

## Additional data on three bee species of the genus *Panurginus* from *P. clavatus* species group (Hymenoptera: Andrenidae: Panurginae)

## Новые данные о трех видах пчел рода *Panurginus* группы *P. clavatus* (Hymenoptera: Andrenidae: Panurginae)

YU.V. ASTAFUROVA & T.G. ROMANKOVA

Ю.В. АСТАФУРОВА, Т.Г. РОМАНЬКОВА

Yu.V. Astafurova, Zoological Institute, Russian Academy of Sciences, 1 Universitetskaya Emb., St Petersburg, 199034, Russia. E-mail: jast@zin.ru

T.G. Romankova. E-mail: tromain@yahoo.com

*Panurginus eurystylus* (Patiny, 2002), *P. punctiventris* F. Morawitz, 1876 and *P. sculpturatus* F. Morawitz, 1872 are redescribed in details. The first species (*P. eurystylus*) is reported as a new record for Azerbaijan, and its female is described for the first time. The second species (*P. punctiventris*) is reported as a new record for Georgia and Azerbaijan, and its lectotype and paralectotype are designated. A key for these species is given.

Подробно переописаны *Panurginus eurystylus* (Patiny, 2002), *P. punctiventris* F. Morawitz, 1876 и *P. sculpturatus* F. Morawitz, 1872. Первый вид (*P. eurystylus*) впервые указывается для Азербайджана, и его самка впервые описывается. Второй вид (*P. punctiventris*) впервые указывается для Грузии и Азербайджана, и его лектотип и паралектотип обозначаются. Дана таблица для определения этих трех видов.

**Key words:** solitary bees, Armenia, Azerbaijan, Georgia, Russia, Ukraine, Hymenoptera, Andrenidae, Panurginae, *Panurginus*

**Ключевые слова:** одиночные пчелы, Армения, Азербайджан, Грузия, Россия, Украина, Hymenoptera, Andrenidae, Panurginae, *Panurginus*

### INTRODUCTION

During the examination of *Panurginus* Nylander, 1848 specimens, mostly collected by Anna Z. Osytchnjuk, some additional information about rare or little known species was obtained. In this article we focus on three of them, belonging to the *P. clavatus* (Warncke, 1972) species group: *P. punctiventris* F. Morawitz, 1876 described on base of two syntypes; *P. eurystylus* (Patiny, 2002) described on base of a single male from Georgia; *P. sculpturatus* only briefly described before (Friese, 1897, 1901; Osytshnjuk, 1977). This species group was differently treated by authors: as the subgenus *Clavipanurgus*

Warncke, 1972 of the genus *Panurgus* Panzer, 1806 (Warncke, 1972), as a subgenus of the genus *Panurginus* (Ruz, 1986: *Clavipanurgus*), as a separate genus (Patiny, 2001, 2003: *Clavipanurgus*), or as a group of species within the genus *Panurginus* (Friese, 1897, 1901; Michener, 2000, 2007). We support the latter judgment and make an attempt to outline a set of characters for this unit. *P. sculpturatus* is a xerophilous, steppe dweller with wide distribution, while the two others are from mountainous areas and with much more limited distribution. Detailed, illustrated descriptions, an identification key for all these species and an annotated list of the material studied are given.

## MATERIAL AND METHODS

Numerous bee specimens (134 females and 121 males) were studied. The most part of the material studied is deposited in the Zoological Institute of RAS, St. Petersburg, Russia (this material is given without indication of deposition place); the rest of material is deposited in the Zoological Museum of the Moscow University (ZMMU), and I.I. Schmalhausen Institute of Zoology, Kiev, Ukraine (IZAN). For the description, we use morphological terms following C. D. Michener (2007). Abbreviations used are as follows: T – metasomal tergum, S – metasomal sternum, F – flagellomere, TM – tarsomere. Measurements were done on: antennal segments in anterior view, genal area and eye at their widest part, and marginal zone of metasomal tergum medially. Integument sculpture is described by the following formula: puncture diameter (in  $\mu\text{m}$ ) / ratio of distance between punctures to average puncture diameter, for example 15–20  $\mu\text{m}$  / 0.2–1.5. The following terms for description of the integument punctures are used: pit – depression with diameter more than 5  $\mu\text{m}$ ; puncture – depression diameter 5  $\mu\text{m}$  or smaller; pore – nonsymmetrical depression (with deepest point situated near edge of this depression). The abbreviation AO in paragraphs about material examined is used for the collector A. Osytshnjuk. New distribution data are asterisked.

## TAXONOMIC PART

Order **HYMENOPTERA**

Family **ANDRENIDAE**

Subfamily **PANURGINAE**

Genus *Panurginus* Nylander, 1848

*Panurginus* Nylander, 1848: 223; Friese, 1897: 9–34; 1901: 7–33; Osytshnjuk, 1977: 296–301; 1978: 369; Michener, 2000: 275; 2007: 287.

Body of *Panurginus* bees are from small to medium-sized (4–12 mm in length),

relatively narrow, dark (brown or black), and with the thin and whitish hairs; males often have yellow clypeus and leg parts, and its first recurrent vein is close to the first submarginal crossvein; females have a sparse scopa on the hind tibia. Bees are active in May–June, and their nests are in the ground. *Panurginus* is a single holarctic genus in the subfamily *Panurginae*.

*Panurginus* may be divided into a few groups on the base of sculptural characters and of shape of both hidden metasomal sterna and male genitalia (Friese, 1897; Warncke, 1972; Patiny, 2003). Two species discussed herein (*P. punctiventris* and *P. sculpturatus*) always come together in different attempts of grouping; but their difference in male genitalia, particularly in the shape of the gonostyli, confounds attempts at recognizing them as a distinct taxonomical group (Michener, 2000, 2007). The third species (*P. eurystylus*) is visually very close to *P. punctiventris*; the latter species is smaller, however their gonostyli and penis valves are of the same type. Based on personal examination, the following morphological characters separate these three species from the other *Panurginus* representatives and let them to be combined within the same group:

(1) male S7 apically with two beak-like, parallel and bent ventrally projections, and with short, horizontal disc; (2) male vertex with strongly developed posterolateral angles well visible in frontal view; (3) genal area completely punctured (without impunctate line along eye); (4) clypeus with round basal margin; (5) disc of metasomal terga posteriorly swelled, smooth, with large pits; non-swelled part of this terga with small pits; (6) mesepisternum glossy (at least in male), with dense, deep and round pits.

