

## A revision of the Central Asian *Scopaeus similis* species group (Staphylinidae, Paederinae)

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### Abstract

The *Scopaeus similis* species group, distributed in Central Asia and the Middle East, is proposed for *S. ferganensis* sp. n. (Kyrgyzstan, Uzbekistan), *S. gissarensis* sp. n. (Uzbekistan), *S. hieki* sp. n. (Kazakhstan), *S. longilobatus* sp. n. (Kyrgyzstan), *S. triangularis* Luze, 1904 (Kazakhstan, Kyrgyzstan, Tadjikistan, Uzbekistan), and two subspecies of *S. similis* Eppelsheim, 1892, *S. s. similis* (Kazakhstan, Kyrgyzstan, Pakistan, Uzbekistan, Tadjikistan) and *S. s. minor* ssp. n. (Iran, Turkmenistan). It is described including bionomic and biogeographic information, followed by diagnoses of the included species, the distribution patterns of which are discussed and mapped. The *S. similis* species group is proposed a monophyletic clade using apomorphic characters of the primary sexual organs. Its phylogenetic position within *Scopaeus* Erichson, 1839 is discussed as well as the phylogeographic relationships within the species group. New country records are published for *S. s. similis* (Kyrgyzstan, Pakistan), *S. similis* incertae sedis (Afghanistan, India), and *S. triangularis* (Kazakhstan, Kyrgyzstan).

**Keywords** Scopaeina | Tien Shan | Alai-Pamir | taxonomy | phylogeography

### 1. Introduction

*Scopaeus* Erichson, 1839 (Staphylinidae: Paederinae) constitutes a group of predominantly riparian rove beetles, which presently includes 452 valid species worldwide, but a huge number of species still await discovery and scientific description. Our poor knowledge of the worldwide diversity and biogeography of *Scopaeus* is impressively demonstrated by the fact, that about a quarter of the world's valid species was described from the comparatively well studied West Palaearctic (Frisch 2010: 159), 51 of which were added between 1994 and 2012 only in the course of my ongoing revisionary and phylogenetic studies on that genus. While the *Scopaeus* fauna of the Mediterranean and the Middle East must be looked upon as well known, the diversity of that group in Central Asia still remains to be discovered. My studies in the Central Asian mountains in recent years, conducted

in the framework of a cooperation of the Museum für Naturkunde Berlin and the Institute of Biology and Pedology of the Academy of Sciences of the Republic of Kyrgyzstan, clearly point to a rich diversity of *Scopaeus* including many endemics.

The 'oldest' Central Asian *Scopaeus* was described by Eppelsheim (1892: 337) based on specimens collected by Leder in Tashkent and named *S. similis*. A few years later, Luze (1904: 90) added *S. triangularis* from the Seravshan Valley, and Bernhauer (1915: 265) described *S. asiaticus* from Tadjikistan and Turkmenistan. Many decades passed, before Boháč (1988: 441) described *S. likovskyi* from the Alai Mountains and Gusarov (1991, 1992, 1994) added *S. sareptanus* and *S. galinae* from the Central Asian steppe and *S. kabakovi* from Afghanistan and Kashmir. Only recently, I described *S. klapperichi* from the Hindukush (Frisch 2008: 280) and added the steppe species *S. kastcheevi* and *S. turkestanicus*

(Frisch 2012: 289–292) to the Central Asian fauna. Including the widespread West Palaearctic *S. debilis* Hochhuth and the trans-Palaearctic *S. laevigatus* (Gyllenhal), only twelve species of *Scopaeus* were hitherto published for Central Asia.

In this contribution, I define the *S. similis* species group for the ‘old’ species *S. similis* and *S. triangularis* and add four new species to the Central Asian *Scopaeus* fauna and a subspecies of *S. similis* to the fauna of the Middle East. In the current classification, however, *S. similis* and *S. triangularis* stand in *Asiascopaeus* (Smetana 2004: 615). That subgenus of *Scopaeus* was erected by Coiffait (1984: 150, 152) for *S. asiaticus* and *S. similis* without a sufficient description. A few years later, Gusarov (1991: 8) revalidated *S. triangularis*, which was synonymized with *S. similis* by Coiffait (1968: 408), as the third species of *Asiascopaeus*. The taxonomical status of *Asiascopaeus* will be discussed in a coming revision of *S. asiaticus* (Frisch 2015, in press), the type species of *Asiascopaeus*, which is not a member of the *S. similis* group, the subject of this contribution.

## 2. Material, methods, and terminology

### 2.1. Material

The specimens referred to in this contribution, including the holotypes of the species described herein, are stored in the Museum für Naturkunde Berlin (MNHB) unless otherwise stated (abbreviations in alphabetical order): **ASCI** – Alexey Shavrin Private Collection, Daugavpils; **FMTD** – Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main (D. Kovac, A. Wesmanis); **GRCL** – Guillaume de Rougemont Private Collection, London; **HMIM** – Hayk Mirzayan’s Insect Museum, Iranian Institut of Plant Protection, Tehran (S. Serri); **HNHM** – Hungarian Natural History Museum, Budapest (G. Macranczy, O. Merkl, G. Szél); **IBPB** – Institut of Biology and Pedology of the Academy of Sciences of the Republic of Kyrgyzstan, Bishkek; **ISNB** – Institut Royal des Sciences Naturelles de Belgique, Brussels (then D. Drugmand); **MNHN** – Muséum National d’Histoire Naturelle, Paris [N. Berti (†), A. Taghavian]; **MSCB** – Michael Schülke Private Collection, Berlin; **MZMC** – Zoological Museum of the Moscow Lomonosov State University (A. Gusakov); **NHMB** – Naturhistorisches Museum, Basel [M. Brancucci (†), E. Sprecher]; **NHMW** – Naturhistorisches Museum, Wien (H. Schillhammer); **NMPC** – Národní Muzeum, Prague (J. Hajek, J. Jelinek);

**SDEI** – Senckenberg Deutsches Entomologisches Institut, Müncheberg (L. Zerche); **SMNS** – Staatliches Museum für Naturkunde, Stuttgart (W. Schawaller); **VACH** – Volker Assing Private Collection, Hannover.

In the compilations of type material and additional specimens examined, the label data usually are not cited verbatim but standardized and completed by e.g. province or district information to make it easier for the reader to find the respective localities. Old, nowadays uncommon locality names are replaced by the current names, but added in rectangular brackets. Labels cited verbatim stand in quotation marks.

### 2.2. Methods

The habitus photographs (Figures 1–6) were created with the montage software Helicon Focus based on digital images which were taken with a camera attached to a stereoscopic microscope magnified 32×. Drawings were made using the drawing attachment U-DA of the transmitted-light microscope Olympus BX50. Aedeagi, abdominal sternites VIII of the males, and laterotergites IX and lateral gonocoxal plates of the females were illustrated magnified 400× (Figures 7–39). Abdominal sternites VIII are illustrated without the fine primary setae except for Figure 28; laterotergites IX are illustrated without any setation. Female primary sexual characters including the attached lateral gonocoxal plates were illustrated magnified 600× (Figures 40–45).

Specimens were measured magnified 140× using a stereoscopic microscope with an eye-piece linear micrometer. Measurements and ratios (means are given in brackets) are based on – as far as available – ten specimens of each species at least which include both sexes and the maximum range of variation in body size and form. Total length of specimens = interval from apical spines of labrum to posterior end of abdomen, depending on intensity of contraction of abdomen; forebody length = interval from apical spines of labrum to posterior margin of elytra at suture; head length = interval from anterior margin of clypeus to posterior margin of head; elytra length = interval from posterior tip of scutellum to posterior end of elytra along suture; eye length = interval from anterior to posterior end of ocular suture; eye length and temporal length are measured in lateral view; length of antennomeres is measured without the thin basal stalk.

### 2.3. Terminology

The morphological structures of the aedeagus are termed following Frisch et al. (2002: 31–34). The

terminology of the primary and secondary sexual characters of the females follows Frisch (2010: 160, 161) except for the spermatheca the structures of which are termed after De Marzo (2009), who illustrated the anatomy of the spermatheca of some genera of the Paederinae including *Scopaeus*. With the example of *Scopaeus mitratus* Binaghi, De Marzo (2009: 211) described the characteristic, sclerotized structure of the spermathecal duct, which I hitherto termed the spermatheca, as a sperm pump. This bipartite organ, an apomorphy of *Scopaeus* (Frisch et al. 2002: 44), is made up of a hollow segment (chamber) the spermathecal duct runs through and a movable, solid segment, which is strongly arcuate forming an apophysis for the muscle band connecting both segments. Though I had already interpreted this organ as a sperm pump (Frisch et al. 2002: 30), I continued to use the imprecise term 'spermatheca'. The spermathecal duct shows a different degree of sclerotization proximal and distal of the sperm pump. While it is strongly sclerotized between the chamber of the sperm pump and the so-called bursa at the genital aperture, the homology of which is still unresolved (Frisch 2010: 160, 161), the distal portion of the duct, which leads to the sac-like, extensible receptaculum seminis, has notably weaker, hyaline walls. With the example of the *S. similis* group, the typical spermathecal complex of *Scopaeus* is illustrated in Figures 40–45.

### 3. Taxonomy

Below the *Scopaeus similis* species group is diagnosed including comparative notes at the species group level and biogeographical and bionomical information followed by species chapters, which comprise comparative diagnoses of the included species, compilations of type specimens and additional specimens examined, and biogeographical information. The brief species diagnoses don't repeat the general species group characters.

#### *Scopaeus similis* species group

**Diagnosis.** Length ranging from 2.8–4.4 mm, forebody length from 1.6–2.3 mm. Body coloration interspecifically varying from light orange brown with darker brown or blackish abdomen to entirely black with somewhat lighter tip of abdomen (Figures 1–6). Elytra of dark specimens lighter posteriorly in variable intensity and extent. Antennae, maxillary palps, and legs of light coloured species light brown, in dark coloured species medium brown, rarely blackish brown, with blackish

penultimate segment of maxillary palps. Punctuation of body surface typical of *Scopaeus*, forebody punctuation distinct and in few specimens only somewhat blurred by slight microreticulation, forebody thus shiny. Head 1.07–1.16 times longer than wide, across tempora 1.01–1.09 times as wide as across eyes, usually notably trapezoidal. Eyes small to medium sized, 0.43–0.66 times as long as tempora. Length of elytra subject to inter- and intraspecific variation, elytra 0.85–1.11 times as long as pronotum. Length of denticles of labrum variable, lateral denticles somewhat shorter to strongly longer than median denticles. Antennal segments relatively short; segments 8 and 9 slightly elongate, quadrate, or slightly transverse; segment 10 quadrate or slightly transverse. Protarsomeres 2–4 of both sexes strongly widened, about three times as wide as long. Mesotibia slender, 5.2–7.3 times longer than wide. Metathoracic wings entire based on a representative number of specimens examined.

**Male:** Abdominal sternite VIII (Figures 28–33) with triangular emargination in roughly posterior third to fifth of sternite length. Distal lobes of aedeagus (Figures 7–27) conspicuously slender, stiletto-shaped both in lateral and dorsal view, showing slight interspecific differences only compared to most clades of *Scopaeus*. Apical lobes in lateral view with characteristic elongate, triangular distal third to sixth ventroproximally marked by right angle or tooth, their ventral margins running very close to each other but separating in distal third of apical lobes to form ventral opening marked distally by projecting ventroproximal angles or teeth of triangular end of apical lobes. Dorsal lobe and flagellum long, slender, and of same length, reaching apical triangle of apical lobes. Dorsal lobe distally divided in two weakly sclerotized, in lateral view somewhat enlarged, almost hyaline ends embracing end of flagellum laterally. Tip of flagellum strongly curved ventrad and visible in ventral opening of apical lobes. Ventral endophallic process and setiferous lateral lobes absent.

**Female:** Dorsal, subapical emargination of laterotergite IX without clear, tooth-like or right-angled demarcation (Figures 34–36). Lateral gonocoxal plates slender, weakly sclerotized, their setiferous median strip approximately 5.0–5.6 times as long as wide (Figures 37, 38, 40, 43–45). Primary female sexual organs with small, hyaline bursa; portion of spermathecal duct between bursa and sperm pump long, showing significant interspecific variation (Figures 40, 43–45).

**Distribution and bionomics.** The mountains of Central Asia constitute the distribution center of the *Scopaeus similis* group (Figures 46, 47). In this area, the species group has been found from the Dzhungarian Alatau in the north at roughly 45°23'N throughout the Tien Shan, Alai, and Pamir Mountains as far south as



**Figures 1–6.** Habitus of (1) *Scopaes s. similis* (Kyrgyzstan, Osh: Uzgen – Jalal-Abad), (2) *S. s. minor* (paratype; Iran, Semnan: 17 km N Shahmirzad), (3) *S. triangularis* (Kyrgyzstan, Batken: Isfana – Isfara), (4) *S. ferganensis* (paratype; Kyrgyzstan, Jalal-Abad: Kekbel Pass), (5) *S. longilobatus* (paratype; Kyrgyzstan, Chui: Kara-Balta River), (6) *S. hiekei* (holotype).

the northern Hindukush, Kashmir, and the Indian Pir Panchal Range, the southeasternmost known locality at 33°38'N, 074°46'E. Towards west, one species reaches the Middle East in the Turkmeno-Khorassanian and Elburz Mountains, where it is known as far west as 052°52'E (Figure 46). While many finds became known from the northern and western Central Asian mountains, particularly from the Tien Shan and the western Alai Mountains, the eastern limit of distribution of the *S. similis* group is still unknown owing to the low collecting activity in vast regions of eastern Central Asia.

Just like the majority of *Scopaeus* (Frisch et al. 2002: 28), the species of the *S. similis* group are hygrophilous dwellers of the uppermost interstice of damp, sandy or gravelly soil with poor vegetation. Particularly in arid and semiarid regions and summerdry climates *Scopaeus* are strictly riparian and predominantly inhabit the banks of various kinds of flowing waters. Thus, I frequently collected species of the *S. similis* group both in damp, fine soil, frequently loess, of steep banks of smallest brooks and under rocks in the sandy soil of wide banks of large streams. According to the specimens examined, the members of the *S. similis* species group were collected at elevations from 600–3000 m. Thus, the vertical distribution of the species group extends from the foothills of the high mountain ranges within the Central Asian steppe up to the lower alpine zone.

**Comparative notes.** Among the Central Asian species groups of *Scopaeus*, members of the *S. similis* group can most easily be confused with the species of the speciose *S. obscuripes* group (Frisch 2015, in press) according to their general appearance. Because members of these sympatric species groups inhabit similar niches, they are often syntopic, which is why samples are often mixed. Though males of most species of the *S. obscuripes* group can easily be distinguished by modifications of abdominal sternite VIII such as an elevated midline, two latero-posterior, asetose impressions, and/or a posterior median field of long, dark, latero-posteriad orientated setae (Frisch 2015, in press: Figures 31–35), I did not find characters of the exoskeleton according to which members of both species groups can be distinguished reliably. Consequently, an accurate distinction of the species of these clades requires the examination of the primary sexual characters. Though the apical lobes of the aedeagus of the members of the *S. likovskiyi* complex often are very slender as well, they lack the characteristic apical triangular widening of the *S. similis* group (Frisch 1999a: 50, Figures 7–8). In the *S. obscuripes* group, the dorsal lobe of the aedeagus is moreover either vestigial or strongly sclerotized until the acute end, and not hyaline apically. Females of the *S. obscuripes* group can be

distinguished by the distinctly larger bursa of the genital aperture, which often is about as long as the lateral gonocoxal plates and has a notably sclerotized distal end, which is easily visible with an average stereoscopic microscope (Frisch 2015, in press: Figures 46–60).

