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## Research article

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# Taxonomy of the poorly known *Quedius mutilatus* group of wingless montane species from Middle Asia (Coleoptera: Staphylinidae: Staphylinini)

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**Abstract.** The *Quedius mutilatus* group, a very poorly known presumably monophyletic complex of wingless, possibly hypogean species confined to the Tien-Shan Mountains, is characterized as such for the first time. Newly available material clarified the identity of *Q. mutilatus* Eppelsheim, 1888 and *Q. kalabi* Smetana, 1995, each hitherto known from a handful of non-conspecific and vaguely georeferenced specimens only. Additional material is reported for *Q. equus* Smetana, 2014 and one species, *Quedius kungeicus* sp. nov., is described. All available data on the taxonomy, distribution and bionomics for all these four species of the group are summarized.

**Keywords.** Rove beetles, new species, *Microsaurus*, allopatry, endemism.

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## Introduction

The mega-diverse rove beetle genus *Quedius* Stephens, 1829 includes a small number of hypogean species with characteristic morphological modifications such as: notably reduced eyes, weaker cuticular pigmentation, dorso-ventrally flattened body with long legs, pronotum strongly narrowing anteriorly, as well as reduced non-functional wings with corresponding shortened elytra and absence of a palisade fringe on the abdominal tergite VII. Hypogean species of *Quedius* are phylogenetically heterogeneous, while their distributions, bionomics and sister group relationships remain largely unexplored (Solodovnikov & Hansen 2016). The poor systematic knowledge of these specialized *Quedius* is unfortunate, as the genus represents an interesting model to study speciation within the context of mountain orogenesis. In this respect, the similar species *Q. mutilatus* Eppelsheim, 1888, *Q. kalabi* Smetana, 1995 and *Q. equus* Smetana, 2014 (grouped here as the ‘*Q. mutilatus* group’)

of the subgenus *Microsaurus* Dejean, 1833 seemed noteworthy, as they were the only members of the genus with such distinct morphological traits in the Tien-Shan, a vast mountain system of the Palaearctic region. As expected, the *Q. mutilatus* group was hitherto known from very scarce, mostly non-georeferenced material lacking bionomic data. Our examination of various collections of *Quedius* yielded new material that was collected over many decades and that sheds light on the composition, distribution and bionomics of this peculiar Asian species group. This paper reports these findings with, among other discoveries, a species new to science.

## Material and methods

This paper is based on the examination of material from the following institutions and private collections:

- cRyv = Private collection of A.B. Ryvkin, Moscow, Russia
- cSch = Private collection of M. Schülke, Berlin, Germany (to be deposited at the Natural History Museum of Berlin)
- NMW = Natural History Museum, Vienna, Austria (H. Schillhammer)
- ZIN = Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (B. Korotyaev)
- ZMUC = Zoological Museum, University of Copenhagen (part of the Natural History Museum of Denmark), Copenhagen, Denmark (A. Solodovnikov, S. Selvantharan)

The holotype of the new species is deposited at ZIN.

Morphological examination and preparation of specimens were conducted using Lomo MSP-2 v. 2 and Leica M125 stereo microscopes. Measurements were recorded at  $4.5\times$  magnification using an ocular micrometer.

Abbreviations:

- EL = length of elytra (from humerus to the most distal part of the posterior margin)
- EW = width of elytra (maximum, with elytra closed along suture)
- FB = forebody length
- HL = head length (from base of labrum to neck constriction along the head midline)
- HW = head width (maximum, including eyes)
- PL = pronotum length (along midline)
- PW = pronotum width (maximum)

Overall body length was measured from the apex of the labrum to the apex of the abdomen. All measurements are in mm unless otherwise indicated.

The photographs of the habitus and aedeagi were obtained with a Nikon D700 digital SLR camera attached to a Nikon SMZ 1500 stereo microscope. Photos and line drawings of the male genitalia are based on preparations of their soft parts in glycerin (obtained via dissecting, maceration in 10% KOH and rinsing in distilled water). Pencil sketches for subsequent computer-based inking were made using a drawing tube attached to a Nikon SMZ 1500 binocular microscope.

The species distribution map in Fig. 1 was produced with QGIS 2.12.0 free software. It is based on the approximate geographic coordinates that we were able to find with the aid of various printed maps or online systems (Google Maps, Google Earth and others) for the toponyms indicated on the specimen labels. Our friend and colleague Ilya Kabak (St. Petersburg, Russia) kindly communicated the coordinates for the specimens he collected. Since none of the geographic coordinates are indicated on the original locality labels for any of the examined specimens, they are given in square brackets in the ‘Material examined’ sections. Specimen labels with very ambiguously indicated localities are cited verbatim and given between quotation marks. All our interpretations of such labels are given in square brackets.