### Identification key for the three *Panurginus* species

1. Female ..... 2
- Male ..... 4

- 2(1). Body length 11–12 mm. Most part of wing yellowish brown; stigma usually orange, but sometimes brownish or yellowish; veins pale or yellowish brown. Metasomal tergal discs punctate, with distance between pits longer than pit diameter. [Europe from Greece to Ural Mountains, Turkey] ... ***P. sculpturatus***  
 – Body length 7–9.5 mm. [Transcaucasus, Turkey, Israel] ..... 3
- 3(2). Wing brown with stigma pale brown or (rarely) orange. Metasomal tergal discs less densely punctate, with distance between pits usually longer than pit diameter. Mesepisternum completely smooth, sparsely punctate, with distance between pits equal to 1–2 pit diameter, on upper quarter denser punctured. Body length 7–8 mm ..... ***P. punctiventris***  
 – Wing yellowish brown with orange stigma, or wing completely orange. Metasomal tergal discs more densely punctate, with distance between pits usually equal to pit diameter or shorter. Mesepisternum shagreened, smooth on upper third, densely punctured, with distance between pits equal to pit diameter or shorter. Body length 8.5–9.5 mm ..... ***P. eurystylus***
- 4(1). Body length 10–12 mm. Apical plate of S8 cordate (Fig. 25). Most part of wing yellowish brown; stigma usually orange, but sometimes brownish or yellowish; veins pale or yellowish-brown, outlined by brown. T1 glossy, with pits (20–25 μm / 1–3) and punctures); S6 with V-like apical elevation (Fig. 20) ..... ***P. sculpturatus***  
 – Body length 6–9.5 mm. Apical plate of S8 not cordate ..... 5
- 5(4). Body size 8.5–9.5 mm. Labral plate widely rounded, twice wider than long. Wing yellowish brown with orange stigma, or completely orange. Apical elevation of S6 with two pairs of small lobes: lateral rounded and medial finger-like (Fig. 2). Apical plate of S8 hexagonal and with distal margin straight (Fig. 7) ..... ***P. eurystylus***  
 – Body length 6–7 mm. Labral plate 1.3–1.5 times wider than long, apically narrowed and rounded. Wing brown with stigma pale brown or (rarely) orange. Apical elevation of S6 with a pair of wide, almost angular lobes and one short median tooth (Figs 12). Apical plate of S8 subtriangular and with distal margin widely rounded (Figs 16–18) ..... ***P. punctiventris***

1. ***Panurginus eurystylus*** (Patiny, 2002)  
 (Figs 1–8)

*Clavipanurgus eurystylus* Patiny, 2002: 1263–1266 (male).

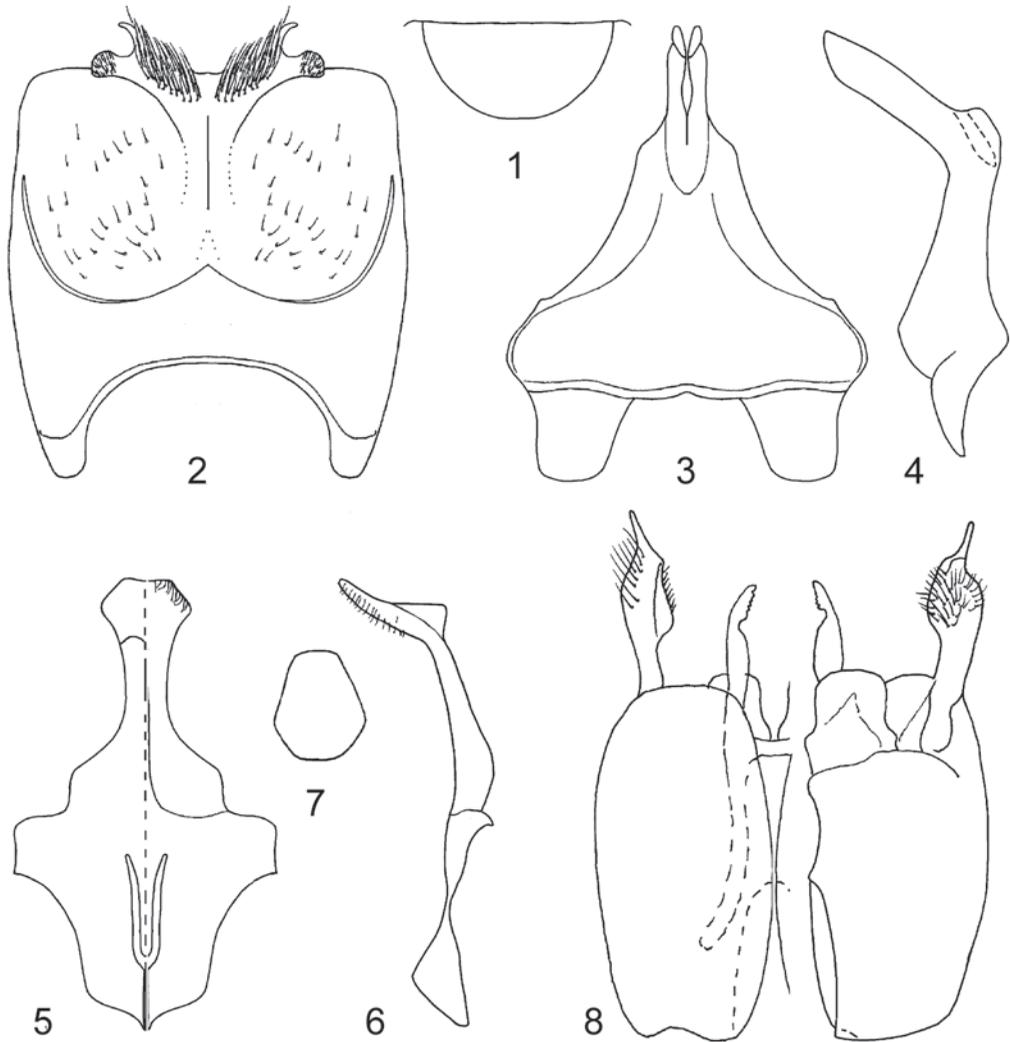
*Clavipanurgus eurystylus*: Patiny, 2003: 230–234.

*Material examined. Azerbaijan:* Talysh, Lerik, 6–7 June 1967, 22 females, 7 males, AO; Kosmolyan, 7 June 1967, 6 females, AO; “Diabarskaya Kotlovina”, 8 June 1967, 10 females, AO; Xankandi [Stepanakert], 16 June 1967, 1 male, AO; Margushevan, near Terter, 4 and 11 May 1935, 7 females, 2 males, Veltishchev (Patiny det.); same locality, 27 June 1935, 4 females, Veltishchev (Patiny det.); Mardakert, Lenina- van, 16 May 1979, 1 male, Ch. Aliev (ZMMU).

*Diagnosis.* *Panurginus eurystylus* distinguished from other congeners from Transcaucasus by relatively large body (8.5–9.5 mm) with dense, deep and round pits; yellowish brown wings with orange stigma; and hind median area of male S6 with a pair of wide, well-sclerotized and apically bulbous lateral branches bent downwards, and with a pair of shorter, narrow, pale and pointed medial appendages directed partly backwards / partly laterally.

*Description. Male.* Body 8.5–9.5 mm in length, shiny, with dense, deep, round pits and pubescence usual. Clypeus yellow with black lateral parts; tarsi yellow with TM2–TM5 darkened; wing yellowish brown with fumigate membranes and orange stigma.