The general appearance of the *S. similis* species group moreover resembles the Pontomediterranean and Middle Eastern *S. elegans* species group (Frisch et al. 2002: 41, 42). Both clades occur in the eastern Elburz Mountains and in the western Koppe Dag. Males of the *S. elegans* group can easily be distinguished by the aedeagus with notably wider apical lobes and a remarkable, flagelliform ventral endophallic process (Frisch 2010: Figures 36–38). Females differ by the sclerotized bursa (Frisch 2010: Figure 49), which is hyaline in the *S. similis* group (Figures 40, 43–45).

Dark coloured specimens of the *S. similis* group might be confused with *S. laevigatus* (Gyllenhal), which however differs by the quadrate head with large eyes, which are 0.71–0.84 times as long as the parallel, posteriorly stronger rounded tempora. Males of *S. laevigatus* can moreover be distinguished by abdominal sternite VIII with two remarkable posterior teeth and a deep, wide, round emargination between them (Frisch 2003: Figure 61), and the different shape of the aedeagus (Frisch 2003: Figures 1–3); females differ by the entirely sclerotized bursa of the genital aperture (Frisch 2003: Figure 127).

Central Asian members of the *S. sericans* (Frisch 2012), *S. signifer* (Frisch et al. 2002: 39, 40), and *S. debilis* (Frisch 1999b) species groups differ from the *S. similis* group in their general appearance, most of all in the very finely and densely punctate, mat body surface, the slender head with large eyes, parallel temples and strongly convex posterior angles (except for *S. turkestanicus* with trapezoidal head; Frisch 2012: 291), and the slender protarsomeres 2–4, which are only twice as wide as long in the two former clades and even quadrate in the *S. debilis* species group. Compared to the *S. similis* group, the aedeagus of all of the species of these three basal clades of *Scopaeus* (Frisch et al. 2002: 37, phylogenetic tree) has remarkably short distal lobes and setiferous lateral lobes. Females of the *S. sericans* group can be distinguished by the shorter, stronger, evenly curved sclerotized portion of the spermathecal duct and the extension at the junction of the hyaline spermathecal duct with the sperm pump (Frisch 2012: Figures 31–41), which is however subject to intraspecific variation and often lacking. In the *S. signifer* group, the sperm pump differs by adjoining junctions of the spermathecal duct (Frisch 2012: Figures 42–44). The sperm pump of *S. debilis*, the only Central Asian species of that group, is characterized by the inner septum of the chamber segment (Frisch 2012: Figure 45).

***Scopaeus similis similis*** Eppelsheim  
(Figures 1, 7–11, 28, 29, 34, 37, 39, 40, 41, 46)

*Scopaeus (Polyodontus) similis* Eppelsheim, 1892: 337.  
*Scopaeus (Scoponaeus) similis*; Jakobson 1909: 490.  
*Scopaeus* (s. str.) *similis*; Coiffait 1968: 408.  
*Scopaeus (Asiascopaeus) similis*; Coiffait 1984: 152, 176.

**Diagnosis.** Total length 3.5–4.4 (Ø 4.0) mm, forebody length 2.0–2.3 (Ø 2.2) mm. Primary body colour (Figure 1) dark reddish brown to black, appendages light brown except for blackish penultimate segment of maxillary palpi, in specimens from Pakistan (Swat) dark brown to blackish brown; old museum specimens from Taraz [Aulie Ata] and type series lighter reddish brown except for dark brown abdomen, possibly bleached out; pronotum frequently somewhat lighter than remaining forebody; elytra reddish brown posteriorly in variable extent; many transitions known from black specimens with narrow dark brown posterior margin of elytra only up to dark reddish brown specimens with lighter reddish brown pronotum and elytra except for blackish scutellar triangle. Head 1.07–1.13 (Ø 1.11) times as long as wide, slightly trapezoidal with moderately widened tempora, which in posterior half strongly taper towards posterior angles, across tempora only 1.01–1.04 (Ø 1.03) times as wide as across comparatively large eyes, which are 0.59–0.66 (Ø 0.62) times as long as tempora. Elytra comparatively long, 1.04–1.11 (Ø 1.08) times as long as pronotum. Length of denticles of labrum variable, lateral denticles somewhat shorter to clearly longer than median denticles. Mesotibia 5.3–5.7 (Ø 5.5) times as long as wide.

**Male:** Posterior emargination of abdominal sternite VIII short and narrow (Figures 28, 29), occupying only about fifth of sternite length. Apical lobes of aedeagus (Figures 7–11) in lateral view very thin at basis, straight dorsally, somewhat widened ventrally, and in distal third somewhat curved ventrad; triangular apical portion with acute ventroproximal end; in dorsal view, apical lobes parallel in proximal half, but in distal half evenly tapered towards somewhat laterally widened apex; flagellum slightly and evenly curved dorsad, except for stronger dorsad curved apical portion with strongly ventrad bent tip.

**Female:** Spermathecal duct between bursa and sperm pump very long and winding, about 12 times as long as sperm pump (Figure 40).

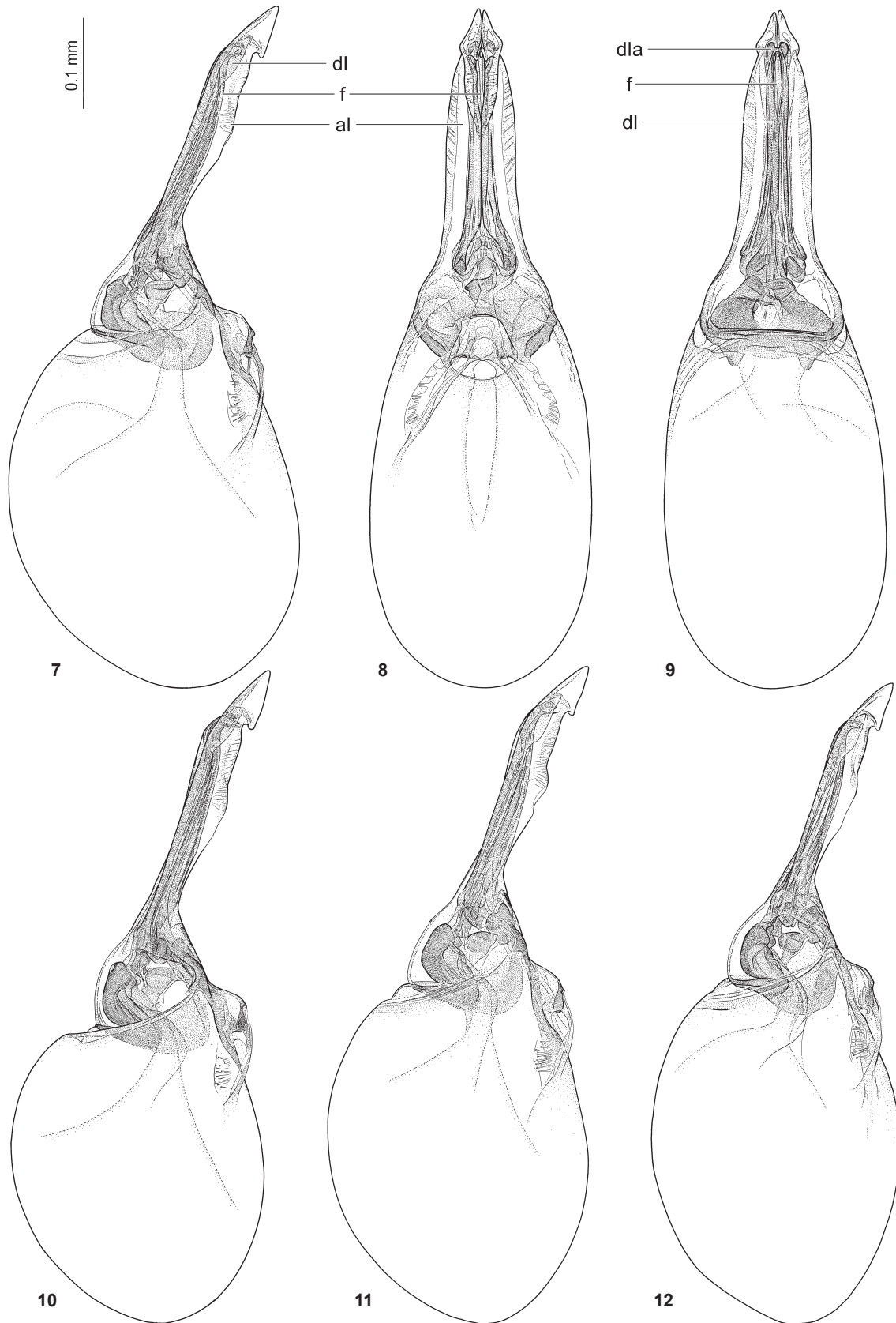
**Type material.** Lectotype ♂, Uzbekistan: Tashkent, leg. Leder; locality label (handwritten): ‘*similis* Epp. Tashkent. Leder.’ (NHMW); designated by Gusarov (1994: 436, 437); examined (aedeagus missing). Paralectotypes (5 specimens): 4 ♀ (three of which attached to the same pin), same locality label as lectotype (NHMW), examined; 1 ♀, locality label (same handwriting as locality labels of preceding paralectotypes):

‘Taschkent’ (NHMW), examined. The specimens bear Gusarov’s large lectotype and paralectotype labels.

The description of *Scopaeus similis* Eppelsheim is based on an unknown number of specimens collected by Leder in the surroundings of Tashkent, Uzbekistan (see Eppelsheim 1892: 321, 338), which then was located in the Russian Syrdarja Oblast. Judging from Leder’s locality labels and Eppelsheim’s collection label (‘c.Eppelsh. Steind. d.’), the six specimens at NHMW from which Gusarov (1994: 436, 437) selected the lectotype doubtlessly belong to the type series.

The aedeagus of the lectotype is lost, but the ectoskeletal characters of the specimen leave no doubt that the interpretation of *S. similis* by Gusarov (1991: 9; 1994: 436, 437), who apparently had examined the missing aedeagus, is correct. The locality of the lectotype is in accord with the distributional pattern of the species.

**Additional material examined** (684 specimens). ‘Buchara’ (ISNB). ‘Turcomania’ (HNHM). ‘Turcomenien Reitter. Leder.’ (HNHM). **Kazakhstan:** ‘AulieAta SyrDaria’ [note: Aulie Ata (today: Taraz) is not at Syrdariya River] (FMFD, NHMW, NMPC, SMTD). **Almaty:** Issyk (Dendropark), 21.08.1989, leg. Kastcheev; Sarydzhas (Kungai Mts), 27.06.1984, leg. Kastcheev; Kokpek (Chyngilsu River), 13.06.2004, leg. Kastcheev; Kokpek Pass (Sogety Mts), 08.07.1984, leg. Kastcheev; Zhansugirov [Džansugurov] (Aksu River), 15.06.1987, leg. Kastcheev; 33 km NW Üsttöbe [Uštobe] (Karatal River), 26.06.2004, leg. Kastcheev (MNHB, VACH); Luch Vostoka, 17.07.1985, leg. Kastcheev; Karatal River near Taldyqorgha [Taldy-Kurgan], 01.07.2004, leg. Kastcheev; Qapshaghay [Kapčagai]: Pristan Nauka (Ili River), 26.09.1981, leg. Kastcheev; Uchjarma (Ili River), 15.08.1982, leg. Kastcheev; Qapshaghay [Kapčagai] (Ili River), 26.09.1981, leg. Kastcheev. **South Kazakhstan:** Aksu [Belyje Vody], 28.06.1983, leg. Kastcheev; Bayzhansay [Bajžansaj] (Karatau Mts), 13.06.1983, leg. Kastcheev; Ashchysay River (Karatau Mts), 19.07.2010, leg. Kastcheev. **Zhambyl:** Taraz [Aulie-Ata] (HNHM, NHMB, NHMW); Taraz: Mikhailovka, 16.08.1986, leg. Kastcheev; Taraz: Talas River, 10.06.1989, leg. Kastcheev; Korday [Kurdai] Pass, 23.06.1985, leg. Kastcheev; Djetsay (Syrdariya River), 04.05.1980, leg. Kastcheev. **Kyrgyzstan:** **Batken:** S Majdan: 2 km N Langar (Isfairam-Say River) (39°52′15″N 72°05′11″E), 1610 m 18.06.2012, leg. Frisch; S Majdan, S Karaul: Austan (Isfairam-Say River) (39°58′09″N 72°06′46″E), 1380 m 18.06.2012, leg. Frisch; NE Majdan, 7 km E Pum: Pum River (tributary of Isfairam-Say River) (40°04′26″N 72°10′06″E), 1550 m 17.06.2013, leg. Frisch. **Chui:** SE Bishkek: 11 km W Yurevka: Karandolot (42°44′24″N 74°55′20″E), 1100 m 04.07.2011, leg. Frisch (IBPB, MNHB); SE Bishkek, 11 km W Yurevka: Karandolot (42°44′16″N 74°55′17″E), 1100 m 22.06.2013, leg. Frisch; SE Bishkek, 11 km W Yurevka: Karandolot (42°44′21″N 74°55′49″E), 1120 m 21.06.2013, leg. Frisch; S Bishkek, SW Koytash: Taty (42°40′21″N 74°38′46″E), 1500 m 05.07.2011, leg. Frisch; SW Tokmok: Kegety (Kegety River) (42°36′50″N 75°08′22″E), 1500 m 03.07.2011, leg. Frisch; S Tokmok, S Kyzyl-Suu: Kyzyl Suu River (42°41′56″N 75°27′44″E), 03.07.2011, leg. Frisch; S Tokmok, S Kyzyl-Suu: Kyzyl-Suu River (42°39′28″N 75°28′11″E), 1430 m 23.06.2013, leg. Frisch; S Bishkek, SE Kashkasu: Kashka-Suu River (42°40′42″N 74°31′05″E), 1630 m 05.07.2011, leg. Frisch; Bishkek: Alamedin River, 1040 m 05.07.2011, leg. Frisch; S Bishkek, W Zarechnoe: Ala-Archa River (42°45′34″N 74°34′14″E), 1080 m 05.07.2011, leg. Frisch; Tokmok – Balykchy: Jil-Azyk Valley



**Figures 7–12.** *Scopaeus s. similis*: Aedeagus in (7) lateral, (8) ventral, (9) dorsal view (Kyrgyzstan, Bishkek), (10) lateral view (Uzbekistan, Quashqardaryo: SO Shahrizabz), (11) lateral view (Pakistan, Khyber Pakhtoon: Chitral). *Scopaeus s. minor*: Aedeagus in (12) lateral view (paratype, Iran, Razavi Khorasan, Emam Qoli). Abbreviations: **al** – apical lobe, **dl** – dorsal lobe, **dla** – apex of dorsal lobe, **f** – flagellum.

