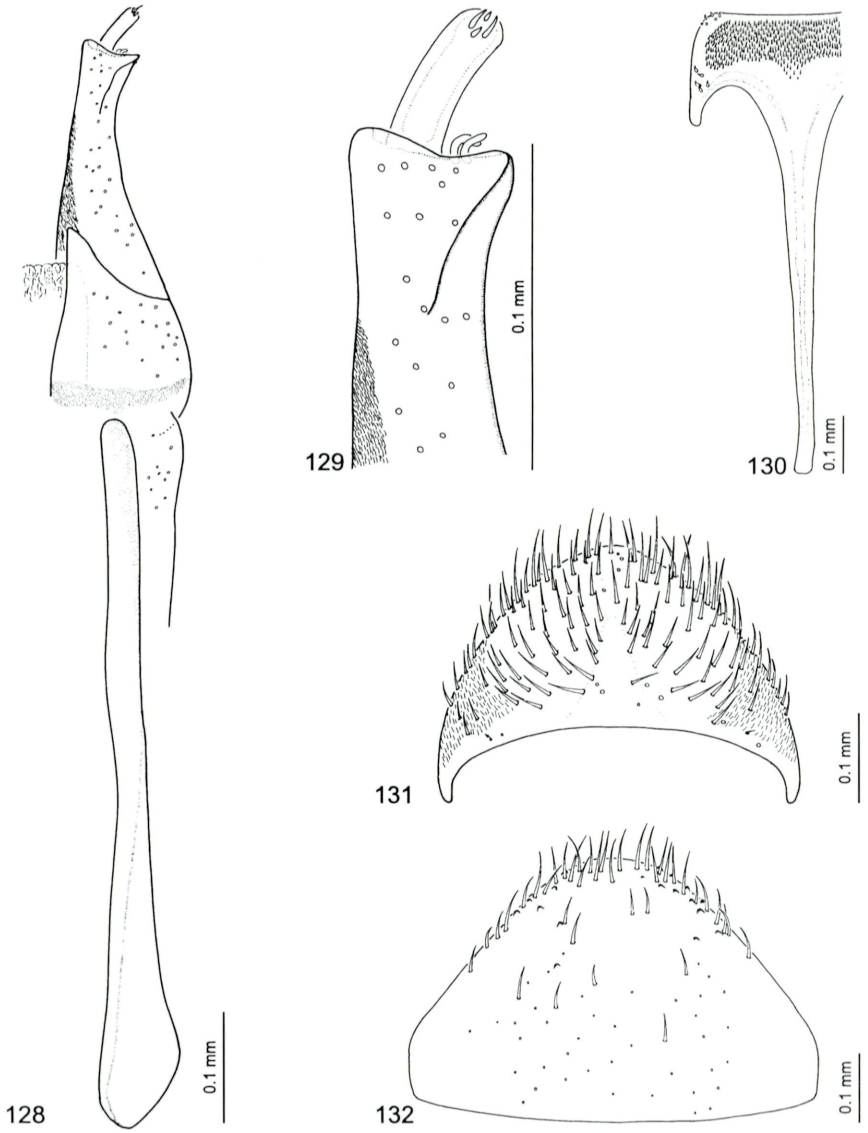
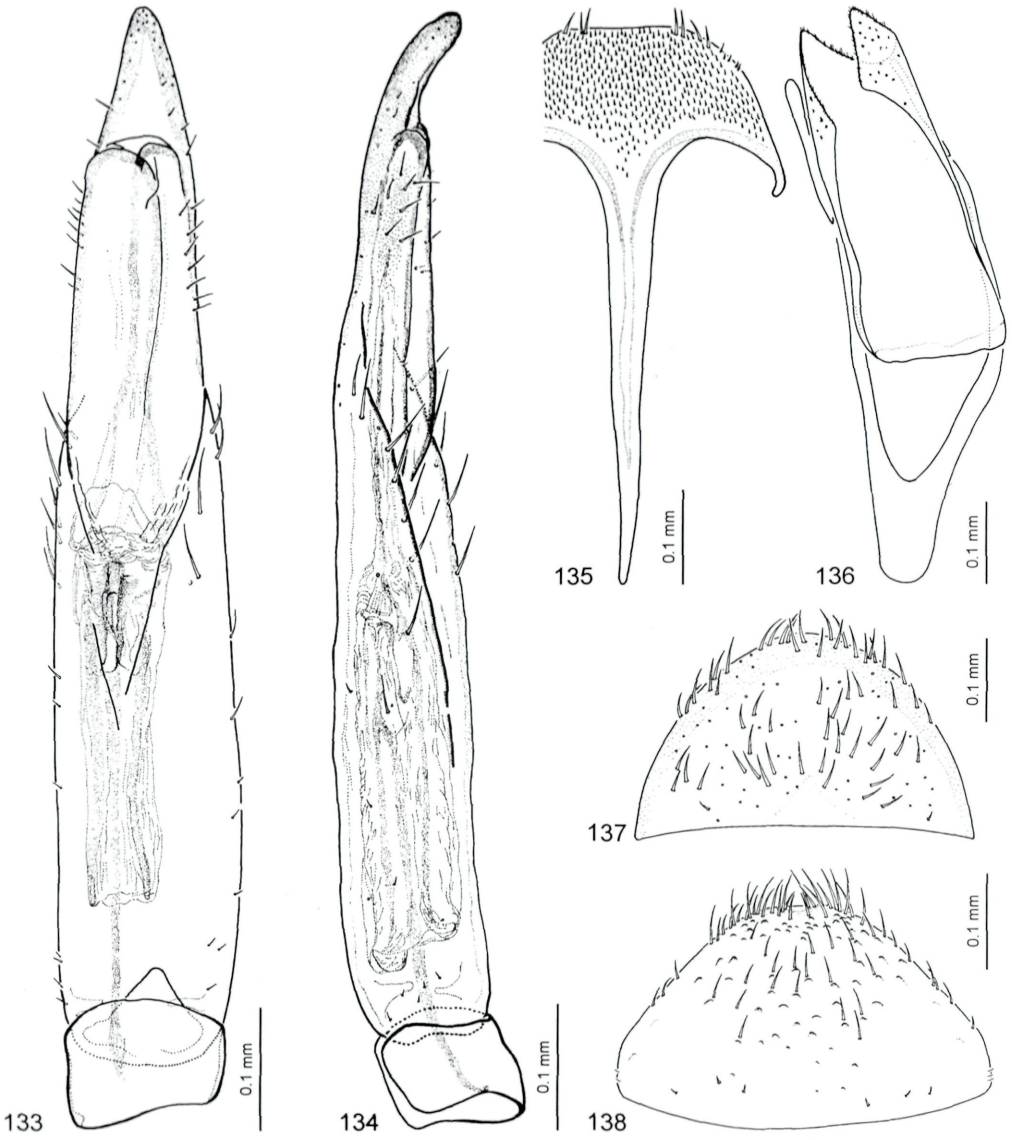
Figs. 116 - 120: *Macronychus quadrituberculatus*, 116) mesonotum, dorsal view; 117) metanotum, dorsal view; 118) metendosternite, dorsal view; 119) hind wing, proximal half; 120) fully developed hind wing, dorsal view.



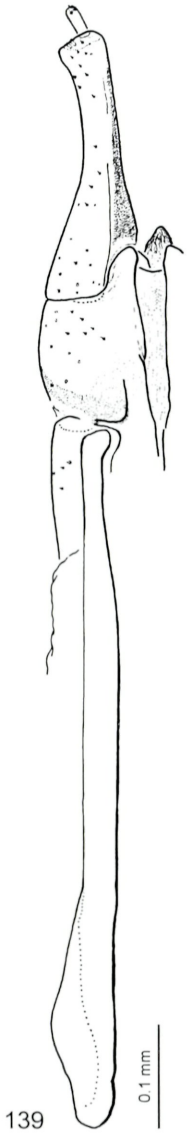
Figs. 121 - 127: *Macronychus quadrituberculatus*, 121) aedeagus, ventral view; 122) aedeagus, lateral view; 123) extruded endophallus, ventral view; 124) sternite VIII of male, ventral view; 125) genital segments of male; 126) tergite VIII of male, dorsal view; 127) ventrite V of male, ventral view.

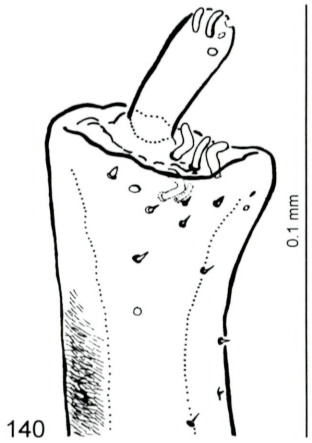


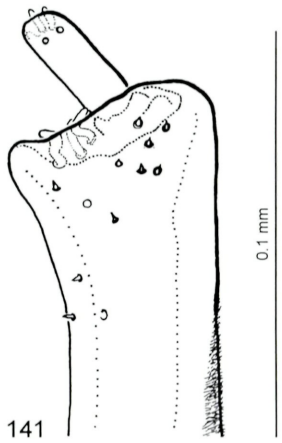
Figs. 128 - 132: *Macronychus quadrituberculatus*, 128) ovipositor, ventral view; 129) apex of ovipositor, ventral view; 130) sternite VIII of female, ventral view; 131) tergite VIII of female, dorsal view; 132) ventrite V of female, ventral view.

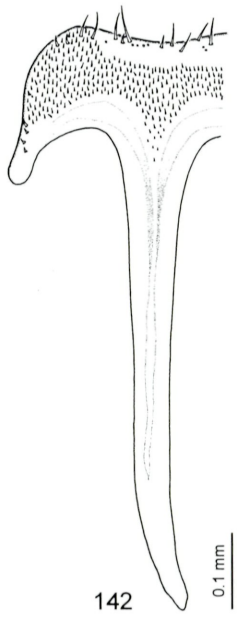


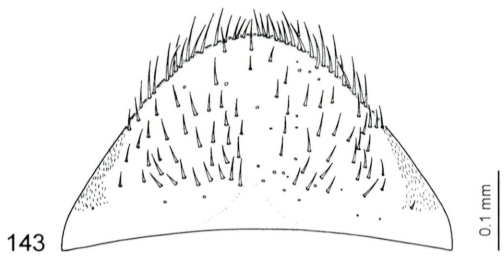
Figs. 133 - 138: *Macronychus glabratus*, 133) aedeagus, ventral view; 134) same, lateral view; 135) sternite VIII of male, ventral view; 136) genital segments of male; 137) tergite VIII of male, dorsal view; 138) ventrite V of male, ventral view.