Head trapezoid, transverse (0.79–0.85 as long as wide); temples long, polished, widely impunctate; vertex well visible in frontal view, with strongly developed posterolateral angles. Vertex, frons, and upper half of paraocular area with merged, deep, round pits (20–25 μm / 0.2–1). Lower half of paraocular area glossy, distance between pits about a pit diameter, narrowly impunctate along clypeus. Supraclypeal and subantennal areas glossy, sparsely punctate (10–20 μm / 2 or more). Antenna short, reaching tegula; flagellum beneath brownish (starting from F3); pedicel transverse; F1 as long as F2 and F3 together; F2 and F3 transverse (F2 shorter than F3); F4 and F5 as long as wide; other flagellomeres



**Figs 1–8.** *Panurginus eurystylus*; male. **1** – labral plate; **2** – S6, ventral view; **3** – S7, ventral view; **4** – S7, lateral view; **5** – S8, dorsal (left) and ventral (right) views; **6** – S8, lateral view; **7** – apical plate of S8, posterior view; **8** – genitalia, dorsal (left) and ventral (right) views.

slightly longer than wide. Clypeus smooth, with round basal margin and dense pits (10–25  $\mu\text{m}$  / 1–3); middle part of clypeus impunctate or with more sparse pits. Labral plate widely rounded, twice wider than long, glossy, depressed medially (Fig. 1). Facial fovea short, well defined, matt, wider than distance to eye, parallel-sided. Genal area 0.8–0.9 times as wide as eye, parallel-sided on upper quarter, glossy, with deep,

round pits and pores (20–30  $\mu\text{m}$ ); pits along eye smaller and denser (10–15  $\mu\text{m}$ ).

Mesosoma with scutum moderately shiny, smooth, with deep, round large and small pits sparser in middle part (15–30  $\mu\text{m}$  / 0.2–2). Scutellum smooth, with confluent pits (15–30  $\mu\text{m}$ ). Metanotum with merged pits. Propodeum laterally shagreened, with shallow pits; distance between pits equal to pit diameter; horizontal part of propo-

deal triangle rugose, its vertical part finely shagreened. Mesepisternum shiny, smooth with large, deep, round pits (20–30  $\mu\text{m}$ ); distance between pits equal to pit diameter or longer. Middle basitarsus about 3.5 times as long as wide, enlarged towards apex; middle TM2 and TM3 elongate; middle TM4 as long as wide; hind basitarsus 3 times as long as wide, slightly narrowed proximally; other hind tarsal segments as long as wide (hind TM3 and TM4 cordate).

Metasomal terga shiny, anteriorly flat, shagreened, with pits denser and smaller than on disc (pit diameter 10–15  $\mu\text{m}$ ); posterior half of discs swelled, smooth, with round deep pits (15–25  $\mu\text{m}$  / 0.5–1.5); distance between pits usually shorter than pit diameter; premarginal lines abrupt; marginal zones glossy, delicately tessellate, translucent, brownish; their length on T1 about one third, on T2 and T3 about half, and on T4 about two thirds of discal length; T1 with median, arrow-like, transverse ridge between smooth, shiny, anterior vertical surface and disc; disc with dense, round pits (10–20  $\mu\text{m}$ ), distance between pits shorter than pit diameter. Terga with lateral tufts of long, white hairs; discs with short, erect, brownish hairs (visible from side).

Metasomal sterna and genitalia (Figs 2–8). Sterna shiny, with dense to confluent shallow pits and pale marginal zone. S4 with long hairs, laterally longer. S6 slightly transverse (0.85 as long as wide), with widely rounded postero-lateral margins; apical elevated structure with narrow, saddle-like depression between lateral projections; each of these projections consist of ventrally bent, wide, strongly sclerotized and apically bulbous ventral branch, and shorter, laterally bent, narrow, pale, pointed appendage; central depression large, wing-like, with dense, short bristles. S7 with two dark apical appendages bent ventrally at 45°, deeply divided, parallel, enlarged dorsoventrally, pointed apically. Neck of S8 ventrally with dark median keel; lateral flaps short, equal to 0.25 length of neck; apical plate bent ventrally, hexagonal, with

longitudinal depression and swelled, round basal angles. Genitalia well sclerotized; gonocoxites without apical emargination; gonostylus proximally narrowed, strongly angled and swelled in middle part, distally narrowed to pointed protrusion; penis valve with proximal part swelled medially, distal part bent ventrally, enlarged, axe-like with medial margin having 7–9 teeth; each tooth with a short apical bristle.

*Female* (nova). Body 8.5–9.5 mm in length, shiny, densely sculptured, with usual pubescence. Antennal flagellum beneath yellowish-brown, wing yellowish brown with fumigate membranes and orange stigma; legs dark with spurs and TM2–TM5 dark-yellow.

Head trapezoid, transverse (0.80–0.88 as long as wide), vertex visible in frontal view. Pedicel as long as wide; F1 elongate, slightly shorter than F2 and F3 together, F2–F5 transverse, F4 and F5 longer than F2 and F3. Vertex, frons, and upper half of paraocular area with merged, deep, round pits (15–25  $\mu\text{m}$  / 0.2–1). Clypeus glossy, with large, round pits (20–40  $\mu\text{m}$  / 1–3) medially widely spaced, laterally dense to confluent. Supraclypeal and subantennal areas glossy, with widely spaced pits (ca 20  $\mu\text{m}$  / 2–4 or more). Labral plate narrowed apically, with rounded distal edge. Facial fovea matt, slightly enlarged towards upper end; upper end as wide as distance to eye; lower end closer to eye. Mandible with red apical tooth. Genal area slightly wider than eye (1.2 times as wide as eye), parallel-sided on upper half, glossy, with dense pits and pores (15–25  $\mu\text{m}$  / 0.5–1), scattered at eye; temple glossy, impunctate.

Mesosoma with scutum and scutellum moderately shiny, smooth, with large and small round pits (10–30  $\mu\text{m}$  / 1–2) denser on periphery. Metanotum smooth, with distance between pits equal to pit diameter. Mesepisternum bulging, shagreened, smoother on upper one-thirds, with round pits and pores deeper on upper half (15–25  $\mu\text{m}$  / 0.5–2), distance between pits usually equal to pit diameter or shorter. Pro-

podeum laterally tessellate, with shallow pits (15–20  $\mu\text{m}$  / 1–2); propodeal triangle on horizontal part with fine wrinkles, on vertical part matt and shagreened. Middle basitarsus 3 times, and hind 4 times longer than wide, tarsal segments elongate.

Metasomal terga shiny, with anterior part non-swelled, shagreened, disc swelled and smooth, premarginal line abrupt, marginal zone glossy, tessellate, brown; terga basally and on premarginal line with pits smaller and denser (10–15  $\mu\text{m}$  / 0.5–1); swelled part of disc with larger and sparser pits (15–25  $\mu\text{m}$  / 0.5–2); each other metasomal tergum with more widely extended pits than on previous one. T1 between anterior vertical part and disc with transversal ridge (similar to male); sometimes punctured slightly sparser than following terga (1–3). Marginal zone on T1 and T2 about half, T3 half – three-quarters, T4 about three-quarters discal length. Pygidial plate black, matt, on base transversally wrinkled. Pygidial and prepygidial fimbriae yellowish.