(42°40'12"N 075°44'54"E), 1680 m 02.07.2011, leg. Frisch; S Tokmok, 3 km E Kyzyl-Suu: Kichi-Almaluu-Say (42°42'46"N 075°31'47"E), 1220 m 23.06.2013, leg. Frisch; Bishkek: Boz Pel'dek (42°46'29"N 074°34'51"E), 15.03.2007, leg. Schmidt (VACH); S Bishkek: Ala Archa, 1650 m 29.10.2000 (MSCB); S Kara-Balty: Uzun-Bulak (Kara-Balta River) (42°35'59"N 073°52'01"E), 1450 m 13.06.2012, leg. Frisch; S Kara-Balty, S Uzun-Bulak (Kara-Balta River) (42°35'59"N 073°52'01"E), 1500 m 13.06.2012, leg. Frisch; SE Tokmok, S Orlovka: Taldy-Bulak River (42°43'14"N 075°36'55"E), 1260 m 03.07.2011, leg. Frisch; S-slope of Tuz-Ashu Pass (42°15'06"N 073°48'25"E), 2240 m 20.06.2013, leg. Frisch. **Issyk-Kul:** WE Tyup: Ak Bulak (42°48'59"N 078°14'25"E), 1910 m 29.06.2011, leg. Frisch; NE Karakol: Razdol'noe (Jirgалан River), 1750 m 26.06.2011, leg. Frisch; Kyzyl-Tuu – Kyzyl-Suu: Barskoon – Barskaun Pass (42°02'42"N 077°35'51"E), 2200 m 23.06.2011, leg. Frisch; Balykchy – Kyzyl-Tuu: Kara-Talaa – Tuura-Suu (42°14'10"N 076°19'38"E), 1900 m 19.06.2011, leg. Frisch; SE Kyzyl-Tuu (42°05'03"N 077°06'26"E), 2370 m 22.06.2011, leg. Frisch; Cholpon-Ata – Tyup: Chon-Urukty (42°44'13"N 077°51'21"E), 1710 m 30.06.2011, leg. Frisch; Tyup (Tyup River) (42°44'32"N 078°23'15"E), 1620 m 28.06.2011, leg. Frisch; S Tosor: Tosor River (42°05'10"N 077°22'03"E), 2100 m 23.06.2011, leg. Frisch; W Kyzyl-Suu: Saruu (Juuku River) (42°12'07"N 077°57'34"E), 2030 m 25.06.2011, leg. Frisch; Balykchy – Kyzyl-Tuu: Kök-Say (42°05'00"N 076°48'47"E), 2030 m 21.06.2011, leg. Frisch; SE Kyzyl-Tuu (42°05'31"N 077°04'53"E), 2140 m 21.06.2011, leg. Frisch; Balykchy – Kyzyl-Tuu: Kara-Talaa – Tuura-Suu (42°09'11"N 076°19'55"E), 2130 m 20.06.2011, leg. Frisch; Balykchy – Cholpon-Ata: Semenovka (42°45'31"N 077°31'50"E), 1860 m 30.06.2011, leg. Frisch; Balykchy – Cholpon-Ata, N Toruaygyr: Ter-Ajgyr River (42°33'13"N 076°24'28"E), 1800 m 01.07.2011, leg. Frisch; Cholpon-Ata, 2000 m 04.07.1989, leg. Čechovký; Jalal-Abad: Chatkal River (41°39'42"N 070°44'48"E), 1400 m 23.07.2006, leg. Schmidt (VACH). **Jalal-Abad:** Tash-Kumyr (41°25'40"N 072°15'18"E), 650 m 17./18.07.2003, leg. Schmidt (VACH); E Torkent, Kosh-Tyube Valley: Kara-Djigach (41°47'49"N 073°16'19"E), 1010 m 13.06.2012, leg. Frisch; NE Kara-Kul, SEE Kekbel: Karasu River (41°41'09"N 072°58'35"E), 1230 m 02.07.2012, leg. Frisch; SO Toktogul (41°51'14"N 073°03'31"E), 970 m 29.05.2014, leg. Frisch; SO Toktogul (41°51'41"N 073°02'23"E), 1050 m 29.05.2014, leg. Frisch; Toktogul – Kara-Kul: Kekbel Pass (41°42'36"N 072°55'29"E), 1420 m 02.07.2012, leg. Frisch; Toktogul – Kara-Kul: Kekbel (41°41'34"N 072°53'43"E), 1160 m 30.05.2014, leg. Frisch; NE Arslanbob, 1900 m 19.05.1993, leg. Schawaller (SMNS); SO Arslanbob: Jaradar [Yarodar], 24.–25.09.1983, leg. Yeskov; Pravda (Arslanbob NR) (41°14'17"N 072°57'45"E), 1020 m 01.06.2014, leg. Frisch; Chatkal River at Ak-Tash (NO Besh-Aral NR) (41°41'20"N 070°41'21"E), 1400 m 15.06.2014, leg. Frisch; Kanysh-Kija (Chatkal Valley) (41°48'20"N 071°08'18"E), 1790 m 16.06.2014, leg. Frisch; NE Kerben: Jerge-Tal (41°35'01"N 071°51'20"E), 1220 m 08.06.2014, leg. Frisch; NNW Kerben: Kashka-Suu (41°41'00"N 071°37'56"E), 1660 m 08.06.2014, leg. Frisch. **Osh:** Ugzen – Jalal-Abad, NNW Shoro-Bashat: Kyr-Dzhol Valley (40°54'49"N 073°12'32"E), 1050 m 01.07.2012, leg. Frisch; Oytal (Oytal River) (40°27'14"N 074°03'21"E), 21./22.07.2003, leg. Schmidt (VACH). **Talas:** NW Toktogul: Chychkan [Tchitchkan] River, 2000 m 25.07.2001, leg. Puchkov (MSCB); Kyzyl-Adyr (42°36'04"N 071°34'17"E), 960 m 19.06.2014, leg. Frisch; S Kek-Saj (42°23'51"N 070°58'59"E),

2030 m 18.06.2014, leg. Frisch; S Talas, S Kozuchak (Besh-Tash NR) (42°24'17"N 072°15'39"E), 1640 m 20.06.2014, leg. Frisch. **Pakistan:** **Khyber Pakhtoon (= Northwest Frontier):** Swat Valley: Miandam, 2300 m 10.05.1983, leg. Besuchet & Löbl (MHNG); Swat Valley: Malam Jabba, 2400 m 09.05.1983, leg. Besuchet & Löbl (MHNG); Chitrāl: Madaglasht, 2900–3050 m 27.05.1983, leg. Besuchet & Löbl. **Tadzhikistan:** **Muchtori Kuhistani Badachschan:** Huf (Rushan Mts), 2200 m 21.05.1982, leg. Mikhailov (MSCB); mouth of Batang River in Panj River, 12.06.1982, leg. Mikhailov (MSCB). **Nohijahoi tobei Dschumhurij:** NEE Dushanbe, Sorvo Valley: Romit, 1300 m 30.06.1990, leg. Schülke & Wrase (MSCB); N Dushanbe, Varzob: Adjuk Cleft (Gissar Mts), 1200 m 01.–03.07.1990, leg. Schülke & Wrase (MSCB); E Dushanbe: Kafirmigan River, 13.06.1975 (MNHN); N Dushanbe: 10 km S Kalon (Gissar Mts), 17.09.2011, leg. Barsevskis (ASCI). **Uzbekistan:** Andijon [Andizan, Andischan]; Qashqardaryo, SO Shahrisabz: Igrisu (Katta-Uru River), 26.07.1942, leg. Arnoldi (MZMC); Shohimardon Exclave, 15.07.1984, 1800 m leg. Behne (SDEI); Tashkent (HNHM, MNHN, NHMW, NMPC).

**Distribution.** The type form of *Scopaeus similis* Eppelsheim is widely distributed across the mountainous regions of Central Asia and recorded from the Dzungarian Alatau (Kazakhstan) in the north at roughly 45°23'N throughout the Tien Shan, Alai, and Pamir Mountains southwards to Kashmir (Pakistan) at about 35°N (Figure 46). The Central Asian steppe zone clearly delimits the range of *S. s. similis* to the west, but the eastern limit of distribution is unknown owing to collecting deficiencies. While many records are known from the easily accessible northern and western Tien Shan, the Fergana Basin, and the western Alai Mountains, the distribution pattern in the Pamir is largely unknown.

*Scopaeus s. similis* was already cited for Uzbekistan (Emirate Buchara: Jakobson 1909: 490), Kazakhstan [Aulie Ata (today Taraz): Binaghi 1939: 735, Coiffait 1968: 408], and Tadzhikistan (Smetana 2004: 615). It is here for the first time recorded for Kyrgyzstan and Pakistan.

#### *Scopaeus similis minor* ssp. n.

(Figures 2, 12, 30, 42, 46)

**Diagnosis.** Male and female genital characters as in *Scopaeus s. similis* Eppelsheim, but body shape, size, and coloration (Figure 2) different from the type form as follows: Body smaller, total length 2.8–4.2 (Ø 3.8) mm, forebody length 1.6–2.1 (Ø 2.0) mm. Coloration much lighter; forebody usually reddish brown except for darker scutellar triangle, varying from orange brown to dark reddish brown; elytra frequently lighter posteriorly in variable extent; abdomen dark brown or blackish; appendages light brown; penultimate segment of maxillary palpi in dark specimens only somewhat darker brown. Head feebly more slender, 1.1–1.15 (Ø 1.12)



times longer than wide, but stronger trapezoidal, across tempora 1.02–1.09 ( $\bar{\theta}$  1.05) times as wide as across smaller eyes, which are only 0.45–0.56 ( $\bar{\theta}$  0.52) times as long as tempora. Elytra more slender and notably shorter, on average slightly shorter than pronotum, only 0.85–1.03 ( $\bar{\theta}$  0.98) times as long as pronotum.

**Type material.** Holotype ♂, **Iran**, Razavi Khorasan, Quchan – Bajgiran road: 6 km O Emam Qoli: Inche (Koppe Dag) (37°21'43"N 058°34'09"E), 1750 m 30.05.2006, leg. Frisch & Serri; Paratypes (224 specimens): 1 ♂, 'Transkaspien'. **Iran**: Mazandaran: 1 ♂, 4 ♀, Shahmirzad – Astaneh road, 45 km NE Shahmirzad: 6 km road to Gandab (35°55'19"N 053°27'22"E), 2350 m 23.05.2006, leg. Frisch & Serri. North Khorasan: 6 ♂, 9 ♀, Shirvan – Quchan road: 24 km SSW Faruj: Garmab (Barjovein Mts) (37°03'01"N 058°06'30"E), 1710 m 01.06.2006, leg. Frisch & Serri; 6 ♂, 1 ♀, Shirvan – Esfarayen road, 31 km NO Esfarayen: Sarchesmeh (Aladag Mts) (37°08'07"N 057°46'06"E), 1730 m 02.06.2006, leg. Frisch & Serri; 1 ♂, pass 26 km S Bojnurd (Aladag Mts) (37°17'25"N 057°22'12"E), 1830 m 02.06.2006, leg. Frisch & Serri; 4 ♂, 10 ♀, Qarloq – Raz road, 33 km NNW Qarloq: Yekehshakh (Koppe Dag) (37°39'34"N 057°25'11"E), 1010 m 03.06.2006, leg. Frisch & Serri; 3 ♂, 6 ♀, Qarloq – Raz road, 10 km NW Qatlish: 5 km NE Pirboz (Koppe Dag) (37°50'03"N 057°14'35"E), 1020 m 03.06.2006, leg. Frisch & Serri. Razavi Khorasan: 9 ♂, 12 ♀, same data as holotype; 23 ♂, 25 ♀, Sah Jahan Mts: Mareshk (Koppe Dag) (36°47'51"N 059°32'48"E), 1800 m 26.05.2006, leg. Frisch & Serri; 7 ♂, 6 ♀, Sah Jahan Mts, SW Mareshk: Gosh (Koppe Dag) (36°42'16"N 059°34'58"E), 1500 m 26.05.2006, leg. Frisch & Serri (HMIM, MNHB); 5 ♂, 7 ♀, SW Shandiz: Zoshg (Binalud Mts) (36°19'43"N 059°10'40"E), 1750 m 27.05.2006, leg. Frisch & Serri; 3 ♂, 6 ♀, SW Shandiz: Zoshg (Binalud Mts) (36°16'59"N 059°07'09"E), 2150 m 27.05.2006, leg. Frisch & Serri; 3 ♂, 1 ♀, 20 km NW Torbat-e Heydariyeh: Senobar (Sorkh Mts) (35°26'04"N 059°05'48"E), 1730 m 28.05.2006, leg. Frisch & Serri; 5 ♂, 4 ♀, 27 km SW Chanaran: Frizi (Binalud Mts) (36°29'21"N 058°59'00"E), 1590 m 29.05.2006, leg. Frisch & Serri; 7 ♂, 5 ♀, Quchan – Bajgiran road: 4 km NW Emam Qoli (Koppe Dag) (37°26'02"N 058°29'45"E), 1640 m 31.05.2006, leg. Frisch & Serri; 3 ♂, 5 ♀, Emam Qoli – Kapkan road, 17 km O Emam Qoli: Aghmezar (Koppe Dag) (37°19'16"N 058°41'13"E), 1850 m 31.05.2006, leg. Frisch & Serri; 3 ♂, 2 ♀, Lotfābād [Ljutfabad] (Koppe Dag) (NHMW). Semnan: 2 ♂, 8 ♀, 17 km N Shahmirzad, 5 km S Chashm (35°51'21"N 053°17'30"E), 2040 m 22.05.2006, leg. Frisch & Serri; 2 ♂, 8 ♀, Shahrud – Mojen road: 5 km SE Tash (36°30'55"N 054°42'16"E), 2040 m 24.05.2006, leg. Frisch & Serri; 3 ♂, 4 ♀, Shahrud – Mojen road: 2 km SE Tash (36°32'44"N 054°40'06"E), 2190 m 24.05.2006, leg. Frisch & Serri. Tehran: 2 ♀, Firuzkuh – Semnan road: 10 km SO Firuzkuh: Saranza (35°46'12"N 052°52'19"E), 2060 m 21.05.2006, leg. Frisch & Serri. **Turkmenistan**: 1 ♀, Ilaj-Kala, 29.05.1971, leg. Pototskaja (MZMC). Ashgabad: 1 ♂, E Lotfābād [Ljutfabad]: Saramsakli (Koppe Dag). Mary: 1 ♂, W Mary: Dort-Kuyu [Dortkuju], 04.1900, leg. Hauser (NHMW).

**Distribution.** The distribution of *Scopaeus s. minor* ssp. n. is confined to the Elburz Mountains and the Turkmeno-Khorassanian Mountain Ranges, where it was collected in the Koppe-Dag, Aladag, Barjovein, Binalud, and Sorkh Mountains (Figure 46). In the Elburz, the

subspecies was found as far west as about 53°E in the Tehran Province. In this South Caspian mountain range, it interestingly seems to be confined to the dry, steppe-like southern incline and obviously avoids the humid, so-called Hyrcanian forest of the northern incline.

**Etymology.** The epithet '*minor*' (Latin, adjective: 'the smaller') refers to the smaller body size of *Scopaeus s. minor* ssp. n. compared to the type form.

### *Scopaeus similis* – specimens incertae sedis

**Material examined** (4 specimens): **Afghanistan**: Badghis: Qades (grotto), 1350 m 30.06.1959, leg. Lindberg (NHMW). Panjshir: Golbahar, 1650 m 14.10.1952, leg. Klapperich (NHMW). Parvan: Ghorband [Gorband], 10.1978, leg. Rougemont (GRCL). **India**: Kashmir: Aharbal (Pir Panjāl Range), 05.1981, leg. Rougemont (GRCL).