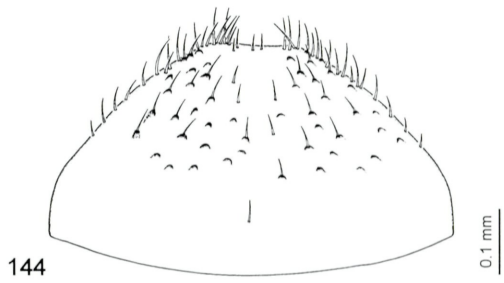




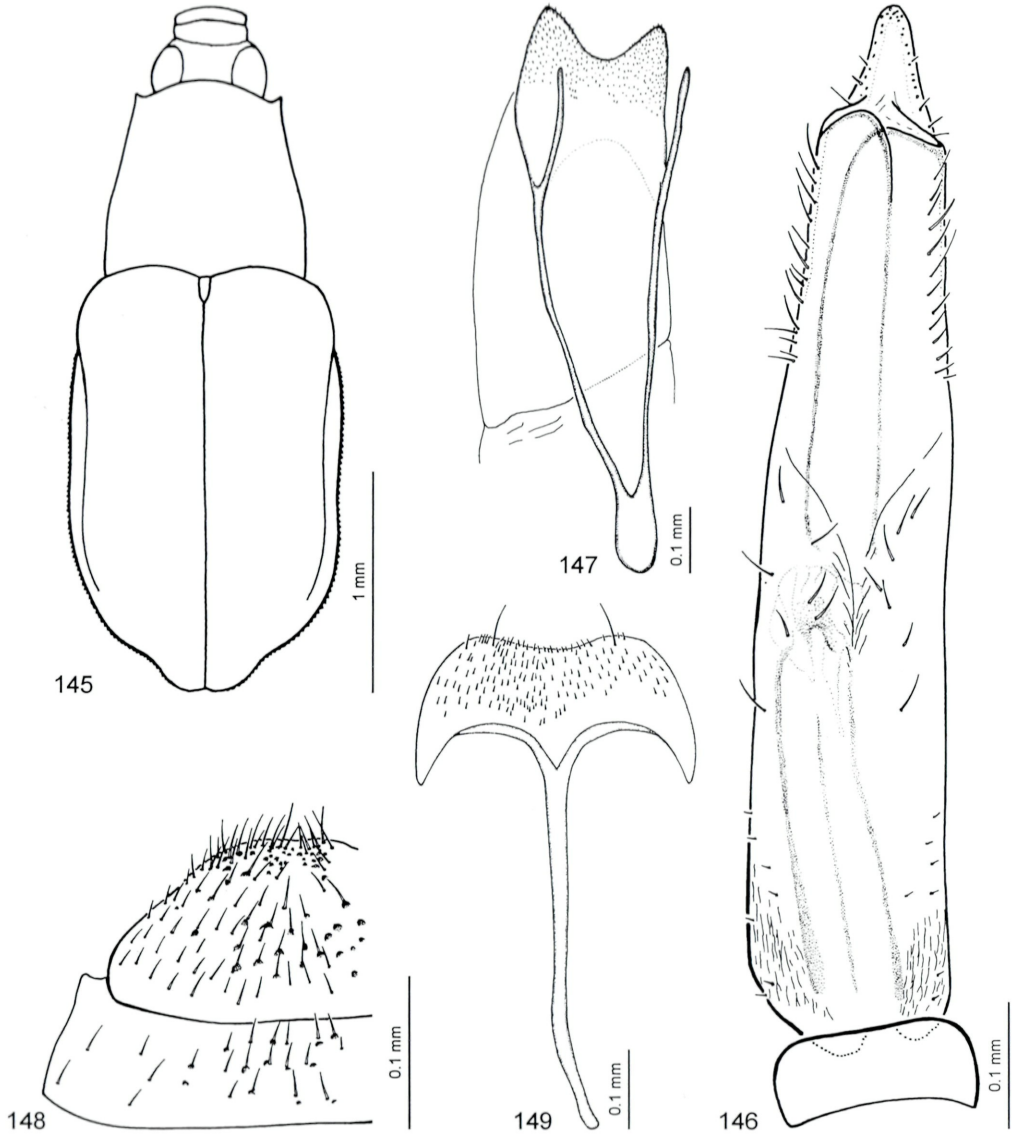




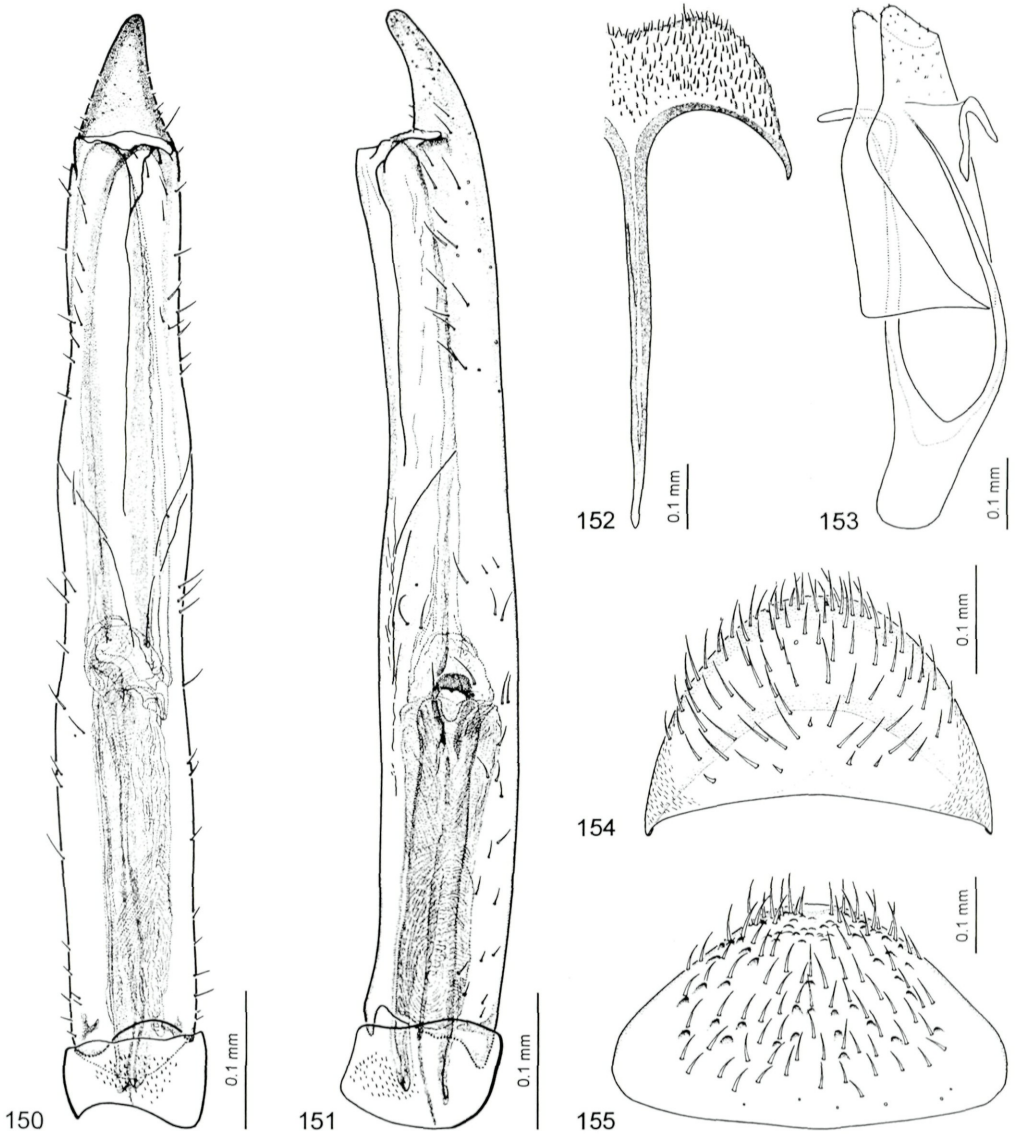




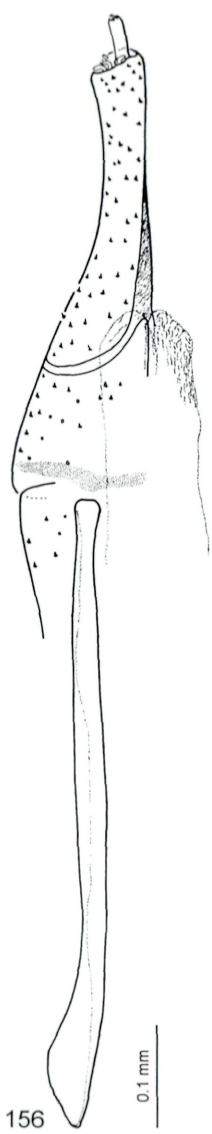
Figs. 139 - 144: *Macronychus glabratus*, 139) ovipositor, ventral view; 140) apex of ovipositor, dorsal view; 141) apex of ovipositor, ventral view; 142) sternite VIII of female, ventral view; 143) tergite VIII of female, dorsal view; 144) ventrite V of female, ventral view.

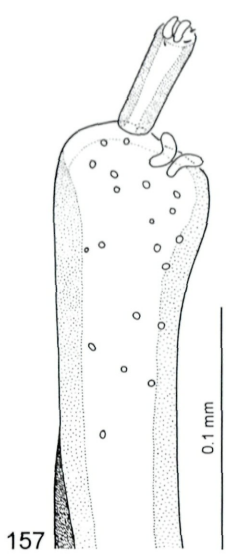


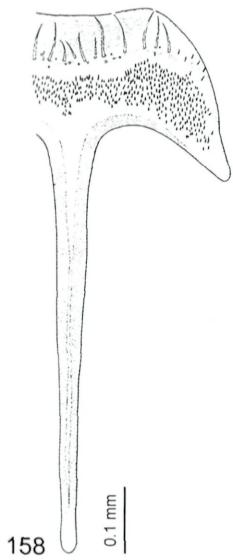
Figs. 145 - 149: *Macronychus levanidovae*, 145) habitus outline, holotype; 146) aedeagus, ventral view; 147) genital segments of male; 148) ventrites IV - V of male, ventral view; 149) sternite VIII of male, ventral view.

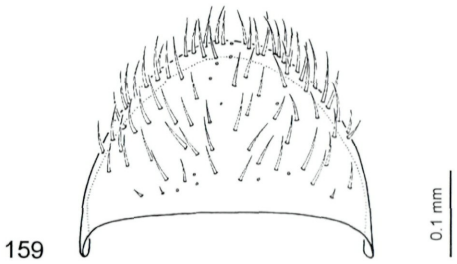


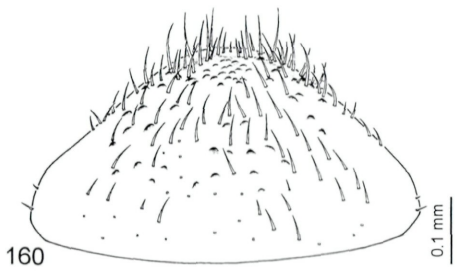
Figs. 150 - 155: *Macronychus vietnamensis*, 150) aedeagus, ventral view; 151) same, lateral view; 152) sternite VIII of male, ventral view; 153) genital segments of male; 154) tergite VIII of male, dorsal view; 155) ventrite V of male, ventral view.