Metasomal sterna shagreened, with dense, shallow pores; hairs long, white, plumose, on S4 and S5 denser.

*Distribution.* Georgia, \*Azerbaijan.

*Note.* This species was described as a representative of the genus *Clavipanurgus* based solely on a male from Georgia; female was unknown (Patiny, 2002). In our research, 60 specimens were identified as *P. eurystylus* based on the original description and illustrations by Patiny (2002). Illustrated descriptions of both male and female of *P. eurystylus* are given below based on the new material studied. Our studies reveal this species from another country of Transcaucasus, Azerbaijan; probably, *P. eurystylus* is widely distributed in this region, where it is active from the beginning of May to the middle of June.

## 2. *Panurginus punctiventris*

F. Morawitz, 1876  
(Figs 9–19)

*Panurginus punctiventris* F. Morawitz, 1876: 58, female.

*Panurginus punctiventris*: Friese, 1897: 28, 1901: 10, 12, 21.

*Panurgus (Clavipanurgus) punctiventris*: Warncke, 1972: 101; 1987: 97, 98.

*Clavipanurgus punctiventris*: Patiny, 2001: 150, 190, 191; 2003: 230–234.

*Lectotype* (designated here). Female; **Armenia**, Alexandropol, F. Morawitz's collection ("Alexandropol" and "*punctiventris* Mor. Typ." by F. Morawitz's hand).

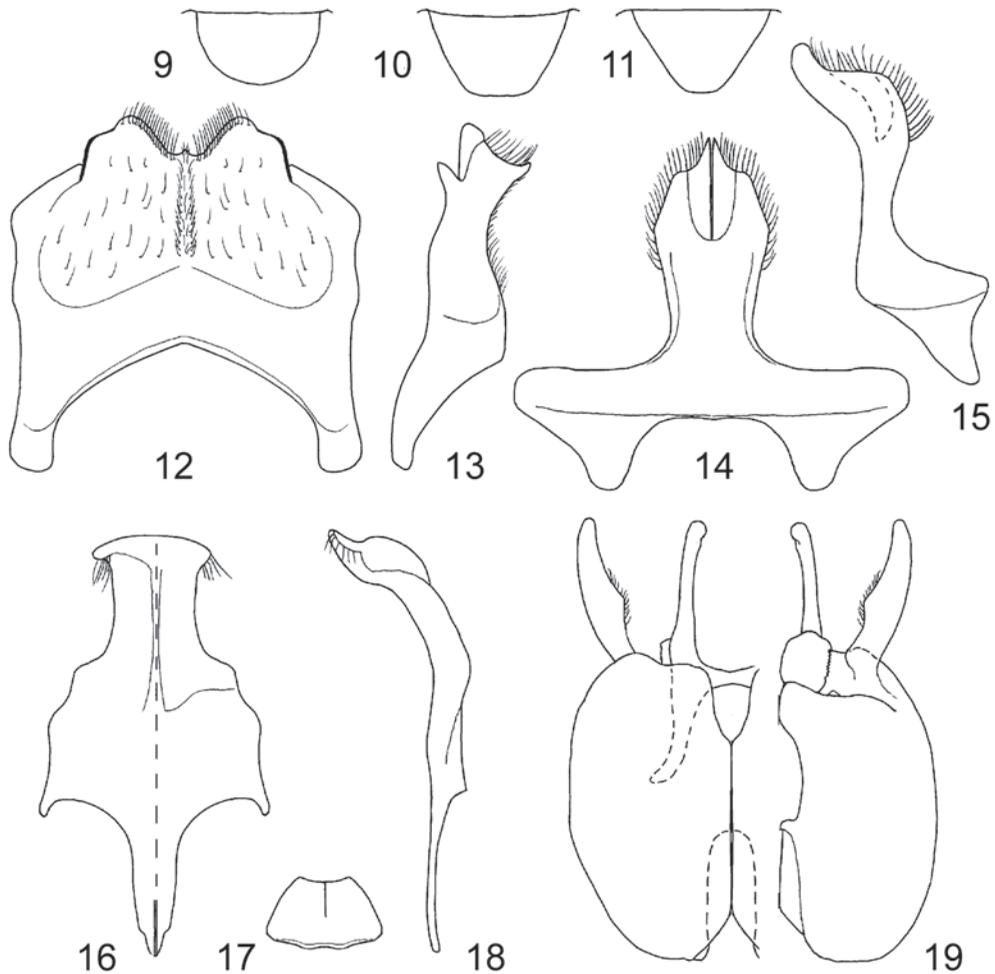
*Paralectotype*. Female (lack of metasoma), same data as for lectotype.

*Other material examined* (17 females, 94 males). **Armenia**: Helenovka [Sevan Vill.], F. Morawitz's collection (gold circle; F. Morawitz's handwriting: "Helenovka", "*punctiventris* Mor. Typ."), 1 female, 1 male; same locality, F. Morawitz's collection, 1 female, 6 male; Echmiadzin [Vagharshapat], 14 May 1901, 3 males, N. Bryanskiy (Wollmann det.); Yerevan, Botanical Garden, 39°52'42"N, 45°25'42"E, 6395 ft, 16 May 1971, 2 males, V. Tobias; Semenovka, 18 June 1909, 1 female, 1 male, N. Bryanskiy (Wollmann det.). **Georgia**: Tiflis [Tbilisi], F. Morawitz's collection, 1 female, 1 male; Tbilisi, 5–10 May 1958, 9 males, V. Zaytzev (Patiny det.); Bogdanovka, 28 June 1967, 11 females, 22 males, AO; Kodjori, 25 May 1967, 32 males, AO; Zekarskiy Perval, 42°32'59"N, 43°57'32"E, 3170 m, dry hill, Compositae [Asteraceae], 1 July 1967, 2 females, 12 males, AO. **Azerbaijan**: Talysh, Lerik, 4–7 June 1967, 4 males, AO; Zuvand, 20 June 1936, 1 male, K. Arnoldi (V. Popov det., 1936).

*Diagnosis.* *Panurginus punctiventris* resembles *P. eurystylus* in punctuation pattern, but the former has a smaller body (its length 8–9 mm), sparser pits on the metasomal terga, more dark wings, and dissimilar male pregenital sterna and genitalia.

*Description.* *Female* (lectotype). Body 9 mm in length, shiny, densely sculptured, on head and mesosoma coarser; pubescence usual. Antennal flagellum brown, beneath lighter; wing yellowish brown with fumigate membranes and orange stigma; legs dark with spurs and TM2–TM5 dark yellow.