**Remarks.** Judging from their genital characters, the few available specimens from the Hindukush and the Pir Panjāl Range doubtlessly represent *Scopaeus similis* Eppelsheim, but it is not possible to assign them to either of the two subspecies described above. They resemble the type form from Central Asia as regards size of eyes and length of elytra, but are coloured like *S. s. minor* ssp. n. from the Middle East. Nevertheless, they represent the first records of *S. similis* for Afghanistan and India (Figure 46). More samples from the southern part of the distribution of *S. similis* are necessary to resolve the taxonomical status of these southern specimens.

### *Scopaeus gissarensis* sp. n.

(Figures 13–15, 31, 43)

**Diagnosis.** Habitus and coloration similar to specimens of *S. s. similis* Eppelsheim (Figure 1) with reddish brown (paratype) and dark reddish brown (holotype) forebody, but different as follows: Total length 3.8–4.2 mm, forebody length 2.2–2.3 mm. Eyes slightly smaller, only 0.56–0.59 times as long as tempora, and elytra shorter, only 1.02–1.03 times as long as pronotum.

**Male:** Posterior emargination of abdominal sternite VIII deeper, occupying almost fourth of sternite length (Figure 31). Aedeagus (Figures 13–15) with smaller bulbous and notably enlarged, dorsally strongly convex median portion between bulbous and distal lobes, therefore phallobasis in dorsal view (Figure 15) parallel with stronger pronounced distal 'shoulders'; in lateral view, median portion of phallobasis with remarkably enlarged, sickle-shaped, dorsal endosclerite twice as long as in *S. similis* (Figure 13, arrow); apical lobes in lateral view less widened ventrally and with triangular apical portion ventroproximally marked right-angled.

**Female:** Spermathecal duct between bursa and sperm pump much shorter, only about six times as long as sperm pump (Figure 43).

**Type material.** Holotype ♂, Uzbekistan, Qashqardaryo: S of Shahrisabz, 08.06.1942, leg. Arnoldi. Paratype: 1 ♀, same data as holotype.

**Distribution.** *Scopaeus gissarensis* sp. n. is known only from the type locality in the western foothills of the Gissar Mountain Range south of Shahrisabz in southern Uzbekistan (Figure 46). In view of the wide distribution of the closely related, presumably allopatric *S. similis* Eppelsheim and the record of that species not far southeast of the type locality of *S. gissarensis*, the new species apparently is a local endemic with a very restricted range in the very west of the Alai Mountains.

**Etymology.** The epithet ‘*gissarensis*’ (Latin, adjective: ‘originating from Gissar’) refers to the distribution of *Scopaeus gissarensis* sp. n. in the Gissar Mountain Range.

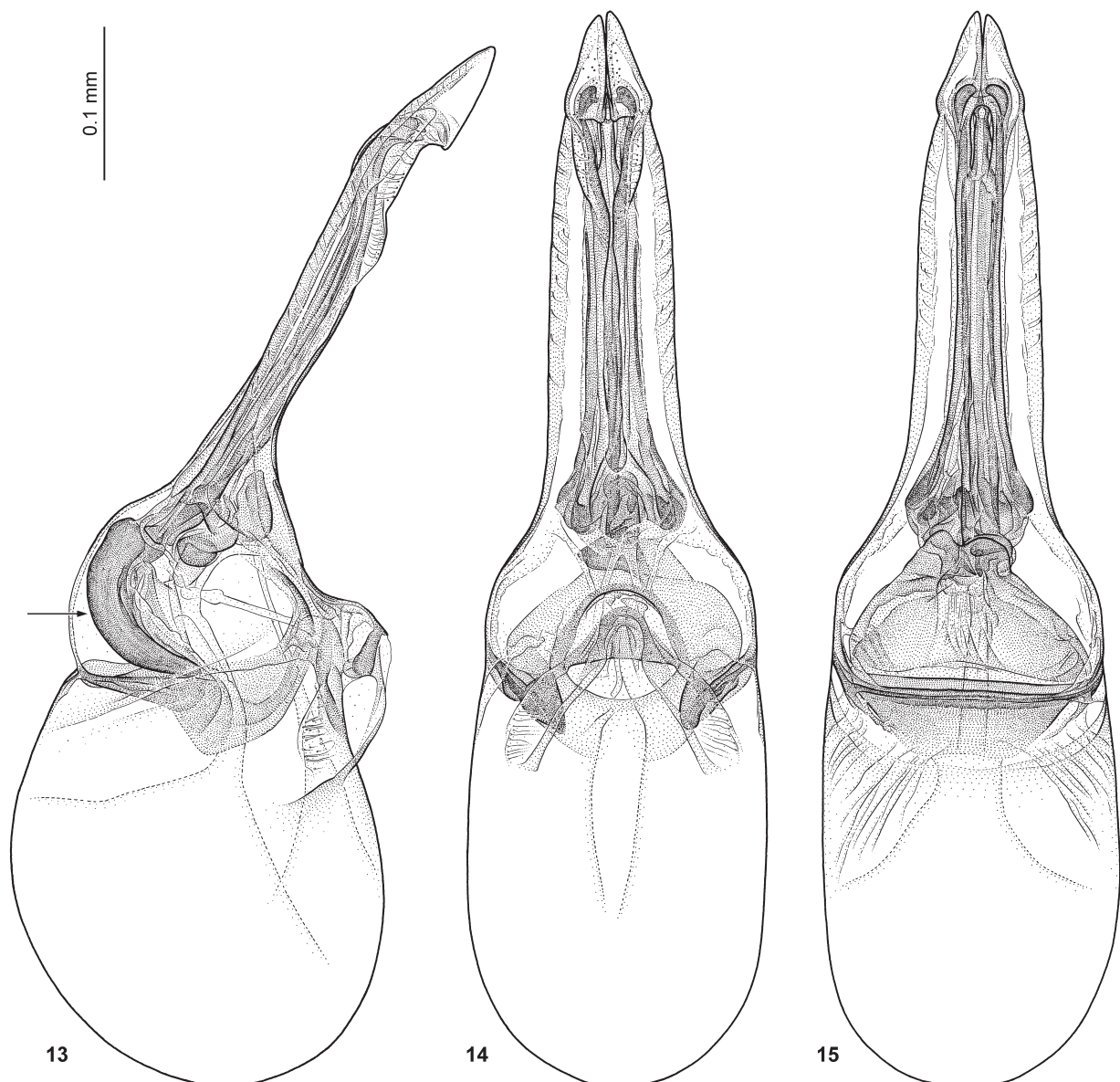
***Scopaeus triangularis* Luze**

(Figures 3, 16–18, 32, 36, 38, 44)

*Scopaeus triangularis* Luze, 1904: 90; synonymized by Coiffait 1968: 408.

*Scopaeus (Asiascopaeus) triangularis*; revalidation by Gusarov 1991: 8.

**Diagnosis.** Total length 3.2–3.9 (Ø 3.5) mm, forebody length 1.8–2.0 (Ø 1.9) mm. Forebody usually light to dark reddish brown, frequently with somewhat darker scutellar



Figures 13–15. *Scopaeus gissarensis*: Aedeagus in (13) lateral, (14) ventral, (15) dorsal view (holotype).

triangle; abdomen dark brown to black; antennae, legs, and maxillary palpi unicolorous light brown (Figure 3); body in specimens from Chatkal River (West Tien Shan) almost black with medium to dark reddish brown elytra and dark brown appendages. Head 1.1–1.15 ( $\bar{\text{O}}$  1.13) times longer than wide, slightly trapezoidal with moderately widened tempora, which in posterior half strongly taper towards posterior angles, across tempora only 1.02–1.05 ( $\bar{\text{O}}$  1.03) times wider than across eyes, which are 0.45–0.53 ( $\bar{\text{O}}$  0.51) times as long as tempora. Elytra 0.96–1.04 ( $\bar{\text{O}}$  1.01) times as long as pronotum. Median denticles of labrum longer than lateral denticles. Mesotibia slender, 6.2–7.3 ( $\bar{\text{O}}$  6.7) times longer than wide.

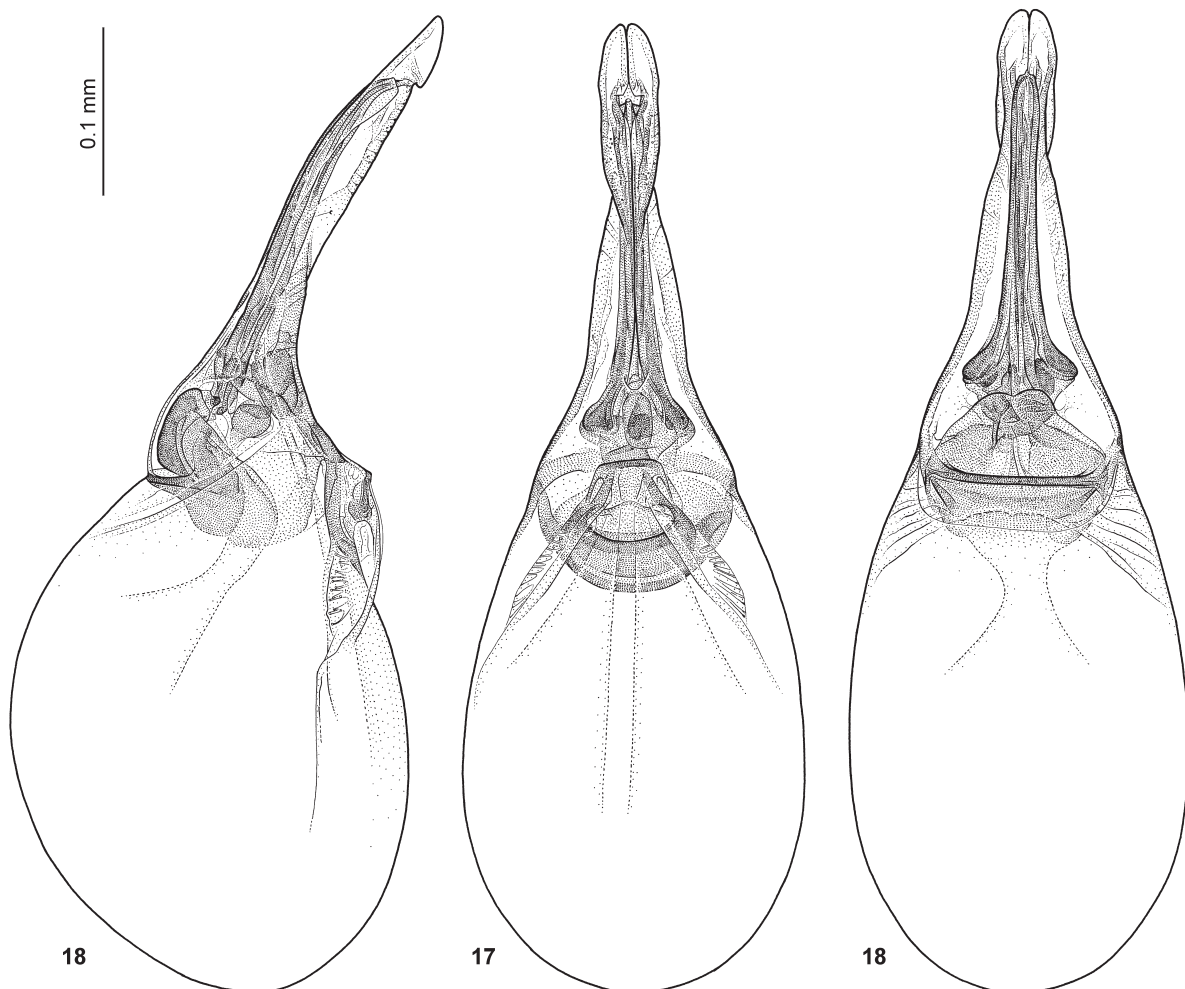
**Male:** Abdominal sternite VIII with wide, triangular emargination in about posterior fourth to fifth (Figure 32). Aedeagus (Figures 16–18) with apical lobes, dorsal lobe and flagellum slightly and evenly curved ventrad; apex of flagellum stronger bent in ventral direction; apical lobes with straight ventral margin, their triangular apical portion short, occupying apical seventh

to eighth, and not much projecting ventrally; in dorsal view (Figure 18), apical lobes taper strongly towards long, more or less parallel apical portion with round ends; in ventral view (Figure 17), apical portion almost half as long as apical lobes, parallel laterally and strongly lengthened in proximal direction.

**Female:** Spermathecal duct between bursa and sperm pump short, good three times as long as sperm pump (Figure 44).

**Type material.** Lectotype ♂, Tadzhikistan, Sughd, Zeravschan: Lake Dshai, 1892, leg. Glasunov; labelled 'Seravschan Lac. Dschai' (NHMW); designated by Gusarov (1994: 437); examined (left hind leg and right antenna missing; apex of aedeagus broken off, but glued on the card of the specimen). The specimen bears Gusarov's large lectotype label.

Luze (1904: 90, 91) described *S. triangularis* from an unknown number of specimens collected by D. Glasunov in 1892 at two very close localities (Zeravshan: Lake Dshai; Yaghnob [Jabnob] River at Takfon) north of the Gissar Range in the Alai Mountains of Tadzhikistan. He had received the new species by A. P. Semenov-Tian-Shansky, to whom he returned the type specimens, but was allowed to keep duplicates for his



Figures 16–18. *Scopaeus triangularis*: Aedeagus in (16) lateral, (17) ventral, (18) dorsal view (Kazakhstan, South Kazakhstan: Arys').

own collection (see Luze 1904: 74), which is today stored at NHMW (Horn et al. 1990: 245). Gusarov (1994: 437) designated a male from NHMW collected by Glasunov at Lake Dshai with the label 'ex. coll. Luze' as the lectotype for *S. triangularis*, but he did not identify paralectotypes. It remains unclear whether or not Gusarov searched for type material of *S. triangularis* in the Semenov collection at the Zoological Museum, Academy of Sciences, St. Petersburg (see Horn et al. 1990: 361).

**Additional material examined** (201 specimens). **Kazakhstan:** South Kazakhstan: Arys' (Syrdarija River), 05.06.1989, leg. Kastcheev. **Kyrgyzstan:** Batken: Isfana – Isfara: SWW Ozgurush (Lyailek River, Turkestan Mts) (39°44'25"N 069°59'53"E), 1520 m 22.06.2012, leg. Frisch (IBPB, MNHB); Isfana – Isfara: SWW Ozgurush (tributary of Lyailek River, Turkestan Mts) (39°44'26"N 070°00'28"E), 1560 m 23.06.2012, leg. Frisch; Isfana – Isfara: Korgon (Lyailek River) (39°54'15"N 069°54'34"E), 1020 m 23.06.2012, leg. Frisch; SW Isfana: Dinau (Turkestan Mts) (39°41'59"N 069°22'30"E), 1770 m 24.06.2012, leg. Frisch; NE Isfana, N Suljukta: Bulak-Bashi (39°59'10"N 069°34'53"E), 910 m 25.06.2012, leg. Frisch; NE Isfana, N Suljukta: Bulak-Bashi (39°58'15"N 069°34'37"E), 980 m 26.06.2012, leg. Frisch; S Ay-Kol: Teo-Jailoo Valley (Tegir-Malik River) (39°43'09"N 069°41'59"E), 2100 m 28.06.2012, leg. Frisch. **Jalal-Abad:** Chatkal River at Ak-Tash (NO Besh-Aral NR) (41°41'13"N 070°39'35"E), 1450 m 14.06.2014, leg. Frisch; Chatkal River at Ak-Tash (NO Besh-Aral NR) (41°41'20"N 070°41'21"E), 1400 m 15.06.2014, leg. Frisch. **Talas:** S Kek-Saj (42°23'51"N 070°58'59"E), 2030 m 18.06.2014, leg. Frisch. **Tadzhikistan:** Sughd: Imeni Rudaki [Rudaky] (Zeravshan Mts), 11.07.1990, leg. Schülke (MSCB); Novabad (Zeravshan Valley), 10.-11.07.1990, leg. Schülke & Wrase. **Uzbekistan:** Qashqardaryo: Yakkabog [Yakkabag], 29.11.1941, leg. Arnoldi. Tashkent: near Tashkent City, 06.05.1988, leg. Vyshinskiy; Tashkent, leg. Leder (NHMW).