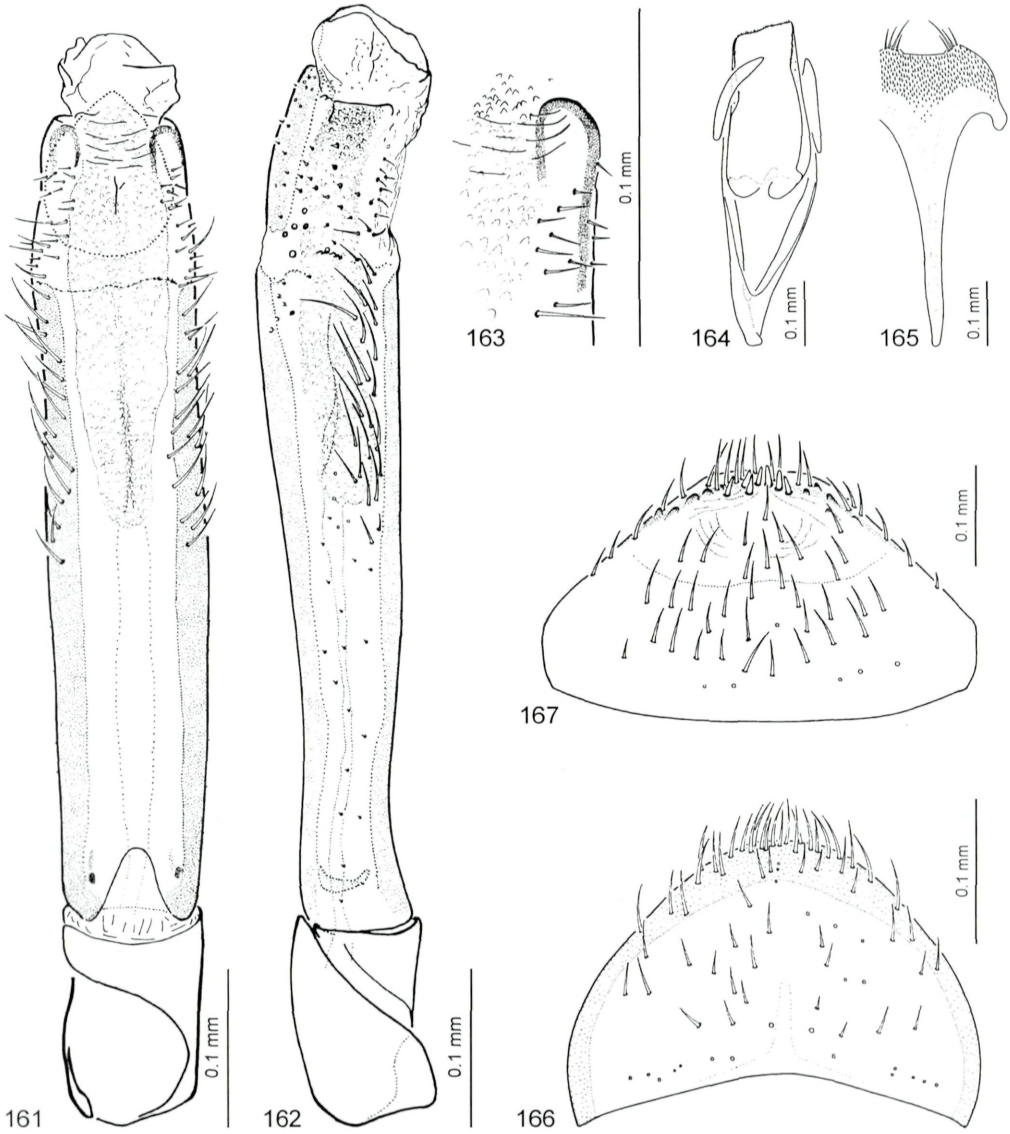




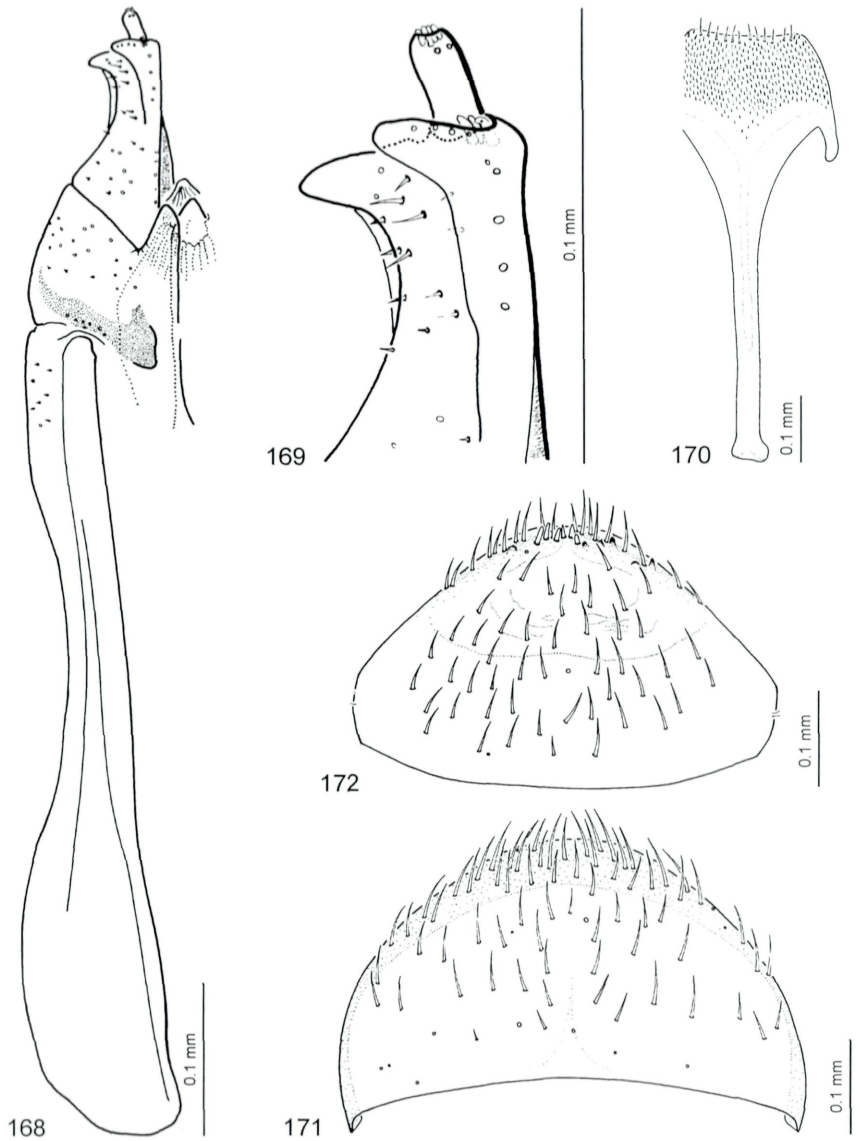




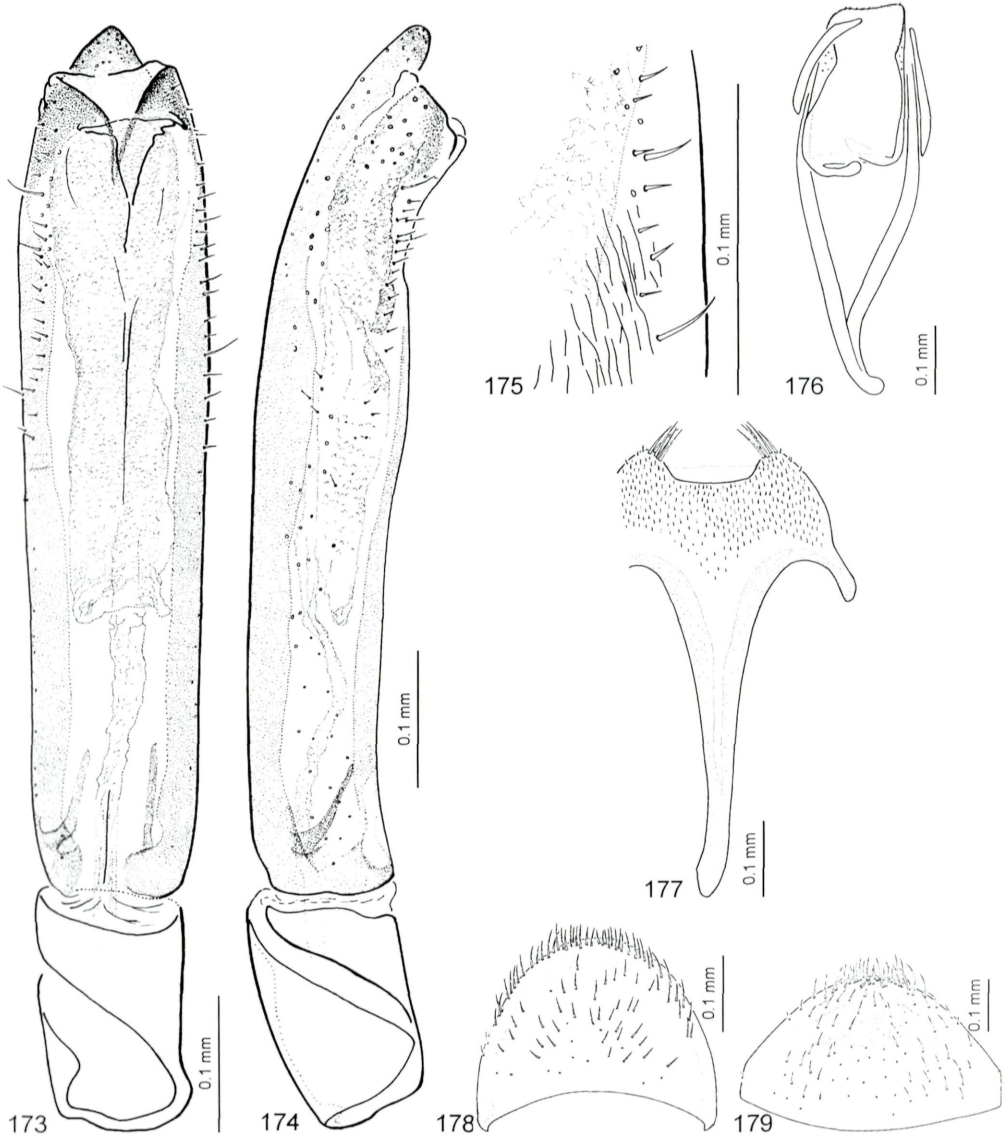
Figs. 156 - 160: *Macronychus vietnamensis*, 156) ovipositor, ventral view; 157) apex of ovipositor, ventral view; 158) sternite VIII of female, ventral view; 159) tergite VIII of female, dorsal view; 160) ventrite V of female, ventral view.