Head transverse (0.83 as long as wide), narrower than mesosoma; vertex visible in frontal view; temple long, glossy, impunctate near eye. Pedicel round, as wide as long; F1 elongate, slightly shorter than F2 and F3 together, F2–F5 transverse, other



**Figs 9–19.** *Panurginus punctiventris*; male. 9–11 – labral plate; 12 – S6, ventral view; 13 – S6, lateral view; 14 – S7, ventral view; 15 – S7, lateral view; 16 – S8, dorsal (left) and ventral (right) views; 17 – apical plate of S8, posterior view; 18 – S8, lateral view; 19 – genitalia, dorsal (left) and ventral (right) views.

flagellomeres (excluding the apical one) as long as wide. Vertex, frons, and upper half of paraocular area smooth, with deep, round pits dense to merged (15–25  $\mu\text{m}$  / 0.2–1.5). Paraocular area on lower half glossy, with sparse and large pit (20–30  $\mu\text{m}$  / 1–3). Clypeus glossy, with large, deep pits on disc more distant, laterally merged (25–30  $\mu\text{m}$  / 0.5–2), medially impunctate. Supraclypeal and subantennal areas glossy, with sparse, small pits (15–20  $\mu\text{m}$  / 1–4); subantennal area similar to allied paraocular surface. La-

brum with basal plate trapezoid, basally 4 times as long as distal margin, transversally depressed, with dense punctures and a central pit. Facial fovea deep, enlarged towards apex; apically over 2 times width of lower end, rounded, as wide as distance to eye; lower end wider than distance to eye. Genal area 1.25 times as wide as eye, on upper 2/3 parallel-sided, glossy, with dense, round pits, distance between pits about a pit diameter, below sparser (15–25  $\mu\text{m}$  / 0.5–1.5, below 1–3).

Mesosoma with scutum and scutellum glossy, with deep, round pits (15–25  $\mu\text{m}$  / 0.5–2), distance between pits usually about a pit diameter; on periphery with confluent pits. Metanotum smooth, with confluent, round pits. Propodeum laterally shagreened, with deep pits (20  $\mu\text{m}$  / 1–3); propodeal triangle with horizontal part slightly depressed, with mostly radiant, fine wrinkles; its vertical part more shiny, delicately shagreened. Mesepisternum bulging, glossy, with deep pits (15–25  $\mu\text{m}$ ), distance between pits equal to 1–2 pit diameter, on upper quarter denser punctured. Middle basitarsus 3.5 times, hind 4 times longer than wide.

Metasomal terga shiny, with posterior half of discs swelled, smooth; non-swelled part of discs shagreened; premarginal lines abrupt, marginal zones depressed, brown, shiny, delicately tessellate, impunctate; their length on T1 and T2 about half and on T3 and T4 about two-thirds of discal length. T1 disc with round pits (15–20  $\mu\text{m}$  / 1–2); basally and on premarginal line with smaller pits and punctures (5–10  $\mu\text{m}$ ). T2–T4 discs with deep pits (15–20  $\mu\text{m}$  / 1–2), basally smaller (10  $\mu\text{m}$ ). Pygidial plate transversally wrinkled, black. Pygidial and prepygidial fimbriae white, basally yellowish.

Metasomal sterna sparsely pubescent, tessellate, with dense, small pores; S5 posterior margin with long, plumose, white hairs, on S4 such hairs are only laterally.

*Male.* Body 6–7 mm in length, shiny, with dense and deep sculpture, and with usual pubescence; integument is yellow on clypeus (except black distal margin and lateral angles), fore tarsi, spurs and tibiae inside, middle tarsi, hind tibiae on basal 0.4 of length, basitarsi; other tarsal segments brown; wing brown with fumigate membranes and brownish-yellow stigma.

Head trapezoid, transverse (0.8 as long as wide), as wide as, or narrower than mesosoma; vertex well visible in frontal view, with strongly developed postero-lateral angles. Antenna attaining tegula; pedicel slightly transverse; F1 elongate, slightly

shorter than F2 and F3 together; F2 and F3 short, transverse, F2 shorter than F3; other flagellomeres as long as wide or slightly longer. Vertex, frons, and upper half of paracocular area with merged, deep, round pits (20–25  $\mu\text{m}$  / 0.2–1). Lower half of paracocular area glossy, distance between pits equal to 1–2 pit diameter, along clypeus narrowly impunctate. Supraclypeal and subantennal areas glossy, sparsely punctate (10–15  $\mu\text{m}$  / 2–4). Clypeus smooth, with basal margin rounded, and with large, round pits (20–25  $\mu\text{m}$  / 0.5–2); distance between pits equal to 1–2 pit diameters in middle part of clypeus and shorter than a pit diameter in lateral one. Labral basal plate 1.3–1.5 times wider than long, apically narrowed and rounded (Figs 9–11), glossy, with a central depression. Facial fovea flat, matt, short, as wide as or slightly wider than distance to eye. Genal area slightly narrower than eye, on upper 1/4 parallel-sided, with deep pits merged to confluent (10–20  $\mu\text{m}$  / 0.2–1).

Mesosomal scutum and scutellum glossy, with deep and round pits (10–25  $\mu\text{m}$  / 0.5–3), and denser punctured on periphery; distance between pits usually about a pit diameter. Metanotum with merged, deep, round pits. Propodeum laterally shagreened, with shallow and pits (ca 20  $\mu\text{m}$ ); distance between pits usually about a pit diameter, but longer in lower part of propodeum; propodeal triangle with horizontal part finely wrinkled and vertical part shagreened. Mesepisternum glossy, with deep, round pits (15–25  $\mu\text{m}$  / 0.5–2); distance between pits about a pit diameter, but shorter in lower part of mesepisternum. Fore tarsal segments longer than wide; basitarsus longer than other segments together. Middle tarsal segments longer than wide; basitarsus 4.5 times longer than wide, as long as other segments together. Hind tarsal segments longer than wide; basitarsus slightly swelled, suboval, 3 times as long as wide.

Metasomal terga glossy, with dense to merged, deep pits of different sizes, dominantly large (10–25  $\mu\text{m}$  / 0.5–2); tergal discs basally non-swelled, shagreened, with

pits smaller and denser (10–15  $\mu\text{m}$  / 0.5–1); marginal zones brown, delicately tessellate or smooth; their length on T1 about one third, on T2 about half, and on T4 about two thirds of discal length; premarginal lines abrupt; tergal disc laterally and pre-marginal line with long, extended hairs. T1 with basal, longitudinal groove, which ends with short, transverse, arrow-like ridge.

Metasomal sterna and genitalia (Figs 12–19). Metasomal sterna moderately shiny, with pores (distance between pores equal to one or a few their diameters) and narrow pale marginal zone. S3–S5 with straight posterior margin, and discal pubescence short and extended. Posterolateral margins of S6 rounded; posterior margin with one short median tooth and a pair of wide lobes; these lobes elevated, subtriangular, directed ventroposteriorly, and laterally sclerotized (dark); internal surface of these lobes with dense hair brush; sternal disc with dense, short pubescence. Anterior part of S7 short, wide, 3 times as wide as basal part of neck; neck short, distally enlarged in shape of polygonal plate, with two beak-like projections which bent ventrally and narrowing towards rounded apex; enlarged part of neck dorsally with dense, extended hairs. Apical plate of S8 as wide as long, strongly sclerotized, dark, bent posterovertrally 60° to neck, widely rounded apically, ventrally pubescent; basal hill of this plate rounded, with median groove. Gonocoxite dark, without apical excavation. Gonostylus yellow, relatively narrow, distally narrowly rounded, with ventral bump at middle and short and narrow proximal part, and with short, extended dorsal and lateral hairs. Penis valve basally parallel-sided, with internal bump at middle, apical axe-like widening having teeth on medial margin; each tooth with short apical bristle.