**Distribution.** *Scopaeus triangularis* Luze is distributed in the western Tien Shan and Alai Mountains including their western foothills (Figure 47) and recorded as far northwest as 42°26'N, 068°50'E in South Kazakhstan and as far southwest as 38°57'N, 066°41'E in southern Uzbekistan. The eastern limit of distribution in the Tien Shan is roughly marked by an imaginary line across northwestern Kyrgyzstan from the Chatkal River in the west of the Jalal-Abad Province at 41°41'N, 070°39'E northeast to the very west of the Talas Province at 42°23'N, 070°58'E. This line delimits the distribution of *S. triangularis* towards east quite precisely, because the westernmost localities of the allopatric *S. ferganensis* sp. n. are close (Figure 47). In the Alai Mountains, *S. triangularis* is recorded as far east as 070°E in the Batken Provinz, Kyrgyzstan, but the distribution might stretch further to the east, because the closest localities of *S. ferganensis* are situated more than 100 km further east.

*Scopaeus triangularis* was already published for Tadzhikistan (Luze 1904: 91) and Uzbekistan (Smetana 2004: 615). It is here for the first time recorded for Kazakhstan and Kyrgyzstan.

**Remarks.** Coiffait (1968: 408) erroneously synonymized *Scopaeus triangularis* with *S. similis* after he had examined two male specimens of the Bernhauer collection at the Field Museum of Natural History, Chicago, which were (probably mis-)identified as *S. triangularis*, because he could not distinguish them from the types of *S. similis* at NHMW. This erroneous synonymy was adopted by Tikhomirova (1973: 177). The type specimen of *S. triangularis* at NHMW, however, Coiffait did not see. Later, Gusarov (1991: 8–10) revalidated and redescribed *S. triangularis* based on two specimens from the Jalal-Abad and Osh provinces of Kyrgyzstan, which however represent *S. ferganensis* sp. n. described below.

### *Scopaeus ferganensis* sp. n. (Figures 4, 19–21)

**Diagnosis.** Habitus similar to *Scopaeus triangularis* Luze, from which it differs as follows (Figure 4): Total length 3.4–3.9 (Ø 3.6) mm, forebody length 1.7–2.0 (Ø 1.9) mm. Body coloration somewhat lighter; forebody orange brown to medium reddish brown, rarely darker reddish brown or dark reddish brown with blackish head; elytra usually somewhat lighter than head and pronotum except for darker scutellar triangle; abdomen dark brown to black; antennae, maxillary palpi, and legs unicolorous light brown. Head somewhat stronger trapezoidal, across notably widened tempora 1.05–1.07 (Ø 1.06) times wider than across eyes. Elytra shorter, only 0.94–1.01 (Ø 0.97) times as long as pronotum. Mesotibia stouter, 5.8–6.3 (Ø 6.0) times as long as wide.

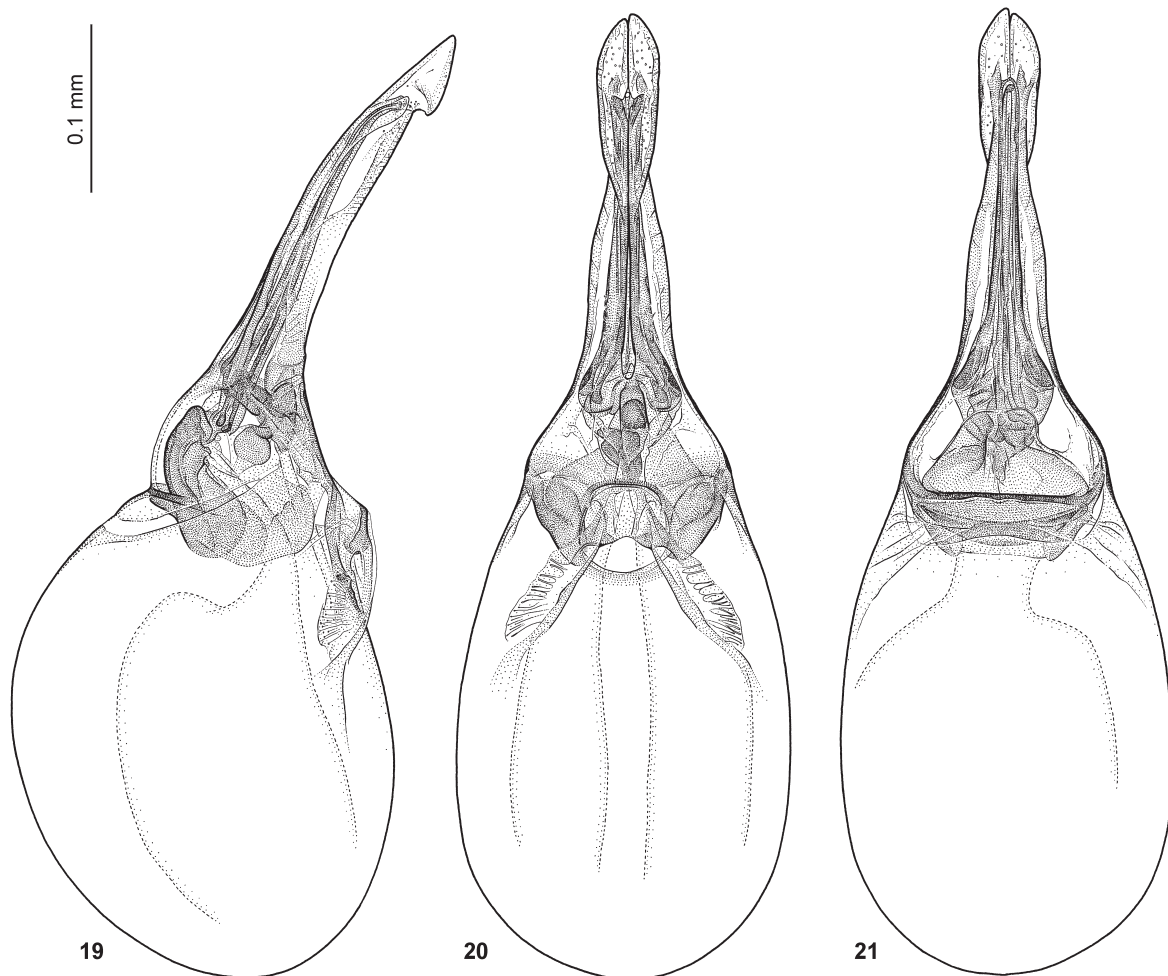
**Male:** Shape and depth of posterior emargination of abdominal sternite VIII as in *S. triangularis* Luze (Figure 32). Aedeagus (Figures 19–21) resembling that of *S. triangularis* (Figures 16–18), but different as follows: Apical lobes with slightly concave ventral margin and notably stronger ventrally projecting triangular apical portion, the width of which is however subject to some variability.

**Female:** Spermathecal duct between bursa and sperm pump good three times as long as sperm pump as in *S. triangularis* (Figure 44).

**Type material.** Holotype ♂, **Kyrgyzstan:** Jalal-Abad, Toktogul - Kara-Kul: Kekbel Pass (41°42'36"N 072°55'29"E), 1420 m 02.07.2012, leg. Frisch. Paratypes (544 specimens): **Kyrgyzstan:** 1 ♂, Alai Mts, leg. Schröder (SDEI). **Batken:** 4 ♂, 6 ♀, Majdan: Shambesai (40°04'44"N 072°04'09"E) (Isfairam-Say River System), 1370 m 17.06.2012, leg. Frisch; 2 ♂, 5 ♀, preceding locality, but (40°04'43"N 072°04'10"E), 1360m, 13.06.2013, leg. Frisch; 5 ♂, 7 ♀, S Majdan: 2 km N Langar (Isfairam-Say River) (39°52'15"N 072°05'11"E), 1610 m 18.06.2012, leg. Frisch; 2 ♂, 4 ♀, S Majdan, S Karaul:

Austan (Isfairam-Say River) (39°58'09"N 072°06'46"E), 1380 m 18.06.2012, leg. Frisch; 4 ♂, 6 ♀, E Sovetsky (Katrang-Too Mountain Range) (40°07'19"N 071°22'59"E), 1410 m 20.06.2012, leg. Frisch; 10 ♂, 9 ♀, S Majdan, W Karaul: Shaty River (tributary of Bant River, Isfairam-Say River System) (39°59'10"N 072°00'19"E), 1750 m 16.06.2013, leg. Frisch; 9 ♂, 10 ♀, W Majdan: Tamasha-Say (40°03'55"N 072°03'17"E) (Isfairam-Say River System), 1460 m 15.06.2013, leg. Frisch; 2 ♀, 3 km NE Majdan: Pum (40°04'39"N 072°07'20"E) (Isfairam-Say River System), 1400 m 17.06.2013, leg. Frisch; 2 ♂, 2 ♀, S Majdan, W Karaul: Bant Valley (40°00'30"N 072°02'46"E) (Isfairam-Say River System), 1460 m 16.06.2013, leg. Frisch; 1 ♂, 1 ♀, N Karadzhigach: Valakish (40°09'52"N 072°05'35"E) (Isfairam-Say River System), 1100 m 14.06.2013, leg. Frisch; 9 ♂, 4 ♀, W Majdan: Tamasha-Say (40°04'43"N 072°03'18"E) (Isfairam-Say River System), 1630 m 15.06.2013, leg. Frisch; 4 ♀, W Karadzhigach: Karadzhigach-Say (40°06'59"N 072°02'24"E) (Isfairam-Say River System), 1560 m 13.06.2013, leg. Frisch; 6 ♂, 6 ♀, Karadzhigach: Chauvay River (40°08'14"N 072°06'39"E) (Isfairam-Say River System), 1160 m 12.06.2013, leg. Frisch; 6 ♂, 6 ♀, Karadzhigach: Chauvay River (40°08'03"N 072°07'42"E) (Isfairam-Say River System), 1280 m 12.06.2013, leg. Frisch; 7 ♂, 9 ♀, NE Majdan, 7 km E Pum: Pum River (tributary of Isfairam-Say River) (40°04'26"N 072°10'06"E), 1550 m 17.06.2013, leg.

Frisch; 1 ♂, W Majdan: Yavan-Say (40°02'06"N 072°04'59"E) (Isfairam-Say River System), 1350 m 18.06.2013, leg. Frisch; 4 ♂, 2 ♀, W Majdan: Chochko-Say (40°02'47"N 072°02'00"E) (Isfairam-Say River System), 1640 m 18.06.2013, leg. Frisch; 8 ♂, 2 ♀, W Majdan: Chochko-Say (40°02'39"N 072°03'06"E) (Isfairam-Say River System), 1570 m 18.06.2013, leg. Frisch. Chui: 5 ♂, 8 ♀, S-slope of Tuz-Ashu Pass (42°15'06"N 073°48'25"E), 2240 m 20.06.2013, leg. Frisch; 1 ♂, Kok-Kul [Kuk-Kul] Lake, 12.05.1988, leg. Majer (NHMB). Jalal-Abad: 3 ♂, 1 ♀, NNW Tash-Kumyr: Sary-Chelek, 1400-1660 m 27.-31.05.1993, leg. Schawaller (SMNS); 9 ♂, 9 ♀, E Torkent, Kosh-Tyube Valley: Kara-Djigach (41°47'49"N 073°16'19"E), 1010 m 13.06.2012, leg. Frisch; 8 ♂, 7 ♀, 18 km NNE Kara-Kul (Karasu River) (41°41'28"N 072°53'41"E), 1120 m 14.06.2012, leg. Frisch; 2 ♀, NE Tash-Kumyr: Shing-Say (41°19'56"N 072°14'43"E), 720 m 15.06.2012, leg. Frisch; 1 ♂, 1 ♀, Kara-Kul – Tash-Kumyr (41°29'24"N 072°19'21"E), 640 m 31.05.2014, leg. Frisch; 1 ♂, 2 ♀, Kara-Kul – Tash-Kumyr (41°32'42"N 072°29'13"E), 770 m 31.05.2014, leg. Frisch; 3 ♀, NE Kara-Kul, SEE Kekbel: Karasu River (41°41'09"N 072°58'35"E), 1230 m 02.07.2012, leg. Frisch; 11 ♂, 15 ♀, same data as holotype; 3 ♂, 3 ♀, preceding locality, 11.06.2013, leg. Frisch; 2 ♂, 3 ♀, preceding locality, 29.05.2014, leg. Frisch; 12 ♂, 5 ♀, Toktogul – Kara-Kul: Kekbel (41°42'09"N 072°55'13"E), 1200 m 20.06.2013, leg.



Figures 19–21. *Scopaeus ferganensis*: Aedeagus in (19) lateral, (20) ventral, (21) dorsal view (paratype, Kyrgyzstan, Jalal-Abad: Kekbel Pass).