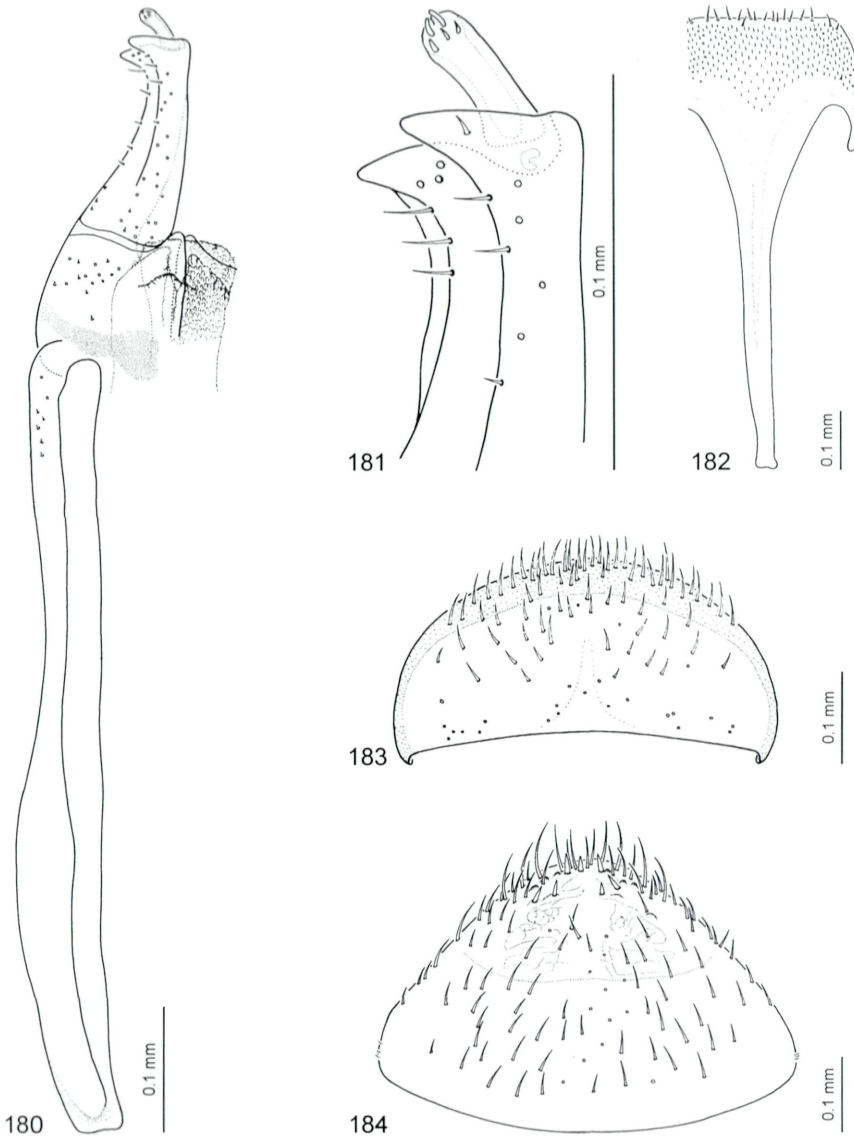
Figs. 161 - 167: *Macronychus reticulatus* sp.n., 161) aedeagus, ventral view; 162) same, lateral view; 163) latero-apical portion of aedeagus, ventral view; 164) genital segments of male; 165) sternite VIII of male, ventral view; 166) tergite VIII of male, dorsal view; 167) ventrite V of male, ventral view.



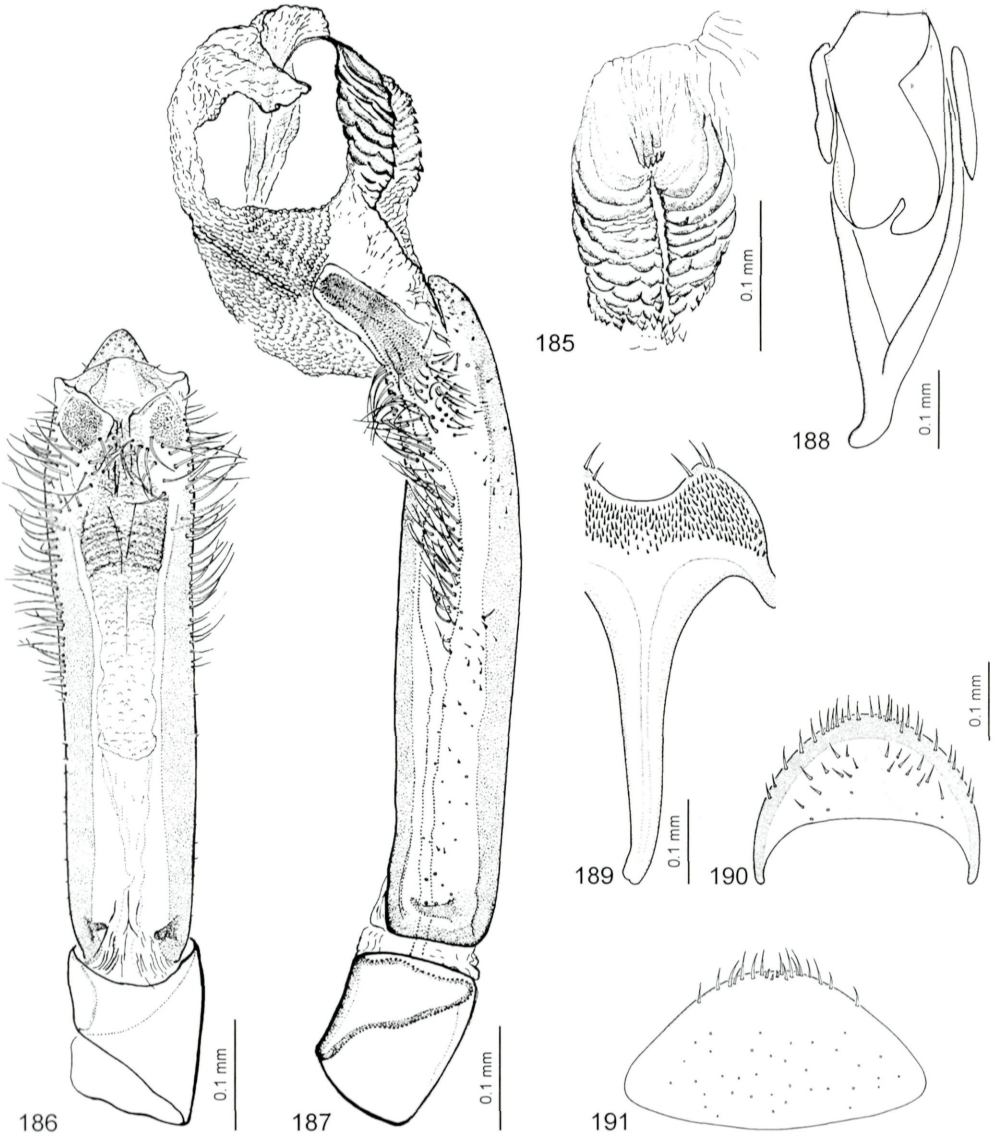
Figs. 168 - 172: *Macronychus reticulatus* sp.n., 168) ovipositor, ventral view; 169) apex of ovipositor, ventral view; 170) sternite VIII of female, ventral view; 171) tergite VIII of female, dorsal view; 172) ventrite V of female, ventral view.



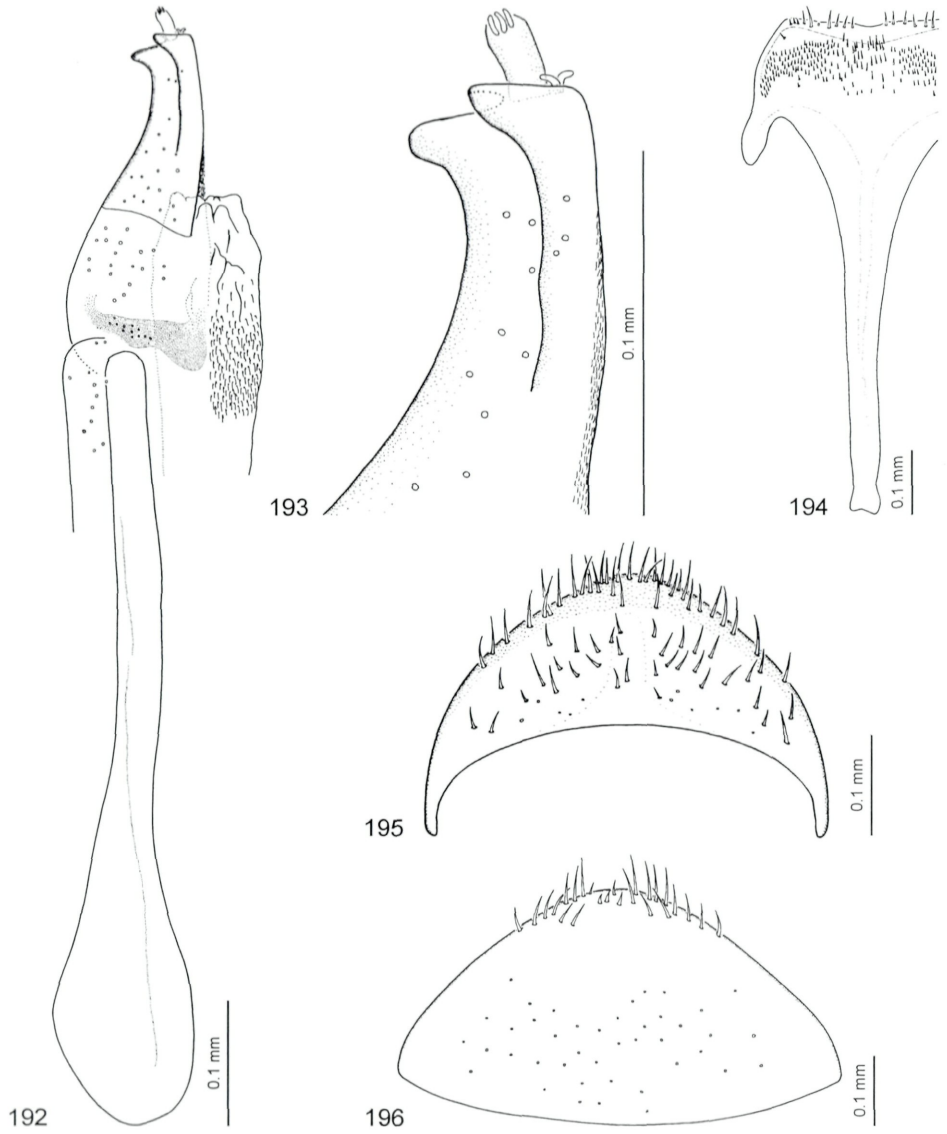
Figs. 173 - 179: *Macronychus sulcatus* sp.n., 173) aedeagus, ventral view; 174) same, lateral view; 175) latero-apical portion of aedeagus, ventral view; 176) genital segments of male; 177) sternite VIII of male, ventral view; 178) tergite VIII of male, dorsal view; 179) ventrite V of male, ventral view.