**Distribution.** Israel (Bodenheimer, 1937), Turkey (Warncke, 1972), \*Georgia, Armenia (Morawitz, 1876), \*Azerbaijan.

**Note.** F. Morawitz described this species based on females (syntypes) collected in Alexandropol. There are two syntypes in the

Zoological Institute of RAS. One of them, which is in better condition, is here designated as the lectotype. In the same collection, F. Morawitz marked also a male and a female from “Helenowka” by a gold paper circle (these circles were used in this collection for type series) and label “*punctiventris* Mor. Typ.”. Due to the International Code of Zoological Nomenclature, the latter specimens cannot be qualified as types. Our study of the specimens showed that the females from Alexandropol and the specimens from the other localities have some morphological differences (Table 1). However, these differences are insignificant and allow us to determinate all these specimens as the same species. So, *P. punctiventris* is indicated for Georgia and Azerbaijan for the first time.

### 3. *Panurginus sculpturatus*

F. Morawitz, 1872

(Figs 20–27)

*Panurginus sculpturatus* F. Morawitz, 1872: 60, male.

*Panurginus sculpturatus*: Friese, 1897: 11, 25; 1901: 23, male, female.

*Panurginus sculpturatus*: Osytsnjuk, 1977: 299; 1978: 369.

*Panurgus (Clavipanurgus) sculpturatus*: Warncke, 1972: 101; 1987: 97, 98.

*Clavipanurgus sculpturatus*: Patiny, 2002: 1263–1266; 2003: 230–234.

**Holotype.** Male; **Russia**, Saratov, F. Morawitz's collection [“Typus” in print; “Saratov” and “*Panurginus sculpturatus* F. Morawitz” by F. Morawitz's hand].

**Other material examined** (65 females, 16 males). **Ukraine:** Crimea, vicinity of Znamenskoe, Denuzlav Lake, on *Sisymbrium orientale*, 12 June 1964, 51 females, 2 males, AO (IZAN); Crimea, Tarkhankut [Tarhan Qut], 16 May 1998, 1 male, A. Ivanov; Odessa Prov., Tuzly, on Cruciferae [Brassicaceae], 22 May 1951, 1 male, V. Dolin; Pavlovka, 22 May 1951, 1 female, G. Protopopova; Lugansk Prov., Kruzhilovka, 6 June 1952, 1 male, G. Medvedev (IZAN); Donetsk Prov., Khomutovskaya Steppe Nature Reserve, coll. AO (IZAN): on *Ranunculus repens*, 17 May 1962, 2 males; on *Veronica austriaca*, 19 and 22

**Table 1.** Differences between females of *P. punctiventris* and *P. eurystylus*.

Characters	Lectotype and paralectotype of <i>P. punctiventris</i>	Other specimens of <i>P. punctiventris</i>	<i>P. eurystylus</i>
Facial foveae	5 times longer than wide. Upper part 2 times wider than lower part	7–9 times longer than wide. Upper part 1.5 times wider than lower part	Length 7–9 width. Upper part more than 2 times wider than lower part
Usual diameter of pit on scutum in $\mu\text{m}$ (its variability)	25 (15–30)	15–20 (10–30)	15–20 (10–30)
Mesepisternum	Usual distance between pits equal to 1–2 pit diameters, on upper quarter shorter (15–25 $\mu\text{m}$ / 1–3)  Completely smooth and glossy	Usual distance between pits equal to pit diameter or shorter (15–25 $\mu\text{m}$ / 0.5–2).  Shagreened, on upper third often smooth and matt	Usual distance between pits equal to pit diameter or shorter (15–25 $\mu\text{m}$ / 0.5–2).  Shagreened, on upper third smooth: matt or sometimes glossy
Distance between pits on T1 disc (in pit diameters)	1–2	1–3	1–2
Distance between pits on T2 and T3 discs (in pit diameters)	1–2	1–4	~1
Body length in mm	9	7–8	8.5–9.5

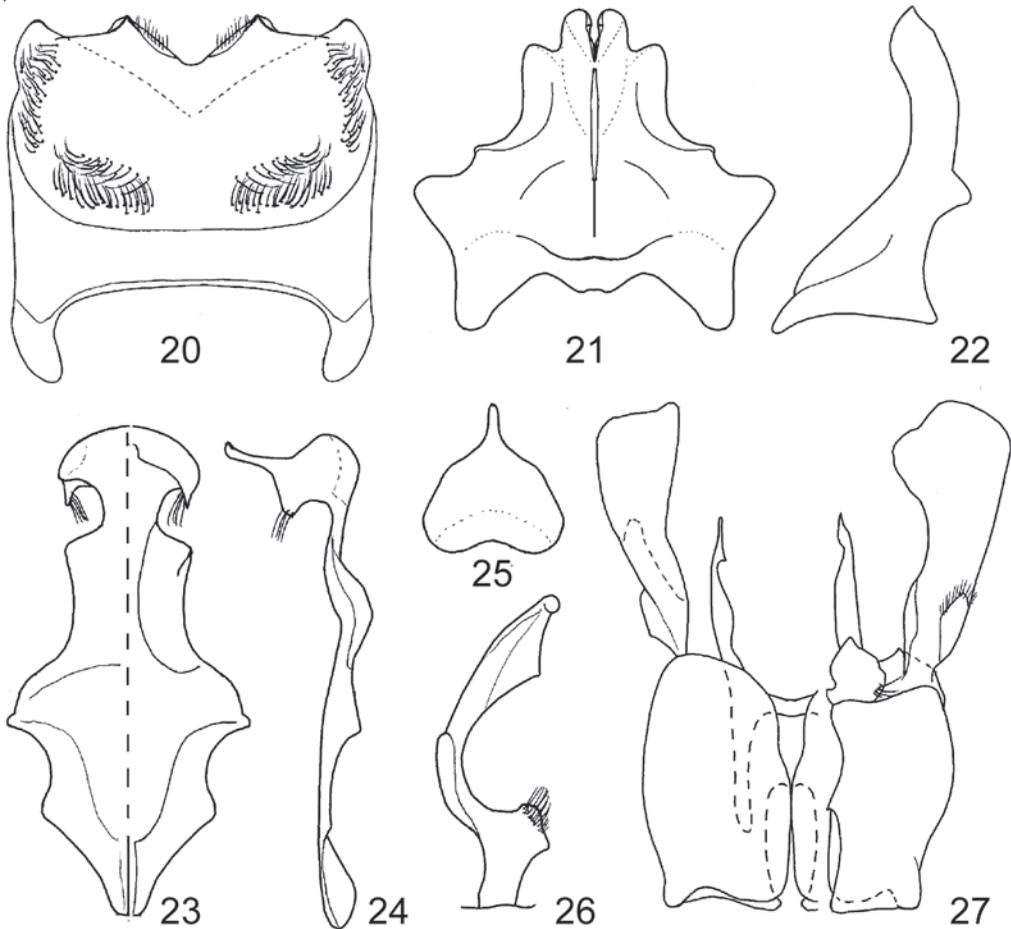
May 1962, 4 males; on *Bunias orientalis*, 24 and 29 May as well as 9 June 1962, 4 females; on *Sinapis arvensis*, 30 May 1968, 1 male; on *Vicia tenifolia*, 3 June 1968 and 8 June 1976, 2 females. **Russia:** Volgograd Prov., Sarepta [near Volgograd], 16 and 23 May 1909, 1 female, 1 male, D. Glasunov; same province, Tinguta, 30 May 1954, 1 female, I. Razumova; Rostov Prov., near Persiyanovka, 16 June 1971, 1 female, Yu. Pesenko.