Frisch; 2 ♂, 3 ♀, preceding locality, 30.05.2014, leg. Frisch; 44 ♂, 40 ♀, preceding locality (41°41'34"N 072°53'43"E), 1160 m 30.05.2014, leg. Frisch (IBPB, MNHB); 2 ♀, SEE Toktogul, NE-end of Toktogul Reservoir: Torkent (Torkent River) (41°50'48"N 073°10'26"E), 960 m 02.07.2012, leg. Frisch; 1 ♂, 11 ♀, SO Toktogul (41°51'14"N 073°03'31"E), 970 m 29.05.2014, leg. Frisch; 8 ♂, 8 ♀, SO Toktogul (41°51'41"N 073°02'23"E), 1050 m 29.05.2014, leg. Frisch; 1 ♀, 11 km NE Bazar-Kurgan (41°06'59"N 072°49'56"E), 830 m 19.06.2013, leg. Frisch; 5 ♂, 3 ♀, Buzuk – Kyzyl-Kokoj (41°26'42"N 071°12'59"E), 1390 m 11.06.2014, leg. Frisch; 5 ♂, 6 ♀, Terek-Saj – Chap-Chyma Pass (41°29'01"N 071°05'26"E), 1600 m 11.06.2014, leg. Frisch; 1 ♂, Terek-Saj – Chap-Chyma Pass (41°29'46"N 070°59'51"E), 1820 m 11.06.2014, leg. Frisch; 3 ♂, Pravda (Arslanbob NR) (41°14'17"N 072°57'45"E), 1020 m 01.06.2014, leg. Frisch; 1 ♂, 2 ♀, Pravda (Arslanbob NR) (41°13'41"N 072°57'57"E), 1010 m 01.06.2014, leg. Frisch; 6 ♂, 4 ♀, SW Charbak: Kyrgoo (Arslanbob NR) (41°11'42"N 072°55'20"E), 940 m 02.06.2014, leg. Frisch; 7 ♂, 1 ♀, SO Arslanbob: Gumkana (Arslanbob NR) (41°19'27"N 072°57'07"E), 1330 m 01.06.2014, leg. Frisch; 1 ♀, Tash-Kumyr – Alcha (41°26'52"N 072°12'46"E), 770 m 04.06.2014, leg. Frisch; 2 ♀, reservoir N Tash-Kumyr (41°24'46"N 072°12'04"E), 650 m 04.06.2014, leg. Frisch; 2 ♂, 3 ♀, Tash-Kumyr (E of Naryn River) (41°18'52"N 072°12'17"E), 600 m 03.06.2014, leg. Frisch; 1 ♀, NNW Tash-Kumyr, Çat – Jangi-Jol: Tegene (41°31'07"N 072°12'54"E), 950 m 05.06.2014, leg. Frisch; 14 ♂, 8 ♀, Sary-Chelek village (41°42'02"N 071°58'53"E), 1020 m 05.06.2014, leg. Frisch; 2 ♂, 2 ♀, Sary-Chelek NR (41°51'30"N 071°56'17"E), 1530 m 06.06.2014, leg. Frisch; 1 ♂, 3 ♀, NE Kerben: Jerge-Tal (41°35'01"N 071°51'20"E), 1220 m 08.06.2014, leg. Frisch; 7 ♂, 3 ♀, NNW Kerben: Kashka-Suu (41°41'00"N 071°37'56"E), 1660 m 08.06.2014, leg. Frisch; 2 ♂, 2 ♀, NNW Kerben: Kashka-Suu (41°40'21"N 071°38'57"E), 1710 m 09.06.2014, leg. Frisch; 2 ♂, 1 ♀, Ters River (Besh Aral NR) (41°35'34"N 070°40'20"E), 1650 m 12.06.2014, leg. Frisch. **Osh:** 1 ♂, 1 ♀, Aravan, 08.06.2001 (MSCB); 5 ♂, 6 ♀, E Osh, E Mady: Eshme (40°34'05"N 073°01'56"E), 1200 m 16.06.2012, leg. Frisch; 1 ♂, 3 ♀, Uozen – Jalal-Abad, NNW Shoro-Bashat: Kyr-Dzhol Valley (40°54'49"N 073°12'32"E), 1050 m 01.07.2012, leg. Frisch; 1 ♂, 3 ♀, Osh – Kyzyl-Kia: Dangi (canyon of Aravan-Say River) (40°21'12"N 072°36'32"E), 1120 m 16.06.2012, leg. Frisch; 1 ♂, Uzgen – Jalal-Abad: E Jalal-Abad (Changet River) (40°52'27"N 073°06'45"E), 840 m 01.07.2012, leg. Frisch. **Talas:** 4 ♂, 6 ♀, NW Toktogul: Chychkan River (42°07'02"N 072°48'22"E), 1680 m 03.07.2012, leg. Frisch; 1 ♀, NW Toktogul: Chychkan River at Dangi tributary (42°09'36"N 072°51'03"E), 1900 m 03.07.2012, leg. Frisch; 1 ♂, preceding locality, 29.05.2014, leg. Frisch; 3 ♂, 10 ♀, Chychkan River W Alabel Pass: Sharkyratma (42°14'54"N 072°59'56"E), 2750 m 03.07.2012, leg. Frisch (IBPB, MNHB); 2 ♂, 5 ♀, Kara-Buura River (42°19'13"N 071°35'39"E), 1750 m 17.06.2014, leg. Frisch. **Uzbekistan:** 1 ♂, Farg'ona (= Fergana, Ferghana): Marg'ilon (= Margilan) [Margelan], leg. Staudinger (NHMW); 1 ♂, Marg'ilon [Margelan], Reitter (NHMW).

**Distribution.** *Scopaeus ferganensis* sp. n. is distributed in the western Tien Shan and the northern Alai Mountains (Figure 47) and expected to occur also in the Fergana Basin. The species was collected in river valleys which drain to that intermontane basin as far west as an imaginary line from the Kara-Buura (42°19'N, 071°35'E) and Ters Rivers (41°35'N, 070°40'E) in the western Tien Shan south to the Katrang-Too Mountain Range at

40°07'N, 071°22'E south of the Fergana Basin. Further to the west, the species is replaced by the vicariant *S. triangularis* Luze. Towards north, *S. ferganensis* is widely distributed across the western Tien Shan to the northern incline of the Talas Alatau and the southern incline of the Kirgizskij Mountain Range at 42°14'N 072°59'E, which moreover constitutes the northeasternmost known locality. North of the Kirgizskiy Range, *S. ferganensis* is replaced by the allopatric *S. longilobatus* sp. n. (see below). The eastern and southern limit of distribution of *S. ferganensis* is unknown, because no samples are available from the inner Tien Shan and south of the northern incline of the Alai Mountains.

**Etymology.** The epithet '*ferganensis*' (Latin, adjective: 'originating from Fergana') refers to the distribution of this species around and probably within the Fergana Basin situated in between the Tien Shan and Alai Mountains.

### *Scopaeus longilobatus* sp. n.

(Figures 5, 22–24, 45)

**Diagnosis.** Habitus similar to *Scopaeus triangularis* Luze and *S. ferganensis* sp. n., from which it differs as follows (Figure 5): Total length 3.1–3.8 (Ø 3.6) mm, forebody length 1.8–1.9 (Ø 1.8) mm. Body coloration notably lighter; forebody light orange brown to light reddish brown except for darker scutellar triangle; abdomen blackish brown; antennae, maxillary palpi, and legs unicolorous light brown. Head slightly longer, 1.09–1.16 (Ø 1.14) times longer than wide, and slightly trapezoidal, across moderately widened tempora 1.03–1.07 (Ø 1.05) times wider than across smaller eyes, which are only 0.43–0.46 (Ø 0.45) times as long as tempora. Elytra notably shorter, only 0.9–0.96 (Ø 0.94) times as long as pronotum. Mesotibia stouter than in *S. triangularis*, but similar to *S. ferganensis*, 5.6–6.8 (Ø 6.2) times as long as wide.

**Male:** Shape and depth of posterior emargination of abdominal sternite VIII as in *S. triangularis* Luze (Figure 32). Aedeagus (Figures 22–24) resembling that of *S. triangularis* (Figures 16–18) and *S. ferganensis* (Figures 19–21), but different as follows: Triangular apical portion of apical lobes notably longer, occupying approximately distal sixth of apical lobes, in lateral view (Figure 22) almost sword-shaped and not wider than apical lobes, thus not projecting ventrally, and marked by acute angle proximally; in ventral and dorsal view (Figures 23, 24), apical portion of apical lobes wider laterally and somewhat stronger extended proximally.

**Female:** Spermathecal duct between bursa and sperm pump good three times as long as sperm pump (Figure 45).

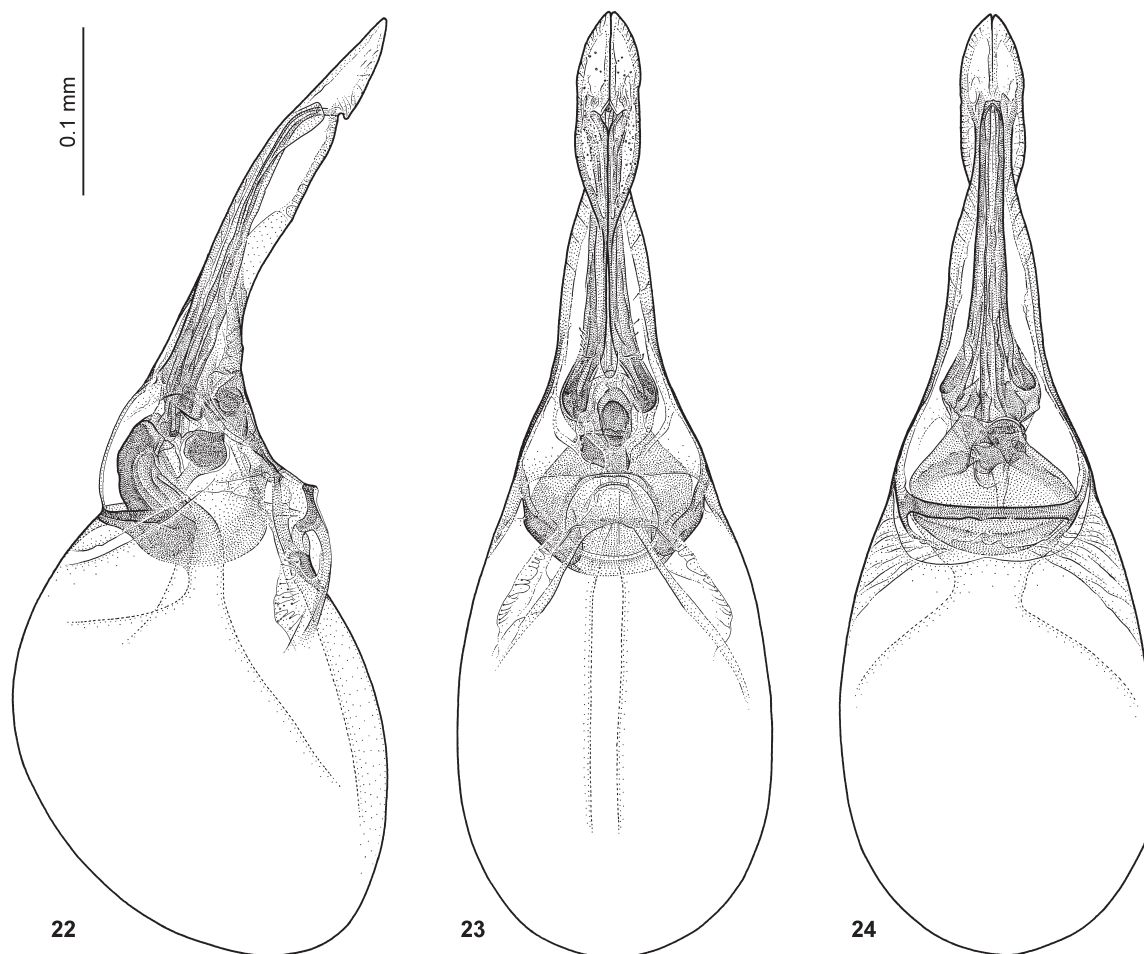
**Type material. Kyrgyzstan:** Holotype ♂, Issyk-Kul, 25 km W Balykchy: 2 km S Kek Mojnok Vtoroe (42°27'19"N 075°50'35"E), 1670 m 18.06.2011, leg. Frisch. Paratypes (163 specimens): **Chui:** 3 ♂, 2 ♀, SE Tokmok, S Orlovka: Taldy-Bulak River (42°43'14"N 075°36'55"E), 1260 m 03.07.2011, leg. Frisch; 1 ♂, 3 ♀, S Bishkek, SW Koytash: Taty (42°40'21"N 074°38'46"E), 1500 m 05.07.2011, leg. Frisch; 9 ♂, 21 ♀, SW Tokmok: Kegety (Kegety River) (42°36'50"N 075°08'22"E), 1500 m 03.07.2011, leg. Frisch; 7 ♂, 12 ♀, S Tokmok, S Kyzyl-Suu: Kyzyl Suu River (42°41'56"N 075°27'44"E), 1250 m 03.07.2011, leg. Frisch; 15 ♂, 19 ♀, preceding locality (42°39'28"N 075°28'11"E), 1430 m 23.06.2013, leg. Frisch (IBPB, MNHB); 2 ♀, S Kara-Balty, S Uzun-Bulak (Kara-Balta River) (42°35'59"N 073°52'01"E), 1500 m 13.06.2012, leg. Frisch; 1 ♀, SE Bishkek, 11 km W Yurevka: Karandolot (42°44'24"N 074°55'20"E), 1100 m 04.07.2011, leg. Frisch; 4 ♀, preceding locality (42°44'21"N 074°55'49"E), 1120 m 21.06.2013, leg. Frisch; 4 ♂, 5 ♀, preceding locality (42°44'16"N 074°55'17"E), 1100 m 22.06.2013, leg. Frisch. **Issyk-Kul:** 6 ♂, 7 ♀, same data as holotype; 7 ♂, 1 ♀, Kek Mojnok Vtoroe – Balykchy (42°27'19"N 075°50'36"E), 1580 m 19.06.2011, leg. Frisch; 4 ♂, 2 ♀, Balykchy – Kyzyl-Tuu: Kara-Talaa – Tuura-Suu (42°09'11"N 076°19'55"E), 2130 m 20.06.2011, leg. Frisch; 1 ♂, SE Kyzyl-Tuu (42°05'03"N 077°06'28"E), 2370 m 22.06.2011, leg. Frisch; 1 ♀, SE Kyzyl-Tuu (42°05'31"N 077°04'53"E),

2140 m 21.06.2011, leg. Frisch; 12 ♂, 9 ♀, Balykchy – Cholpon-Ata, N Toruaygyr: Ter-Ajgyr River (42°33'13"N 076°24'28"E), 1800 m 01.07.2011, leg. Frisch. **Talas:** 4 ♂, 2 ♀, S Talas, S Kozuchak (Besh-Tash NR) (42°21'14"N 072°18'45"E), 1700 m 20.06.2014, leg. Frisch.

**Distribution.** As far as known presently, *Scopaeus longilobatus* sp. n. is restricted to the very north of the Tien Shan and recorded from the northern foothills of the Talas Alatau at 42°21'N, 072°18'E across the northern incline of the Kirgizskij Mountain Range as far east as the northern incline of the Terskej Alatau south of Issyk-Kul (Figure 47).

**Etymology.** The epithet '*longilobatus*' (Latin, adjective: 'longilobate' or 'having long lobes') refers to the lengthened triangular apex of the apical lobes of the aedeagus of *Scopaeus longilobatus* sp. n..

**Remark.** A female collected east of Almaty in southeastern Kazakhstan [Sarybastau (Chylik River), 14.06.1988, leg. Kastcheev (MNHB)] probably belongs to *S. longilobatus* sp. n., but in absence of male specimens it is not included in the type series and the distribution map (Figure 47).



**Figures 22–24.** *Scopaeus longilobatus*: Aedeagus in (22) lateral, (23) ventral, (24) dorsal view (paratype: Kyrgyzstan, Issyk-Kul, 25 km W Balykchy).

*Scopaeus hiekei* sp. n.  
(Figures 6, 25–27, 33)

**Diagnosis.** Total length 3.6 mm, forebody length 1.9 mm. Forebody light reddish brown except for darker scutellar triangle; abdomen blackish brown; antennae, maxillary palpi, and legs light brown (Figure 6). Head 1.1 times as long as wide and notably trapezoidal, across tempora 1.06 times as wide as across eyes, which are 0.49 times as long as tempora. Elytra very short, 0.87 times as long as pronotum. Median denticles of labrum slightly longer than lateral denticles. Mesotibia stout, 5.3 times as long as wide.