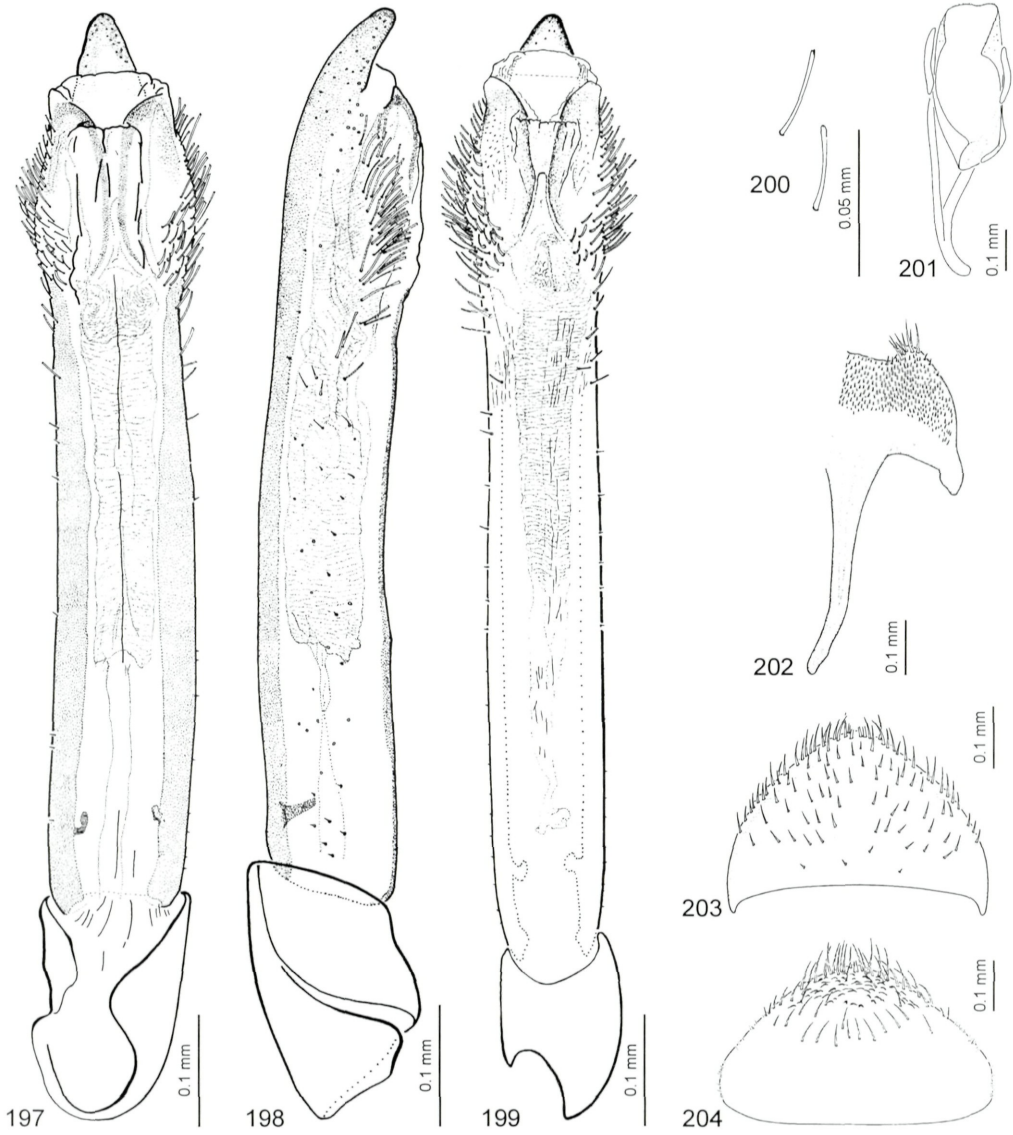
Figs. 180 - 184: *Macronychus sulcatus* sp.n., 180) ovipositor, ventral view; 181) apex of ovipositor, ventral view; 182) sternite VIII of female, ventral view; 183) tergite VIII of female, dorsal view; 184) ventrite V of female, ventral view.



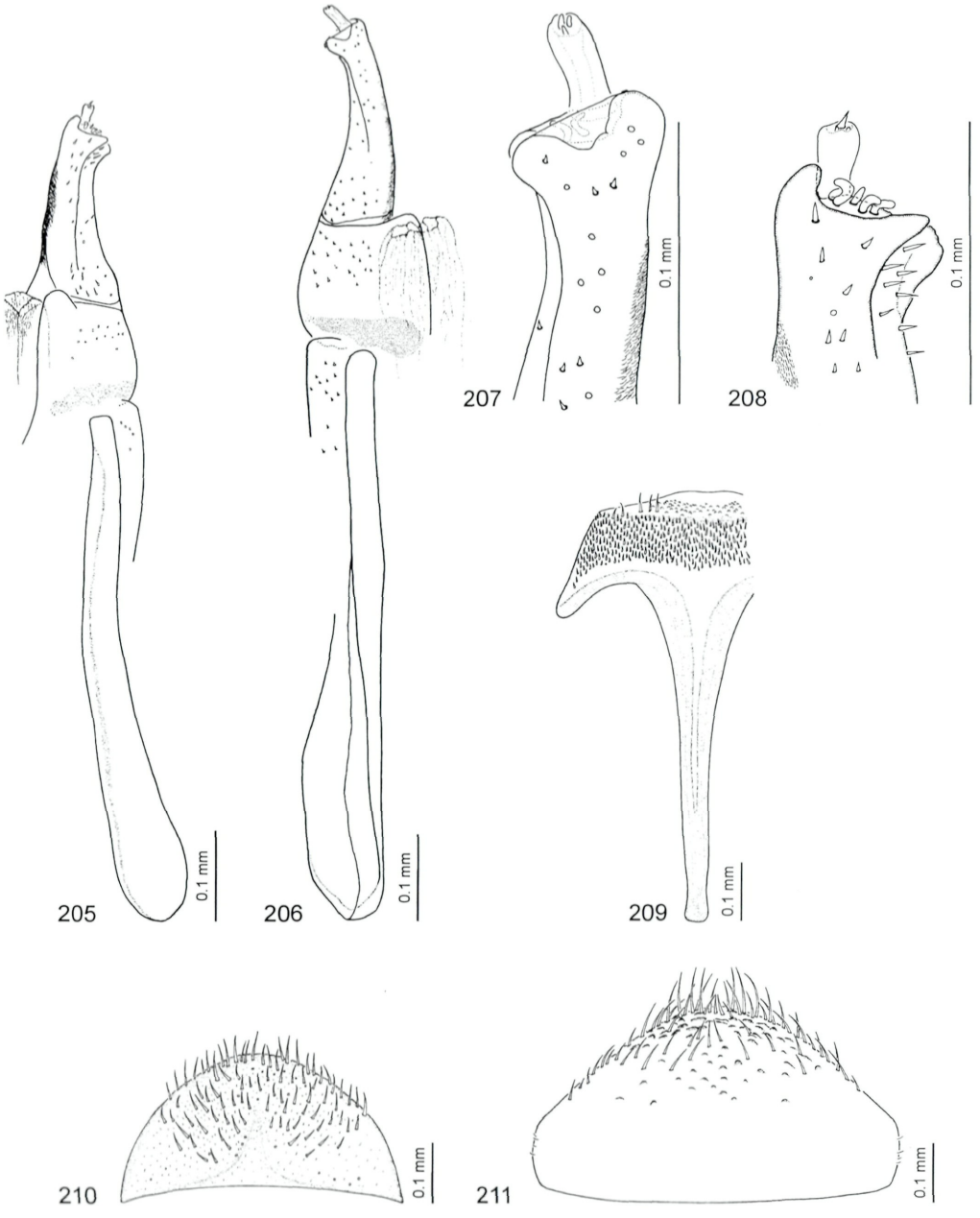
Figs. 185 - 191: *Macronychus jaechi* sp.n., 185) apico-dorsal portion of extruded endophallus, 186) aedeagus, ventral view; 187) aedeagus, lateral view; 188) genital segments of male; 189) sternite VIII of male, ventral view; 190) tergite VIII of male, dorsal view; 191) ventrite V of male, ventral view.



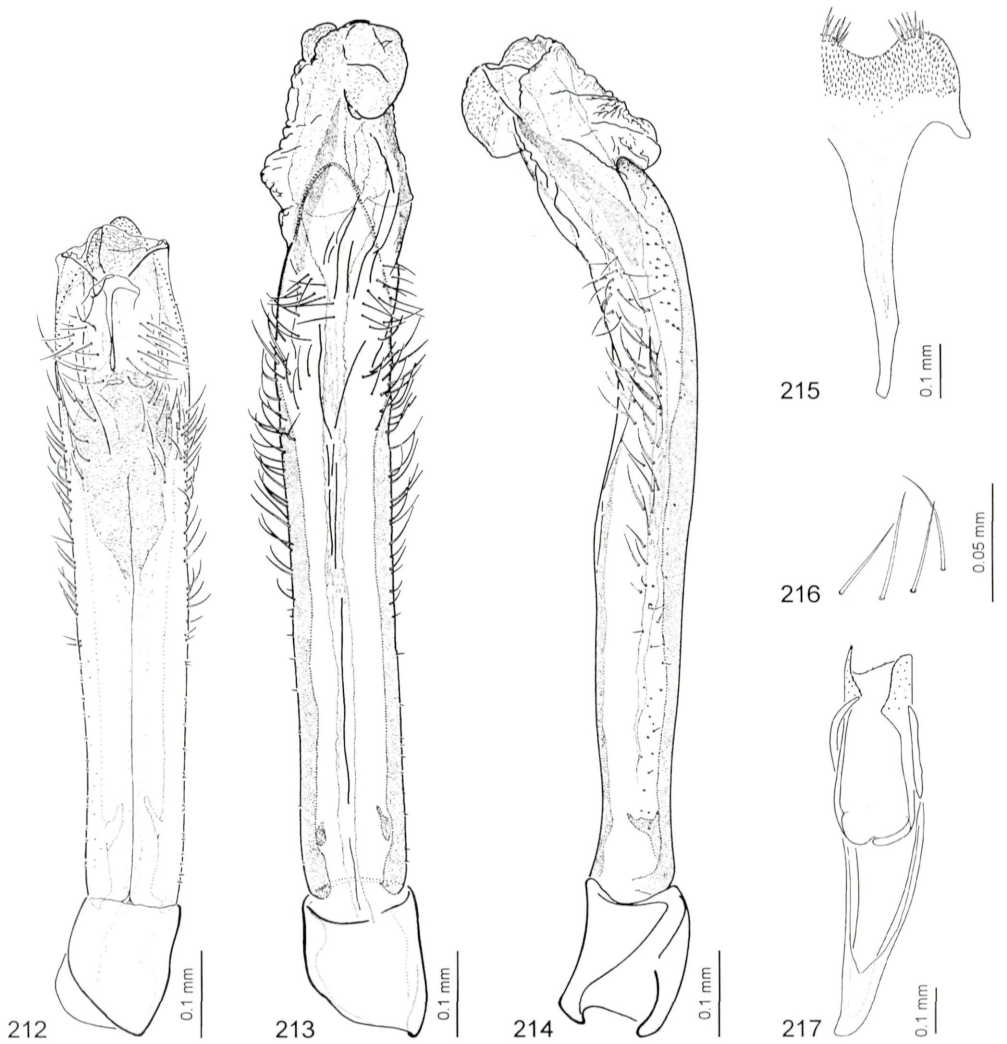
Figs. 192 - 196: *Macronychus jaechi* sp.n., 192) ovipositor, ventral view; 193) apex of ovipositor, ventral view; 194) sternite VIII of female, ventral view; 195) tergite VIII of female, dorsal view; 196) ventrite V of female, ventral view.