**Diagnosis.** *Panurginus sculpturatus* differs from the previous species by its larger body size, cordate apical plate of S8, and long, distally enlarged gonostyli.

**Description.** Male. Body 10–12 mm in length, shiny, densely sculptured and with usual pubescence. Clypeus yellow, with apical and lateral margins black; wings yellowish-brown with fumigate membranes, orange stigma (sometimes brownish or yellowish) and veins light yellowish-brown, outlined by brown; fore tibia anteriorly and tarsus yellow (TM2–TM4 sometimes reddish-yellow); middle basitarsus dark

yellow; middle TM2–TM5 yellow or reddish-yellow; hind legs dark (TM3–TM5 sometimes reddish).

Head trapezoid, transverse (0.8–0.9 as long as wide), as wide as mesosoma; vertex with strongly developed posterolateral angles well visible in frontal view. Vertex, paraocular and genal areas smooth, with dense, deep, round pits (15–25  $\mu\text{m}$  / 0.2–1.5) and punctures. Supraclypeal area glossy, widely impunctate in middle part. Subantennal area glossy, with sparse pits (10–15  $\mu\text{m}$  / 2 and more). Labral plate trapezoid, depressed and glossy, with straight distal margin equal to half of width of this plate in base. Pedicel transverse; F1 slightly shorter than F2 and F3 together; F2 and F3 equal in length, as long as wide or slightly transverse; other flagellomeres elongate. Clypeus basally strongly outcurved, moderately shiny, smooth, sparsely punctured (10–20  $\mu\text{m}$  / 1–3), widely impunctate at middle of apical part. Facial fovea very



**Figs 20–27.** *Panurginus sculpturatus*; male. **20** – S6, ventral view; **21** – S7, ventral view; **22** – S7, lateral view; **23** – S8, dorsal (left) and ventral (right) views; **24** – S8, lateral view; **25** – apical plate of S8, posterior view; **26** – gonostylus, lateral view; **27** – genitalia, dorsal (left) and ventral (right) views.

short, matt, wide, with upper part 3 times as wide as lower part. Genal area as wide as eye, parallel-sided on upper quarter; with pits from dense to confluent ( $15\text{--}25\ \mu\text{m} / 0.5\text{--}1$ ); temple usually widely impunctate.

Mesosomal scutum and scutellum glossy, with moderately dense, deep, round pits ( $10\text{--}30\ \mu\text{m} / 0.5\text{--}2.0$ ); metanotum punctured denser ( $0.2\text{--}0.5$ ). Mesepisternum glossy, with deep, round pits ( $15\text{--}30\ \mu\text{m} / 0.5\text{--}3$ ) and punctures ( $4\text{--}7\ \mu\text{m}$ ). Propodeum laterally shagreened, with deep, round pits, distance between pits shorter than pit diameter; lateral corners bulging and shiny;

propodeal triangle with horizontal part rugose and vertical part finely wrinkled. Fore basitarsus long, 4.5 times as long as wide, distally enlarged and flattened; TM2 wider than long, with inner angle pulled out; TM3 and TM4 slightly elongate; all tarsomeres cordate. Middle basitarsus elongate, 5 times as long as wide, dorsally rectangular; proximal half dorso-ventrally widened; TM2–TM4 slightly elongate, cordate. Hind basitarsus 4.5 times as long as wide, TM2 and TM4 as long as wide, TM3 elongate.

Metasomal terga glossy, on disc with punctures and deep pits ( $15\text{--}25\ \mu\text{m} / 0.5\text{--}$

2); distance between pits usually about pit diameter or shorter; pregradular areas with pits smaller and merged ( $10\text{--}15\ \mu\text{m} / 0.2\text{--}1$ ); marginal zones strongly depressed, brown, glossy, impunctate; their length on T1 about half or less and on T2–T4 about two-thirds of discal length. T1 between vertical (anterior) and discal surfaces with short angled ridge. T1–T5 discs with tiny, short, erect white hairs, laterally with long hair tufts. T6 and T7 with long fimbria basally yellowish or brownish and apically white.

Metasomal sterna and genitalia (Figs 20–27). Metasomal sterna shiny, medially impunctate, laterally with dense, tiny, hair pores ( $5\ \mu\text{m}$ ); S1 and S2 with long, recumbent, white hairs; S3–S5 discs laterally with dense, long hair tufts. S4–S6 medially with shiny, impunctate depression. S6 apically with plate curved ventrally and having short hair brush posteriorly; disc with lateral, oblong hair tuft not overlapping sternal margin. S7 posterior margin with a pair median, parallel, long, laterally flattened processes bent ventrally (this curvature distinctly visible only from side). S8 wide, with neck wider than long; apical plate bent ventrally at  $90^\circ$ , cordate in posterior view, with narrowly pulled, pointed apex; lateral angles (directed anteriorly) with apical hair tuft; basal hill widely rounded in profile. Gonostylus 3 times as long as its distal width, longer than gonocoxite, enlarged towards apex, apically swelled, ventrobasally with short, trapezoid process apically pubescent (this pubescence clearly visible in profile). Penis valve short, equal to about half of gonostylus in length, on most part of length parallel-sided, with apex small, narrow, axe-like, and bent ventrally at  $45^\circ$ .

Female. Body 11–12 mm in length, shiny, densely sculptured and with usual pubescence. Wings yellowish-brown with orange stigma and veins warm-yellow, outlined by brown; TM2–TM5, claws and spurs reddish-yellow, on hind legs darkened.