**Male:** Abdominal sternite VIII with deep, wide, triangular emargination in almost posterior third (Figure 33). Aedeagus (Figures 25–27) with remarkably small bulbus and strongly enlarged median portion with long, curved dorsal endosclerite; apical lobes evenly curved ventrad, but in distal third notably curved dorsad, their triangular apex strongly projecting ventrally and marked by right-angled ventroproximal end; ventral

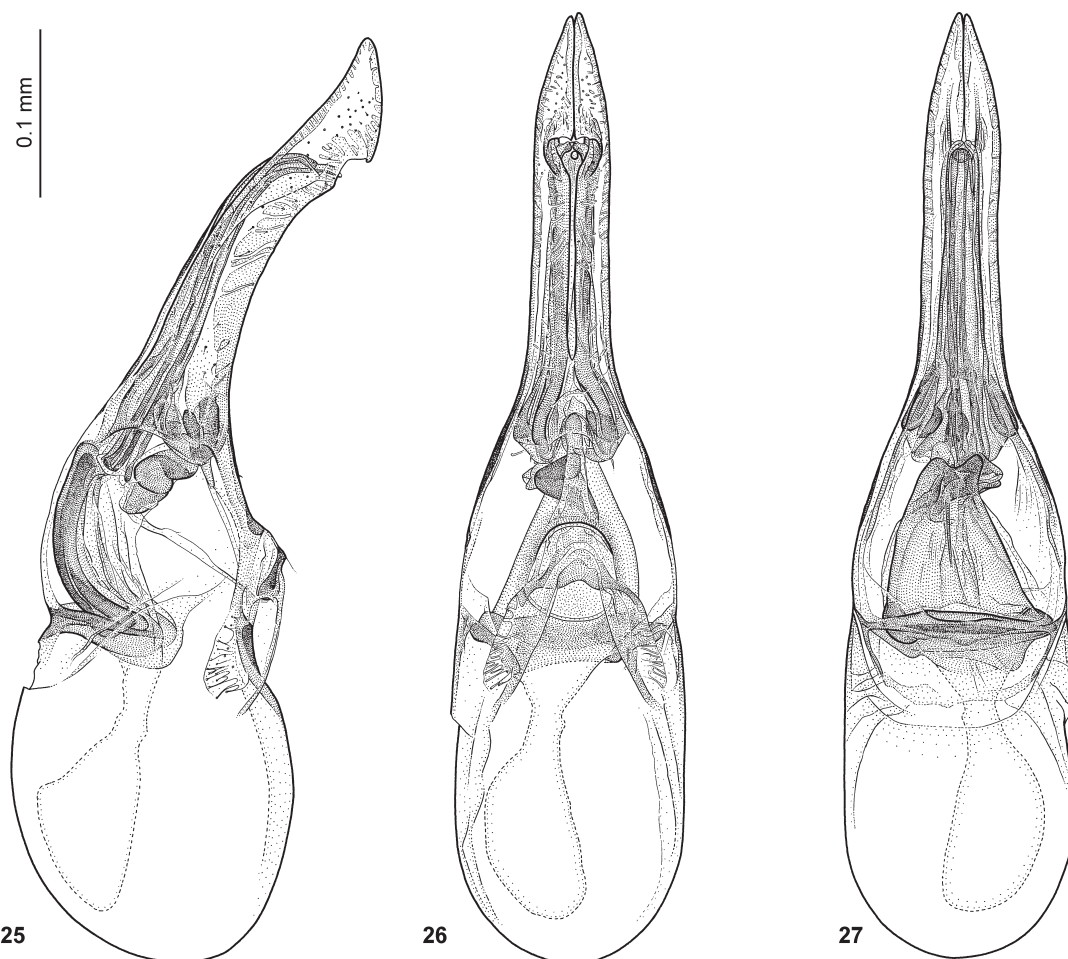
margin of apical lobes obtuse-angled widened proximal of apical, ventral enlargement, forming shallow, concave emargination; in ventral and dorsal view (Figures 26, 27), apical lobes parallel laterally, but in about distal third evenly tapering towards acute apex; dorsal lobe and flagellum straight, but towards end evenly bent ventrad.

**Female unknown.**

**Type material.** Holotype ♂, Kazakhstan, Almaty, Almaty City: Wesnovka River, 22.05.1978, leg. Hieke.

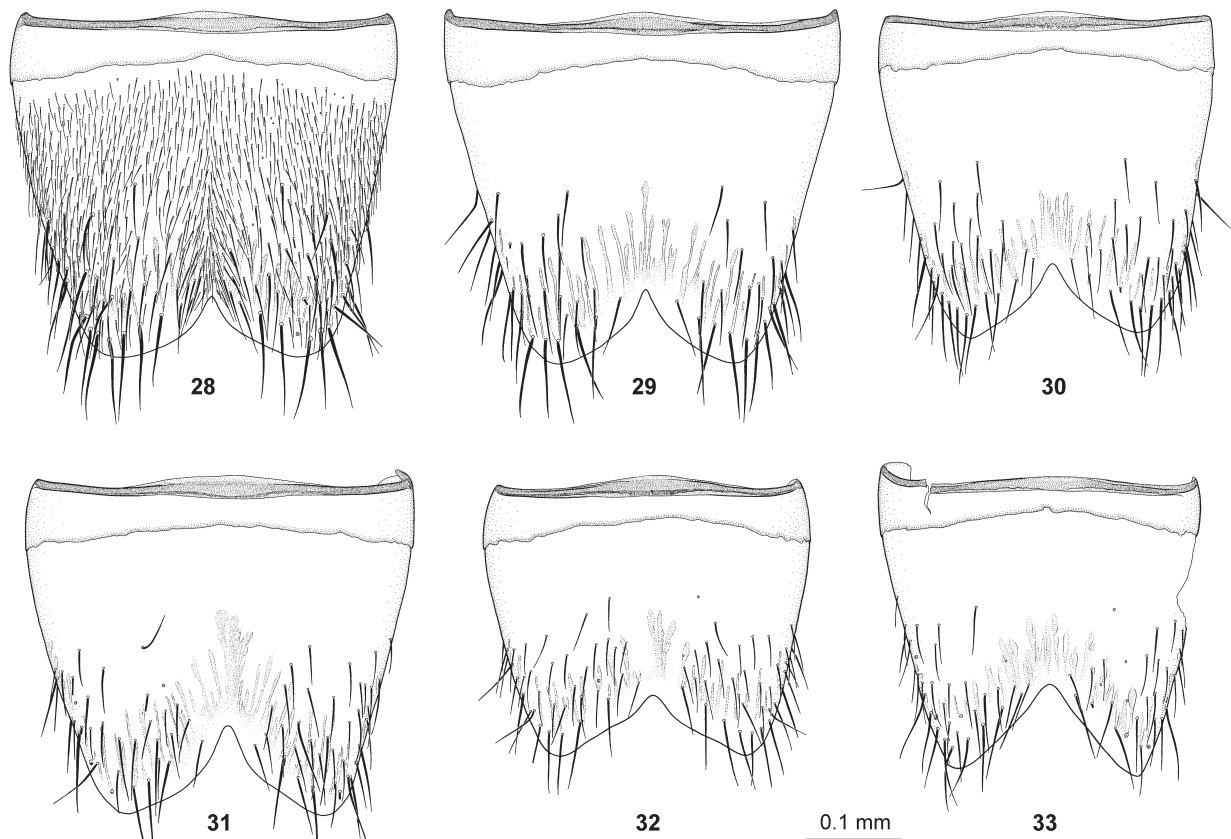
**Distribution.** *Scopaeus hiekei* sp. n. is hitherto known only from the type locality in the northern foothills of the Ile Alatau in the city zone of Almaty, Kazakhstan (Figure 47).

**Etymology.** With pleasure I dedicate this new species to my dear colleague Dr. Fritz Hieke, curator of the Coleoptera collection of the Museum für Naturkunde Berlin from 1962–1995 and well-known specialist of *Amara* Bonelli (Carabidae), who discovered it at the occasion of a collecting trip to Kazakhstan.

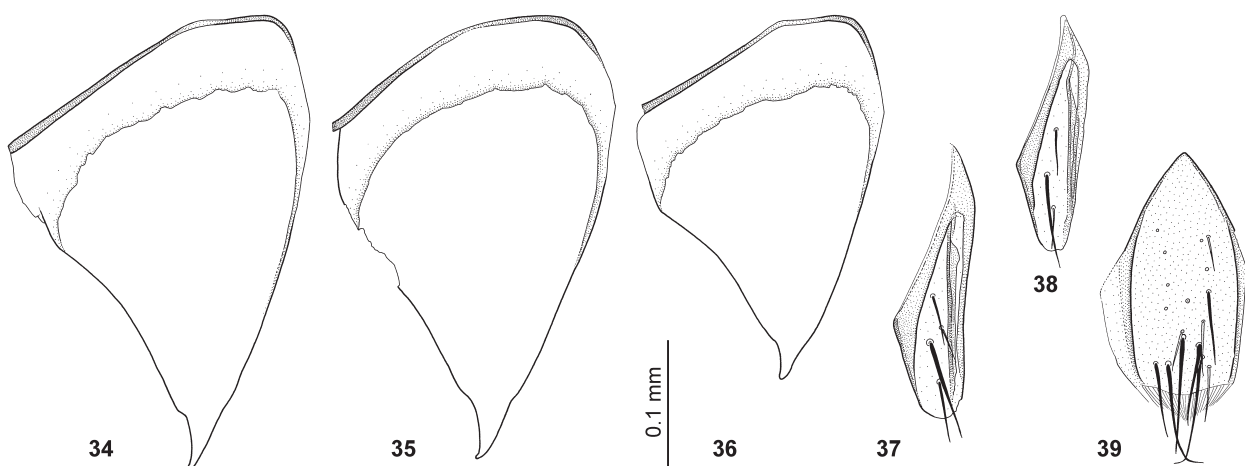


Figures 25–27. *Scopaeus hiekei*: Aedeagus in (25) lateral, (26) ventral, (27) dorsal view (holotype).

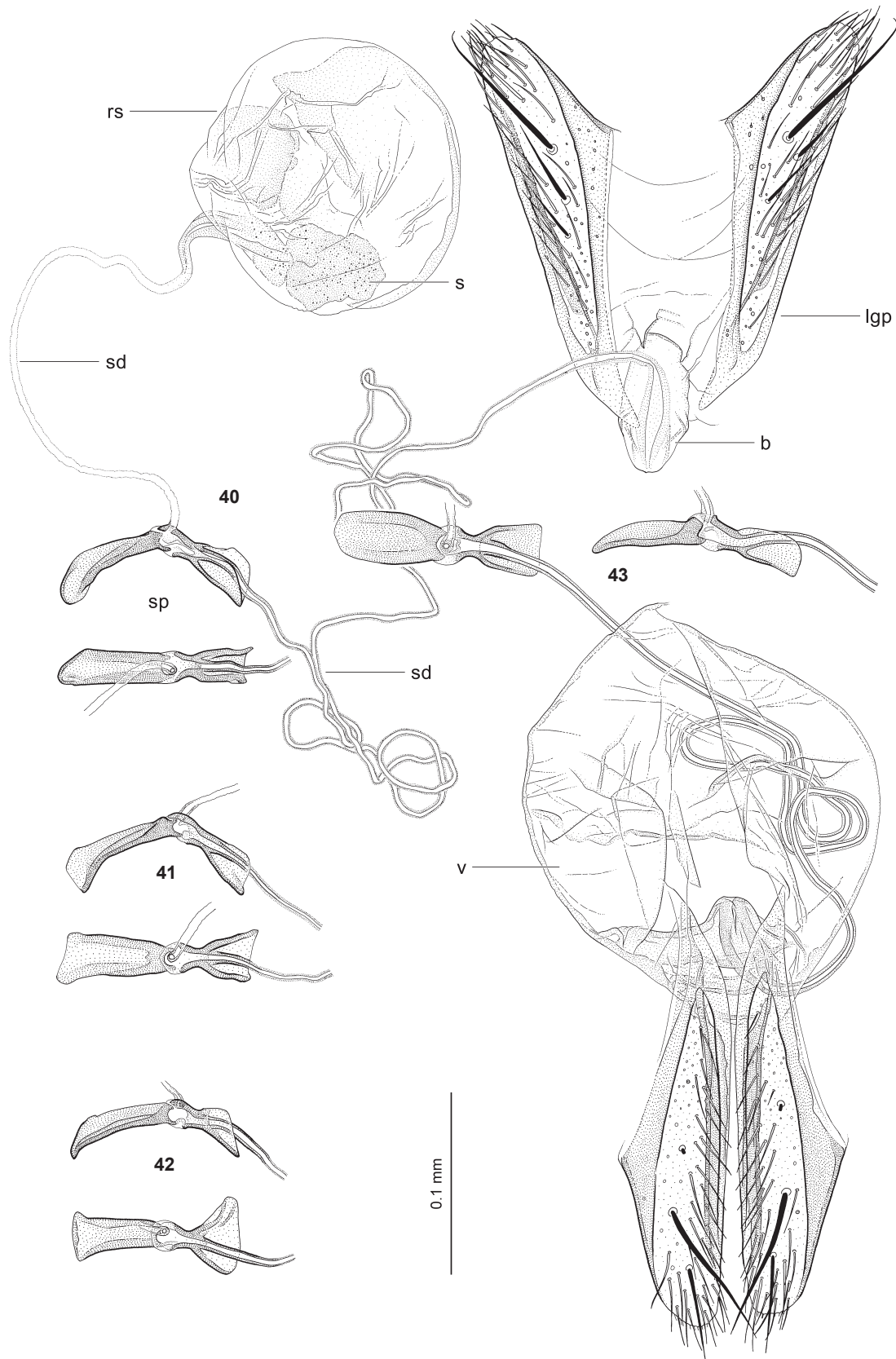




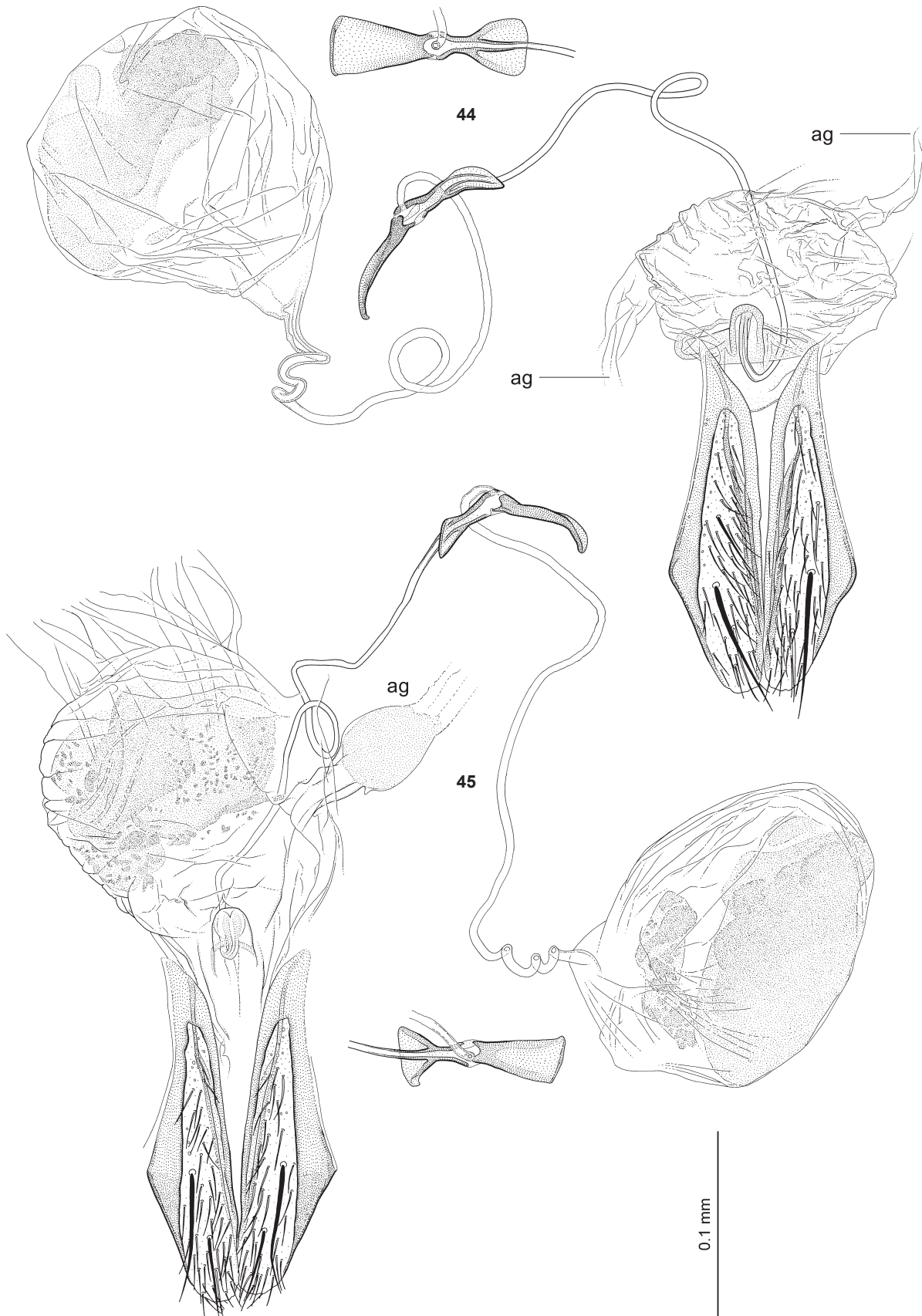
Figures 28–33. Abdominal sternite VIII of male of (28) *Scopaeus s. similis* (Kyrgyzstan, Chui: Taldy-Bulak River), (29) *S. s. similis* (Kyrgyzstan, Issyk-Kul, WE Tyup), (30) *S. s. minor* (paratype; Iran, Semnan: Shahrud – Mojen), (31) *S. gissarensis* (holotype), (32) *S. triangularis* (Kyrgyzstan, Batken: Isfana – Isfara), (33) *S. hiekei* (holotype).