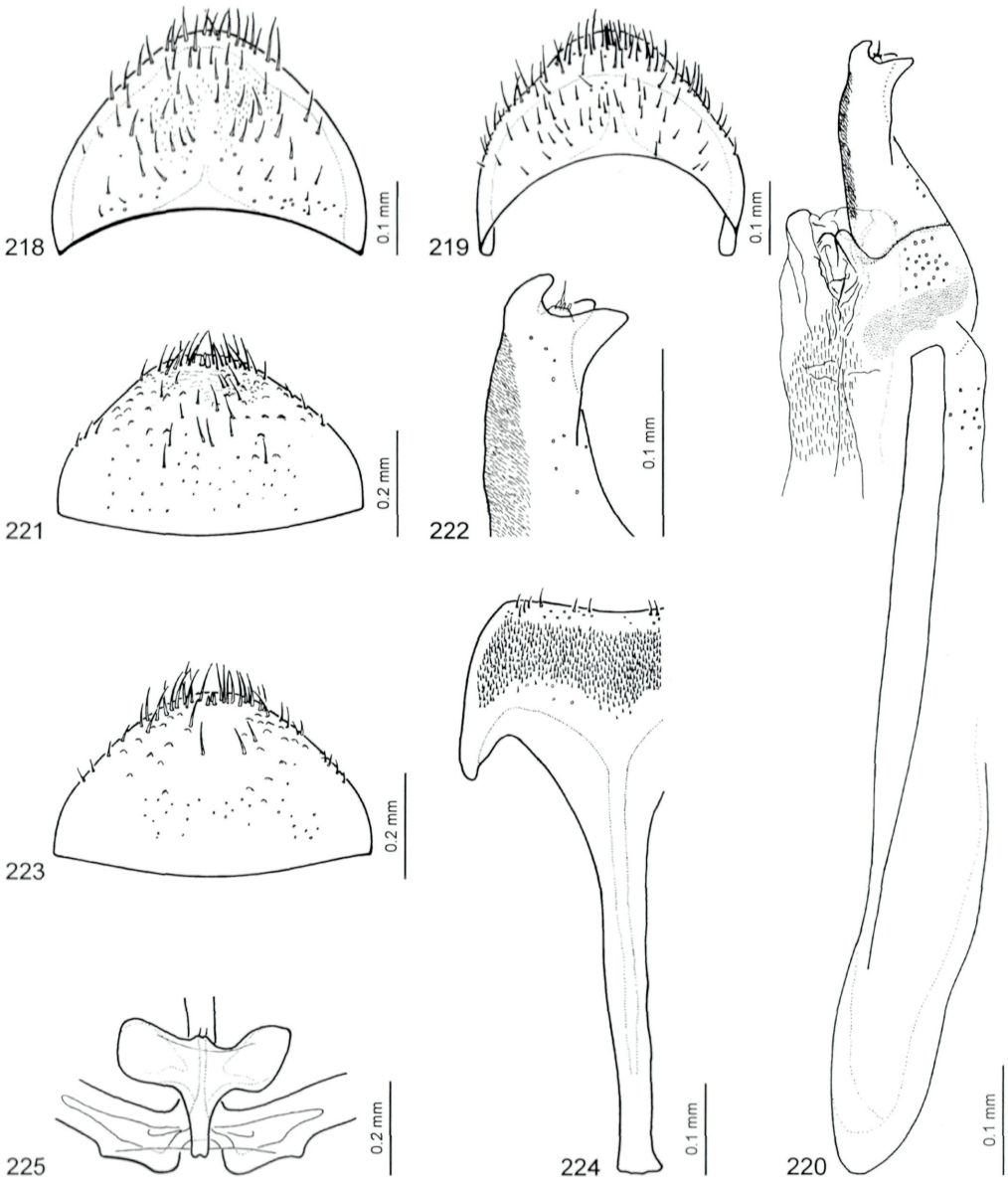
Figs. 197 - 204: *Macronychus indicus*, 197) aedeagus, paratype, ventral view; 198) same, lateral view; 199) aedeagus, holotype, ventral view; 200) blunt lateral setae of aedeagus; 201) genital segments of male; 202) sternite VIII of male, ventral view; 203) tergite VIII of male, dorsal view; 204) ventrite V of male, ventral view.



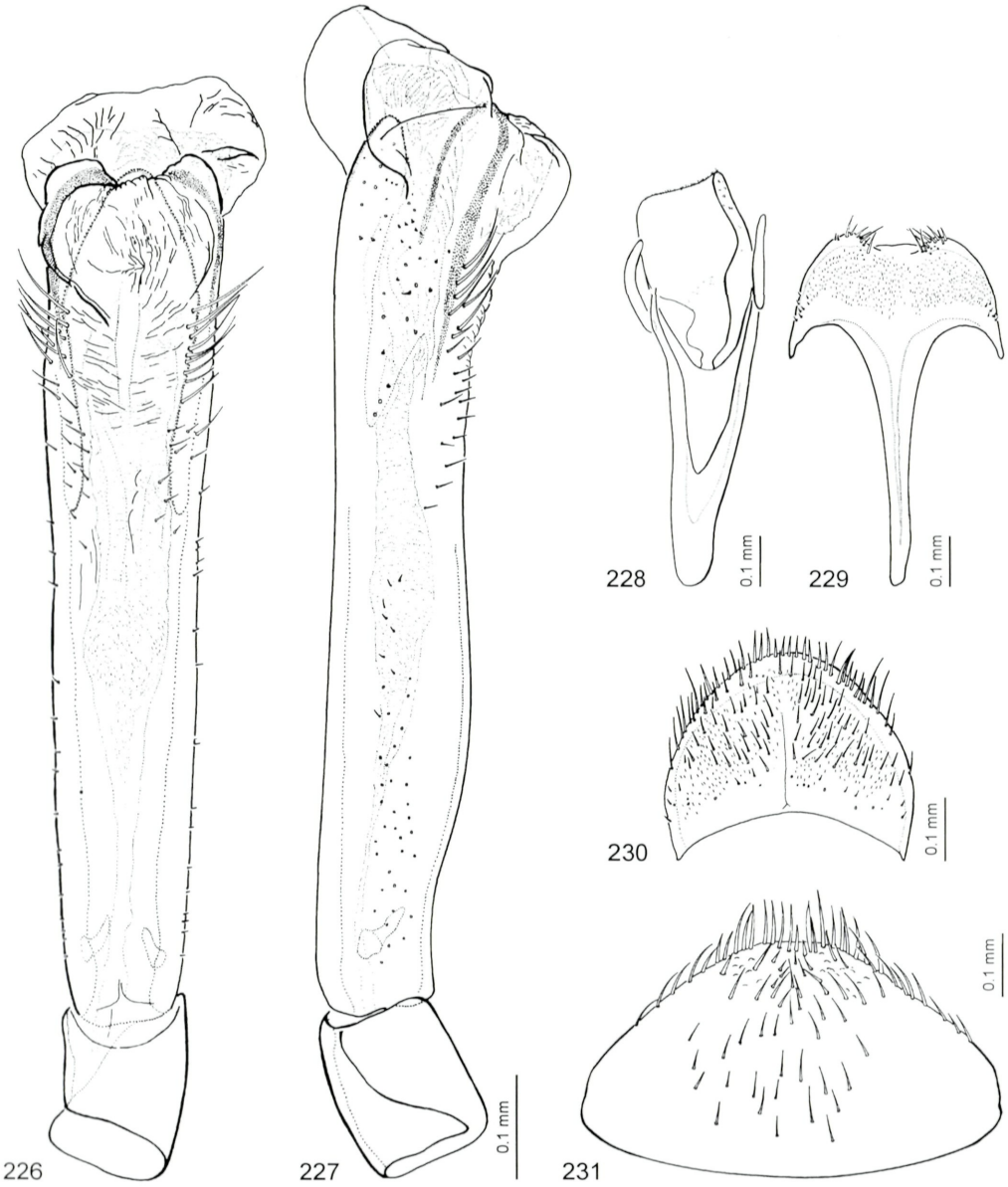
Figs. 205 - 211: *Macronychus indicus*, 205) ovipositor, paratype, ventral view; 206) ovipositor, specimen from Nepal, ventral view; 207) apex of ovipositor, paratype, ventral view; 208) apex of ovipositor, specimen from Nepal, ventral view; 209) sternite VIII of female, paratype ventral view; 210) tergite VIII of female, paratype, dorsal view; 211) ventrite V of female, paratype ventral view.



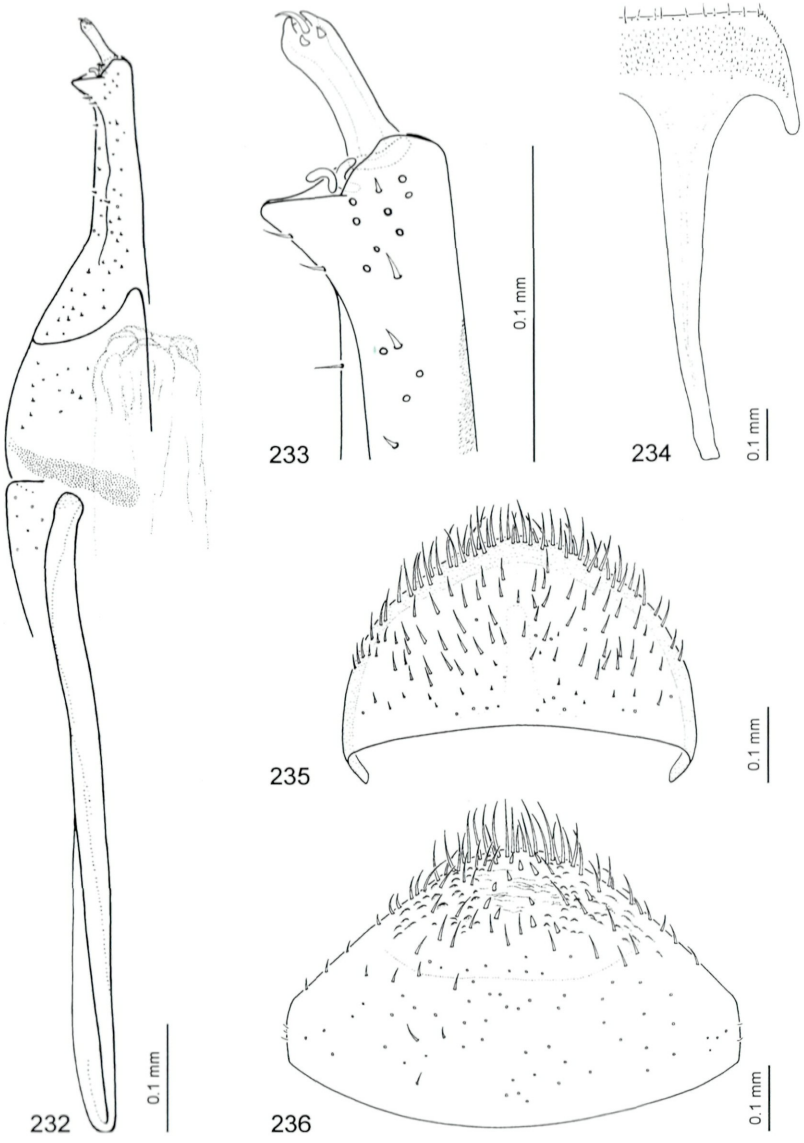
Figs. 212 - 217: *Macronychus kubani* sp.n., 212) aedeagus, paratype ventral view; 213) aedeagus, paratype endophallus extruded, ventral view; 214) same, lateral view; 215) sternite VIII of male, ventral view; 216) latero-apical setae of aedeagus; 217) genital segments of male.