Head trapezoid, transverse ( $0.88\text{--}0.9$  as long as wide), narrower than mesosoma, with strongly developed posterolateral an-

gles, vertex well visible in frontal view. Vertex, frons, and upper part of paraocular area shiny, smooth, with merged, deep, round pits ( $15\text{--}25\ \mu\text{m} / 0.2\text{--}1.5$ ) and punctures; paraocular area below with wider interspaces (1–4); temple with sparse punctures. Clypeus basally strongly outcurved, glossy, with small and large pits ( $10\text{--}40\ \mu\text{m} / 1\text{--}3$ ), on disc often widely impunctate. Supraclypeal area widely impunctate in middle part; subantennal space with pits from dense to merged ( $10\text{--}15\ \mu\text{m} / 0.5\text{--}1$ ). Pedicel transverse; F1 narrow, long, as long as F2 and F3 together; F2 as long as wide; F3 short, transverse; other flagellomeres as long as wide or slightly transverse. Facial fovea on lower two-thirds parallel-sided; upper part turned from eye, enlarged, wider than distance from fovea to eye; lower part 3–4 times wider than this distance. Genal area 1.2 times as wide as eye, glossy, with deep, round pits ( $10\text{--}20\ \mu\text{m} / 0.5\text{--}2$ , below 3–4); distance between pit usually equal to pit diameter or shorter (longer on lower part of genal area).

Mesosomal scutum glossy, with deep, round pits ( $15\text{--}30\ \mu\text{m} / 0.5\text{--}5$ ) and often with punctures between them; distance between pits usually equal to pit diameter or longer; scutum on periphery denser punctured; scutellum dense punctured ( $0.5\text{--}1.5$ ). Metanotum with deep, round pits from dense to confluent. Mesepisternum and propodeum sculptured like in male. Middle basitarsus wide, short, 2.5 times as long as wide; mediotarsi slightly elongate. Hind basitarsus 4 times as long as wide; TM2 and TM3 slightly longer than wide; TM4 as long as wide.

Metasomal terga shiny, on disc delicately tessellate or smooth, with deep pits; distance between pits longer than pit diameter; marginal zones strongly depressed, translucent, brown, slightly tessellate, impunctate; their length on T1 about one third and on T2–T4 one third or two thirds of discal length. Transverse ridge of T1 between vertical (anterior) and discal surfaces longer than in male; T1 glossy, with small and

large pits (5–10, 20–25  $\mu\text{m}$  / 1–3); T2–T4 discs smooth or delicately tessellate, with deep, small and large pits (5–10  $\mu\text{m}$  and 20–30  $\mu\text{m}$  / 1–4); basal groove and pre-marginal line with smaller, round, deep, merged pits (10  $\mu\text{m}$  / less 0.5). Pygidial plate transversally wrinkled, black or reddish-brown; pygidial and prepygidial fimbriae yellowish, basally darkened. Metasomal sterna matt, shagreened, with pores dense to confluent, S6 anteriorly impunctate; laterally and posteriorly with long, thin hairs; S5 with dense, long hair fringe.

**Distribution.** Europe from Greece to Ural Mountains, Asia Minor (Warncke, 1972; Osytsnjuk, 1977).

**Bionomy.** Xerophilic, oligotrophic on Brassicaceae (Osytsnjuk, 1977).

#### ACKNOWLEDGEMENTS

We would like to thank the following persons: S.V. Kononova (I.I. Schmalhausen Institute of Zoology, Kiev), D.C. Currie, D.C. Darling and B. Hubley (Royal Ontario Museum, Toronto) for their help and care; V.G. Radchenko, Z.S. Gershenzon (I.I. Schmalhausen Institute of Zoology, Kiev) and A.V. Antropov (Zoological Museum of Moscow University) for making collections in their charge available for our study; S. Patiny (Gembloux Agro-Bio Tech, Belgium) for providing us with his reprints. We are also grateful to M. Rightmyer (San Diego Natural History Museum, California) and two anonymous reviewers, who kindly found time for reading the manuscript and made their valuable comments. This work has been supported by a grant of the Russian Foundation for Basic Research (project No. 10-04-00265).

#### REFERENCES

- Bodenheimer F.S.** 1937. Prodrum Faunae Palaestinae. *Memoires de l'institut d'Egypte*, **33**: 1–286.
- Friese H.** 1897. Monographie der Bienengattung Panurginus (Nyl.) (Palaearktische Formen). *Mitteilungen Schweizerischen entomologischen Gesellschaft*, **10**: 9–34.
- Friese H.** 1901. *Die Bienen Europa's (Apidae europaeae)*. Theil VI. Subfamilien Panurginae, Melittinae, Xylocopinae. Innsbruck: Selbstverlag, Druck C. Lampe. 284 p.
- Michener, Ch.D.** 2000. *The bees of the World*. Baltimore, London: The Johns Hopkins University Press. xiv+913 p.
- Michener, Ch.D.** 2007. *The bees of the World* [second edition]. Baltimore: The Johns Hopkins University Press. xvi+953 p.
- Morawitz F.F.** 1872. Neue suedrussische Bienen. *Horae Societatis Entomologicae Rossicae*, **9**(1): 45–62.
- Morawitz F.F.** 1876. Zur Bienenfauna der Caucasusländer. *Horae Societatis Entomologicae Rossicae*, **12**(1): 3–69.
- Nylander W.** 1848. Adnotationes in expositionem monographicam apum borealium. *Notiser ur Sällskapetets pro Fauna et Flora Fennica Förhandlingar*, **1**: 165–272.
- Osytsnjuk H.Z.** 1977. *Fauna Ukrainy*, **12** (5), Apoidea, Andrenidae. Akademiya Nauk Ukrainskoj RSR, Kiev: Naukova Dumka. 328 p. (In Ukrainian).
- Osytsnjuk A.Z.** 1978. Superfamily Apoidea. In: **Medvedev, G.S.** (Ed.). *Opredelitel' nashekomykh evropejskoj chasti SSSR* [Key to the Insects of the European Part of the USSR], **3**(1): 279–519. Leningrad: Nauka. (In Russian).
- Patiny S.** 2001. *Monographie des Panurginae de l'ancien monde (Hymenoptera: Apoidea, Andrenidae)*. Thèse de doctorat (PhD), Faculte universitaire des Sciences agronomiques de Gembloux.
- Patiny S.** 2002. A new *Clavipanurgus* (Andrenidae, Panurginae) species from Georgia, *Clavipanurgus eurystylus* sp.n. *Linzer biologische Beiträge*, **34**(2): 1263–1266.
- Patiny S.** 2003. Phylogénie des espèces *Clavipanurgus* Warncke, 1972 (Hymenoptera, Apoidea: Andrenidae). *Annales de la Société entomologique de France (n.s.)*, **39**(3): 229–234.
- Ruz L.** 1986. *Classification and Phylogenetic Relationships of the Panurgine Bees (Hymenoptera-Andrenidae)*. PhD thesis, University of Kansas. 312 p.
- Warncke K.** 1972. Westpaläarktische Bienen der Unterfamilie Panurginae (Hym., Apidae). *Polskie pismo Entomologiczne (Bulletin Entomologique de Pologne)*, **42**(1): 53–108.
- Warncke K.** 1987. Ergänzende Untersuchungen an Bienen der Gattungen *Panurgus* und *Melitturga* / Andreninae, Apidae, vor allem aus dem türkischen Raum. *Bollettino del Museo Civico di Storia Naturale di Venezia*, **36**: 75–107.

Received November 4, 2011 / Accepted May 16, 2012