Figures 34–39. Female genital sclerites of *S. similis* species group: Laterotergite IX of (34) *Scopaeus s. similis* (Kyrgyzstan, Bishkek), (35) *S. gissarensis* (paratype), (36) *S. triangularis* (Kyrgyzstan, Batken, S Ay-Kol); lateral gonocoxal plate of (37) *S. s. similis* (Kyrgyzstan, Bishkek), (38) *S. triangularis* (Kyrgyzstan, Batken, Ay-Kol); tergite X of (39) *S. s. similis* (Kyrgyzstan, Bishkek).



**Figures 40–43.** Female primary sexual organs of (40) *Scopaeus s. similis* (Kyrgyzstan, Bishkek) in dorsal view with lateral gonocoxal plates folded laterally, (43) *S. gissarensis* (paratype) in ventral view; sperm pump of (41) *S. s. similis* (Kyrgyzstan, S Bishkek: Ala-Archa River), (42) *S. s. minor* (Iran, Razavi Khorasan: Mareshk). Abbreviations: **b** – bursa, **lgp** – lateral gonocoxal plate, **rs** – receptaculum seminis, **s** – spermatophore, **sd** – spermathecal duct, **sp** – sperm pump.



Figures 44–45. Female primary sexual organs of (44) *Scopaeus triangularis* (Kyrgyzstan, Batken: S Ay-Kol) in ventral view, (45) *S. longilobatus* (Kyrgyzstan, S. Bishkek) in ventral view. Abbreviation: ag – accessory gland.

#### 4. Phylogeography

The *Scopaeus similis* species group is here defined for six closely related taxa from Central Asia and neighbouring parts of the Middle East. I postulate it a monophyletic group judging from the following features of the aedeagus, which I consider as autapomorphies of the group. The typical set of distal lobes of the aedeagus of *Scopaeus* s. str. (Frisch et al. 2002: 38) is very slender, stiletto-shaped, and the apical lobes show a characteristic triangular end. In addition, the two apico-lateral ends of the dorsal lobe are weakly sclerotized and appear almost hyaline in lateral view (e.g. Figures 7, 10–13). The characters of the female primary sexual organs, first of all the hyaline bursa (Figures 40, 43–45), are however ancestral and not suitable to support a phylogenetic hypothesis.

Within *Scopaeus* Erichson, 1839, the *S. similis* species group must be assigned to *Scopaeus* s. str., because it shows the derived characters of that clade, which are (Frisch et al. 2002: 38) the complete division of the median lobe of the aedeagus in two apical lobes and a dorsal lobe between them, a long flagellum of the aedeagus (Figures 7–9), and the presence of a terminal apophysis of the chamber segment of the sperm pump (Figures 40–45). The combination of derived ectomorphological and genital features of the species included suggest, that the *S. similis* group must be looked upon as a modern clade of the genus, which is closely related to the West Palearctic *S. sulcicollis* and *S. elegans* species groups (Frisch et al. 2002: 37, phylogenetic tree) and the Central Asian

*S. obscuripes* group (Frisch 1999a, 2015, in press). These derived characters are the more or less trapezoidal head, the strongly widened protarsomeres (Figures 1–6), and the absence of setiferous lateral lobes of the aedeagus.

As far as known presently, the *S. similis* species group reveals three phylogenetic lineages. The first one is made up of *Scopaeus similis* Eppelsheim and *S. gissarensis* sp. n., which can be considered as sister taxa according to the short, narrow posterior emargination of abdominal sternite VIII (Figures 28–31), the variable length of the lateral denticles of the labrum, and genital characters such as the apomorphic structure of the aedeagus with, in ventral view, laterally angulate widened, both distad and proximad strongly tapered apical portion of the apical lobes with acute ends (Figures 8, 14) and the long, winding spermathecal duct (Figures 40, 43). *Scopaeus triangularis* Luze, *S. ferganensis* sp. n., and *S. longilobatus* sp. n. constitute another lineage. They differ from the above *S. similis* lineage by average smaller size, the notably wider triangular emargination of abdominal sternite VIII (Figure 32), the short spermathecal duct (Figures 44, 45), and the general shape of the aedeagus with, in ventral and dorsal view, longer and parallel apical portion of the apical lobes without lateral, angulate widening and with less acute apical end (Figures 17, 18, 20, 21, 23, 24), which I consider an apomorphic character. Though the ectomorphological and genital differences of *S. triangularis*, *S. ferganensis* and *S. longilobatus* are small, they are stable, and intermediate populations are unknown. They are moreover not expected, because in the western

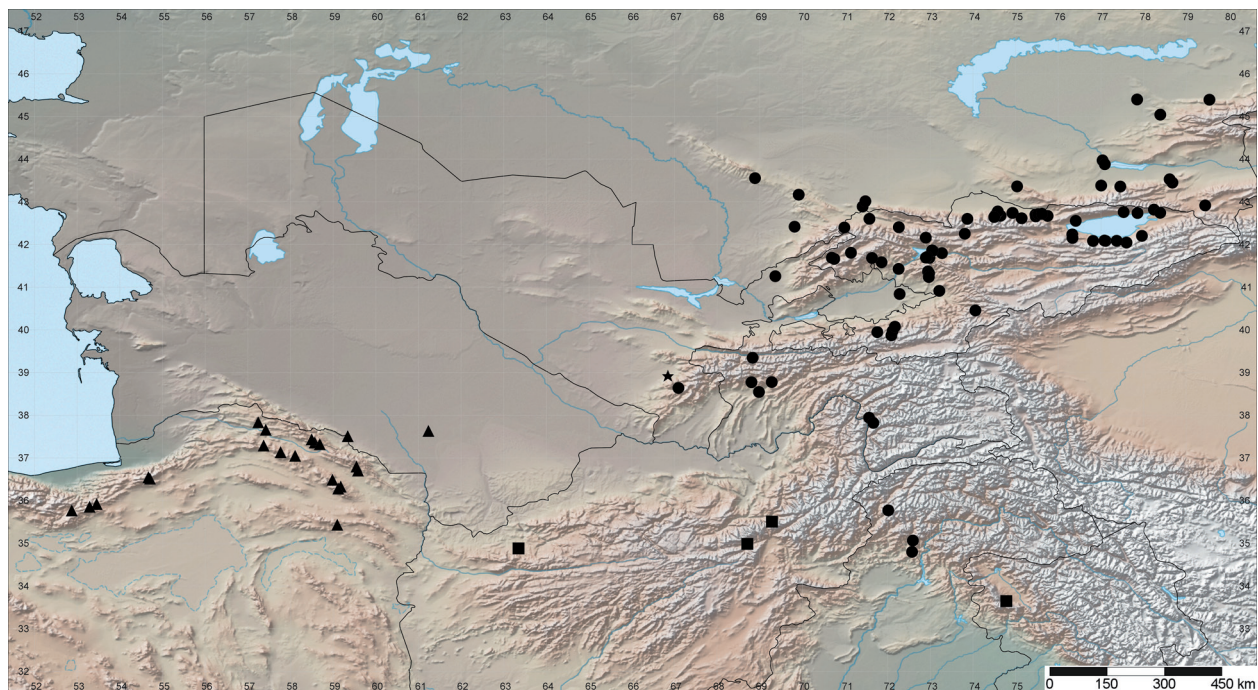


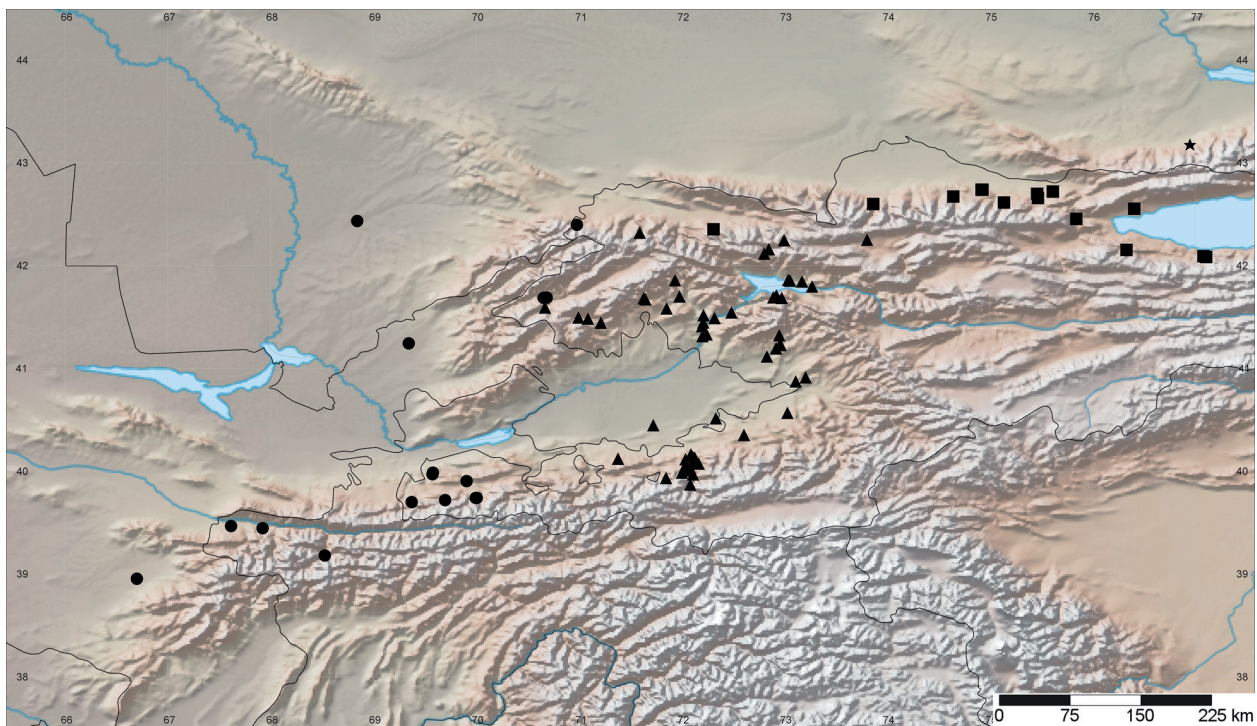
Figure 46. Distribution of the *Scopaeus similis* - lineage: ● *S. s. similis*, ▲ *S. s. minor*, ■ *S. similis* incertae sedis, ★ *S. gissarensis*.

Tien Shan I collected these species in close proximity, but never syntopically (Figure 47). Nevertheless, *S. triangularis*, *S. ferganensis*, and *S. longilobatus* doubtlessly represent phylogenetically young taxa. Judging from the distinct shape of the aedeagus (Figures 25–27), *Scopaeus hiekei* sp. n. finally constitutes the third lineage. It is hitherto unknown if this species represents a third group of vicariants or if it holds an isolated position within the *S. similis* species group. While both the ectomorphological and genital characters of the above lineages are suitable to postulate monophyletic groups, I see no characters for a sound hypothesis on sister group-relationships between them.

Unlike the *S. hiekei* lineage, numerous distributional data are available for a biogeographic reflection on the *S. similis* and *S. triangularis* lineages, which are each made up of three allopatric taxa (Figures 46, 47). In the former clade, *S. s. similis* is the dominant taxon, being widespread across the Central Asian mountains from the Dzhungarian Alatau in the north southwards to the Hindukush, Kashmir, and the Himalayan Pir Panchal Range, though specimens from the Hindukush and Pir Panchal differ somewhat in their ectomorphological characters (see chapter *Scopaeus similis specimens incertae sedis*). *Scopaeus s. minor* is the western vicariant of *S. s. similis* in the Elburz and Turkmeno-Khorassanian mountain ranges, separated from the type form by a distribution barrier of about 500 km dry steppe. The distribution pattern of *S. gissarensis*,

which is known from the type locality in the very west of the Alai Mountains only, is still unknown. Judging from the wide distribution of the allopatric *S. s. similis*, however, the species is expected to be endemic to the very west of the Alai Mountains. The taxa of the *S. triangularis* lineage also go back to allopatric speciation. *Scopaeus triangularis* is restricted to the very west of the Tien Shan and Alai Mountains. The orogenesis of the northern mountain chains of the Tien Shan must be looked upon as the vicariance event which caused the speciation of the northern *S. longilobatus* and the southern *S. ferganensis*, which is distributed around the eastern Fergana Basin.

While their members are strictly allopatric, the *S. similis* and *S. triangularis* lineages show a sympatric and often syntopic distribution in the Central Asian mountains (Figures 46, 47). The phenomenon of sympatric phylogenetic lineages within a monophyletic clade is widespread in *Scopaeus*, e.g. in the Pontomediterranean and Middle Eastern *S. elegans* species group (Frisch 2010: 187–189). The *S. triangularis* lineage however did not reach the eastern Elburz and the Turkmeno-Khorassanian mountains. In Kyrgyzstan I frequently collected *S. similis* and the local species of the *S. triangularis* lineage in the same habitat. In Central Asia, the members of the *S. similis* group are the commonmost species of *Scopaeus*. They nearly inhabit all kinds of riparian habitats and even dwell in the more or less sterile, often flooded gravel banks of the large rivers, which the remaining clades of *Scopaeus* usually avoid.



**Figure 47.** Distribution of the *Scopaeus triangularis* and *S. hiekei* - lineages: ● *Scopaeus triangularis*, ▲ *S. ferganensis*, ■ *S. longilobatus*, ★ *S. hiekei*.

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