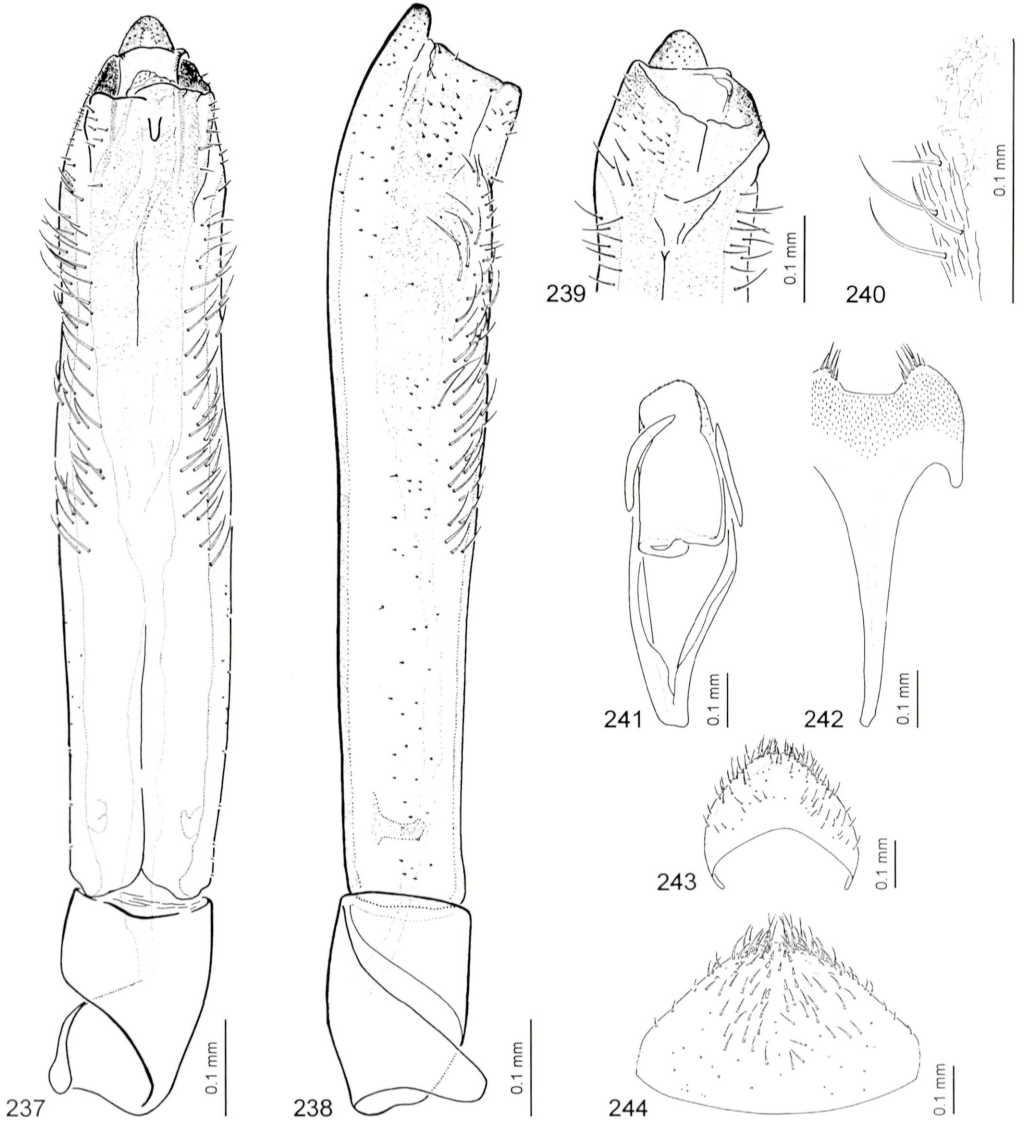
Figs. 218 - 225: *Macronychus kubani* sp.n., 218) tergite VIII of male, dorsal view; 219) tergite VIII of female, dorsal view; 220) ovipositor, ventral view; 221) ventrite V of male, ventral view; 222) apex of ovipositor, ventral view; 223) ventrite V of female, ventral view; 224) sternite VIII of female, ventral view; 225) metendosternite.



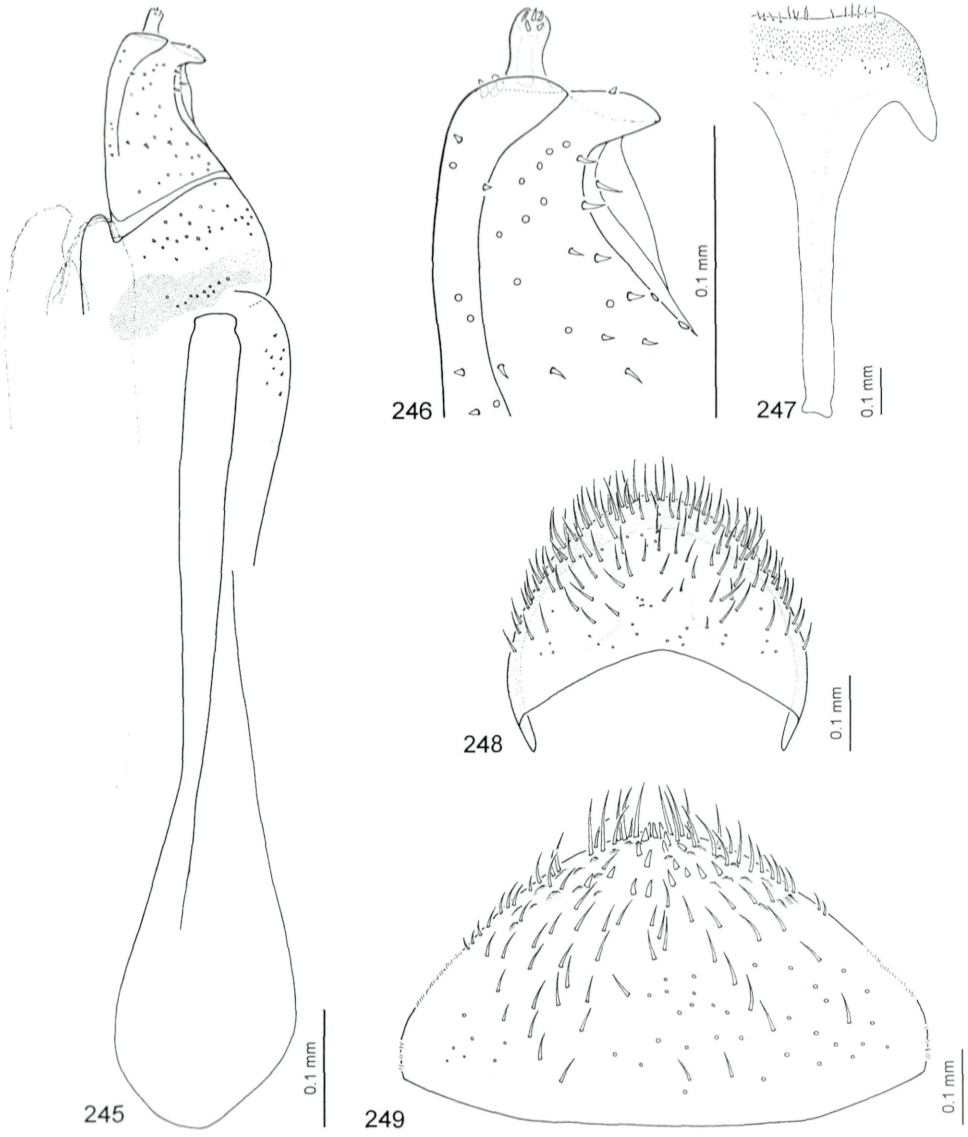
Figs. 226 - 231: *Macronychus jendeki* sp.n., 226) aedeagus, holotype, ventral view; 227) same, lateral view; 228) genital segments of male; 229) sternite VIII of male, ventral view; 230) tergite VIII of male, dorsal view; 231) ventrite V of male, ventral view.



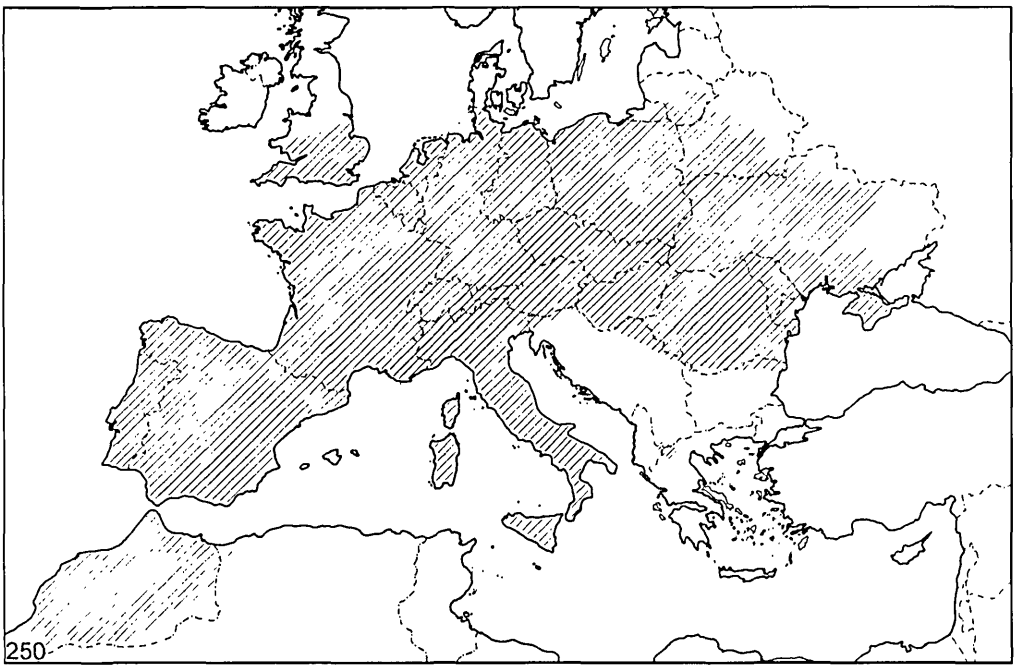
Figs. 232 - 236: *Macronychus jendeki* sp.n., 232) ovipositor, paratype, ventral view; 233) apex of ovipositor, ventral view; 234) tergite VIII of female, dorsal view; 235) sternite VIII of female, ventral view; 236) ventrite V of female, ventral view.

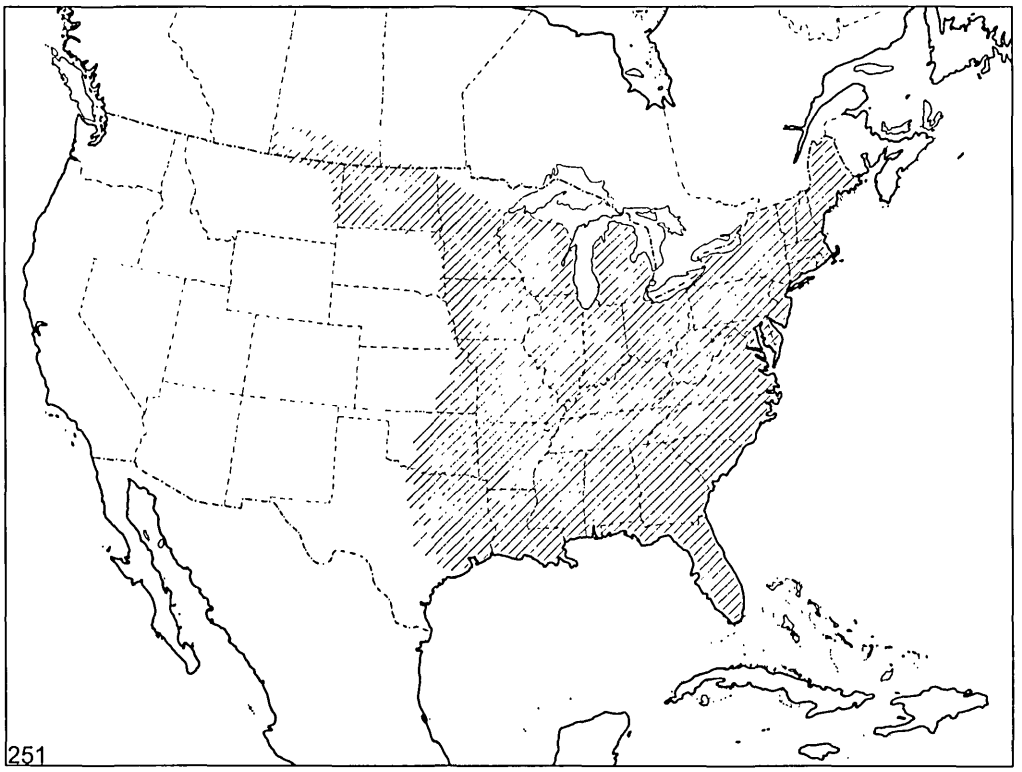


Figs. 237 - 244: *Macronychus ultimus* sp.n., 237) aedeagus, ventral view; 238) same, lateral view; 239) apex of aedeagus, ventral view; 240) latero-apical setae of aedeagus; 241) genital segments of male; 242) sternite VIII of male, ventral view; 243) tergite VIII of male, dorsal view; 244) ventrite V of male, ventral view.



Figs. 245 - 249: *Macronychus ultimus* sp.n., 245) ovipositor, ventral view; 246) apex of ovipositor, ventral view; 247) sternite VIII of female, ventral view; 248) tergite VIII of female, dorsal view; 249) ventrite V of female, ventral view.





Figs. 250 - 251: Geographical distribution of 250) *Macronychus quadrituberculatus* and 251) *M. glabratus*.

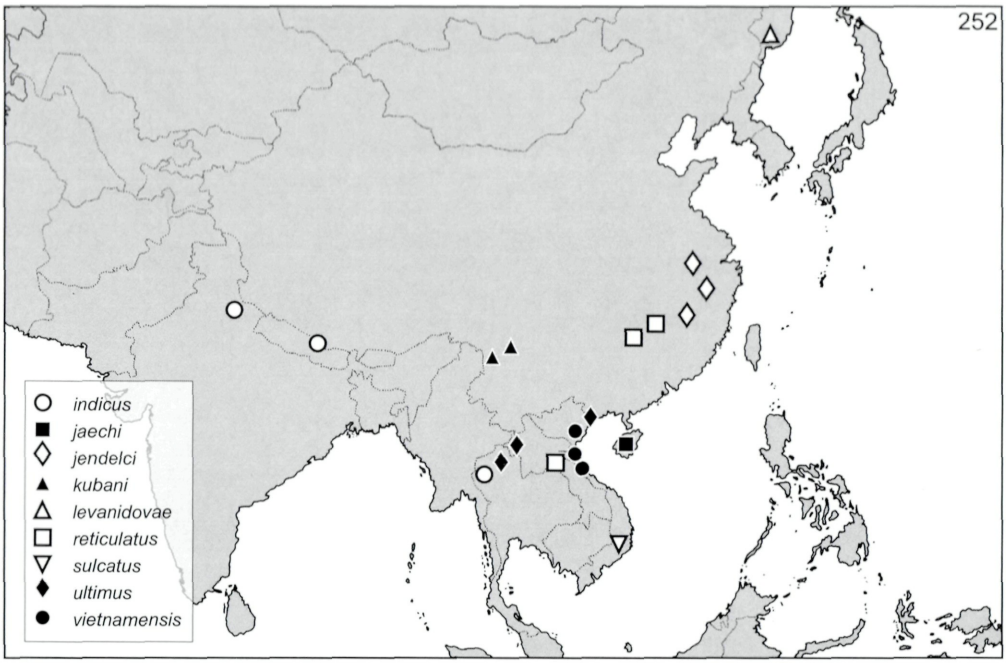


Fig. 252: Geographical distribution of the Asian species of *Macronychus*: *M. indicus* sp.n., *M. jaechi* sp.n., *M. jendeki* sp.n., *M. kubani* sp.n., *M. levanidovae*, *M. reticulatus* sp.n., *M. sulcatus* sp.n., *M. ultimus* sp.n., *M. vietnamensis*.

Catalogue of the genus *Macronychus* MÜLLER

Macronychus MÜLLER, 1806: 207.
Type species (by monotypy): *Macronychus quadrituberculatus*, MÜLLER 1806: 215.

Macronychus quadrituberculatus MÜLLER, 1806: 215.*
Immature stages: DUFOUR 1862; PEREZ 1863; BERTRAND 1939; BERTRAND 1954; OLMI 1976.
Biology: CONTARINI 1832; DUFOUR 1862; OLMI 1976.
Distribution: Western, southern and central Europe (BERTHÉLEMY & OLMI 1978): France, Germany, The Netherlands, Spain, Portugal, Greece, Italy, Romania, Czech Republic, Austria, Switzerland, Poland, Slovakia, Hungary, Ukraine, Finland (BERTHÉLEMY 1979); northern Africa: Morocco.

Macronychus glabratus SAY, 1825: 187.
M. lateralis MELSHEIMER, 1846: 99. Synonymized by LECONTE 1854: 217.
Immature stages: WEST 1929b; BROWN 1972; LE SAGE & HARPER 1976a, b, 1977.
Biology: WEST 1929a; BROWN 1973; DAVIS & FINNI 1974.
Distribution (BROWN 1975, 1983)**:** North Amerika, United States: North Dakota, Wisconsin, Michigan, Ontario, Kansas, Iowa, Missouri, Illinois, Indiana, Ohio, Kentucky, New York, Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, West Virginia, Virginia, Maine, Rhode Island, Connecticut, Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Georgia, South Carolina, North Carolina, Florida; Canada: Quebec.

* ZAITZEV (1908) listed *Parnus obscurus* FABRICIUS, 1874 as possible senior synonym of *M. quadrituberculatus*. The present study of the holotype of *Parnus obscurus* reveals that the specimen examined does not belong to Dryopoidea.

Macronychus levanidovae LAFER, 1980: 50.
Distribution: Asia: eastern Russia (Primorye).

Macronychus vietnamensis DELÈVE, 1968: 179.
Distribution: Asia: northern Vietnam.

Macronychus reticulatus sp.n.
Distribution: Asia: Laos and China (Hunan).

Macronychus sulcatus sp.n.
Distribution: Asia: southern Vietnam.

Macronychus jaechi sp.n.
Distribution: Asia: China (Hainan).

Macronychus indicus HINTON, 1940: 118.
Distribution: Asia: northern India (Uttar Pradesh), Nepal, Thailand.

Macronychus kubani sp.n.
Distribution: Asia: southern China (Yünnan, Sichuan).

Macronychus jendeki sp.n.
Distribution: Asia: southern China (Anhui, Jiangxi, Hunan).

Macronychus ultimus sp.n.
Distribution: Asia: northern Vietnam, northern Laos, Thailand.

List of species removed from *Macronychus*

Macronychus caucasicus VICTOR (= MOTSCHULSKY), 1839: 70. *Grouvelleus caucasicus*, ZAITZEV 1908: 311. *Grouvellinus caucasicus*, CHAMPION 1923: 170.
Elmis coyei ALLARD, 1869: 466. *Microdes coyei*, GROUVELLE 1889: LXXX. *Grouvelleus coyei*, ZAITZEV 1908: 311. *Grouvellinus coyei*, DELÈVE 1967: 444. Synonymised by JÄCH (1990: 39).
Distribution (JÄCH 1990): Europe: Greece (Samos), Turkey. Asia: Armenia, western Iran, Iraq, Syria, Lebanon, northern Israel.

Macronychus minusculus GROUVELLE, 1892: 187. *Grouvelleus minusculus*, ZAITZEV 1908: 311. *Grouvellinus minusculus*, CHAMPION 1923: 169. *Zaitzeviaria minuscula*, DELÈVE 1970: 270.
Distribution: Asia: Sumatra.

Macronychus parvulus HORN, 1870: 41. *Zaitzevia parvula*, HINTON 1936: 432.
Elmis columbiensis ANGELL, 1892: 84. Synonymised by SANDERSON (1938: 146).
Distribution (BROWN 1983): North America: British Columbia, Washington, Oregon, Idaho, Alberta, Montana, South Dakota, California, Nevada, Wyoming, Utah, Colorado, Arizona, New Mexico.

Macronychus rioloides REITTER, 1887: 259. *Microdes rioloides*, GROUVELLE 1889: LXXX. *Grouvelleus rioloides*, ZAITZEV 1908: 311. *Grouvellinus rioloides*, CHAMPION 1923: 169.
Macronychus arius JANSSENS, 1959: 3. *Grouvellinus arius*, JÄCH 1984: 107. Synonymised by JÄCH (1990: 40).
Distribution (JÄCH 1990): Asia: Afghanistan, Kazakhstan, Kyrgyzstan, Uzbekistan.

Macronychus simplex HINTON, 1936: 433. *Zaitzevia simplex*, HINTON 1940: 113. *Macronevia simplex*, JÄCH & BOUKAL 1996: 181.
Distribution: Asia: Peninsular Malaysia.

Macronychus thermae HATCH, 1938: 18. *Zaitzevia thermae*, HINTON 1939: 181.**

** According to HINTON (1939) *Z. thermae* appears to be synonym of the widely distributed *Z. parvulus* (HORN).

Distribution (Brown 1983): North America: Montana, Bridger Canyon near Bozeman, thermal springs.

Macronychus variegatus Germar, 1824: 89. *Ancyronyx variegatus*, Erichson: 1847: 522.
Elmis cincta Say, 1825: 186.
Distribution (Brown 1983): North America: Quebec, Wisconsin, Michigan, Ontario, Kansas, Missouri, Illinois, Indiana, Ohio, Kentucky, New York, Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, West Virginia, Virginia, Maine, Vermont, Rhode Island, Connecticut, Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Georgia, South Carolina, North Carolina, Florida.

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Fedor Čiampor jr.
Department of Zoology, Comenius University, Mlynská dolina B-I, 842 15 Bratislava, Slovakia
Present address: *Institute of Zoology, Slovak Academy of Sciences, Dúbravská cesta 9, 842 06 Bratislava, Slovakia*
E-mail: uzaeciam@savba.savba.sk

Dr. Ján Kodada
Department of Zoology, Comenius University, Mlynská dolina B-I, 842 15 Bratislava, Slovakia