## Results

Family Staphylinidae Latreille, 1802  
Subfamily Staphylininae Latreille, 1802  
Tribe Staphylinini Latreille, 1802  
Subtribe Quediina Kraatz, 1857  
Genus *Quedius* Stephens, 1829  
Subgenus *Microsaurus* Dejean, 1833

### *Quedius mutilatus* group

#### Diagnosis

The *Quedius mutilatus* group of species can be recognized as follows: relatively large *Microsaurus* (body length 8–11.6 mm) with brown to dark brown, dorso-ventrally flattened body, with notably small eyes and pronounced signs of brachyptery such as short elytra and absent palisade fringe on abdominal tergite VII; head with posterior frontal puncture situated very close to neck; pronotum with distinct anterior and posterior angles, normally with three punctures in dorsal rows with anteriormost (smaller) puncture located latero-anteriorly at pronotal anterior margin, and with one to two sublateral punctures situated slightly anterior to large lateral puncture; scutellum impunctate; aedeagus robust, symmetrical, with apical portion of median lobe slightly curved towards paramere, with characteristic tooth near apex (in lateral view), with paramere widest shortly before apex (in parameral view) and with four distinct groups of sensory peg setae: two apical and two lateral.

#### List of species

*Quedius mutilatus* Eppelsheim, 1888; *Quedius kalabi* Smetana, 1995; *Quedius equus* Smetana, 2014 and *Quedius kungeicus* sp. nov.; all species can be reliably separated from each other by the structure of the aedeagus only.

#### Distribution

All species of the group seem to be allopatric (Fig. 1): *Quedius mutilatus* Eppelsheim, 1888 is restricted to the central part of Terskei Alatau, south of Issyk-Kul Lake; it is replaced eastwardly by *Q. kalabi* Smetana, 1995 and then *Q. equus* Smetana, 2014, the latter probably being distributed throughout NE Terskei Alatau to Xinjiang Province in China. *Quedius kungeicus* sp. nov. is known from the type locality in eastern Kungei Alatau only. There is a single female from the high altitudes of Atbashi Mountain in Central Tien-Shan, which presumably belongs to the *Q. mutilatus* group, but cannot be further identified without associated males. Three ambiguous specimens from Toksanbai in Dzungarian Alatau, damaged by dermestids, are presumably mislabelled and in fact originate from Terskei Alatau, because a single fully preserved male among them displays an aedeagus of the *Q. kalabi* type. All specimens of the *Q. mutilatus* group with recorded bionomic data indicate a specialization to high elevations.

#### Systematics

Some authors affiliated *Q. mutilatus* with *Q. przewalskii* Reitter, 1887 (Reitter 1887; Boháč 1988) or with the *Q. przewalskii* group (Smetana 2014); the latter, however, lacks a clear definition (Solodovnikov & Hansen 2016). For example, Smetana (2014) affiliated *Q. mutilatus* and *Q. equus* to the *Q. przewalskii* group, contrary to his (e.g., Smetana 2001) earlier opinion of the composition of this group. Based on body chaetotaxy and the shape of the aedeagus, it could be related to *Q. puncticollis* (Thomson, 1867), as proposed by Coiffait (1978). The *Q. puncticollis* group of Coiffait (1978) is phylogenetically heterogeneous, based on the diverse morphology and scattered distributions of species. We establish the *Q. mutilatus* group here for *Q. mutilatus* and related species from Tien-Shan. Members of the group

markedly differ from *Q. puncticollis* and related species in a microphthalmous, brachypterous habitus, with weakly pigmented coloration and in the shape of the aedeagus, with a pointed apex of the median lobe and sensory peg setae arranged in apical and lateral groups. The *Q. mutilatus* group differs from the *Q. przewalskii* group, in the more restricted sense of Smetana (2001), in having three (contrary to one or two) punctures in the dorsal rows of the pronotum and in the structure of the aedeagus, which is symmetrical, with a median lobe having a pointed apex and a more basally positioned ventral tooth, and with wide parameres having two groups of sensory peg setae (apical and lateral).

All species of this group are individually treated below. In addition to the description of a new species, a redescription is provided for *Q. mutilatus*, the most commonly cited species of the group with which other, later described species have been compared.

***Quedius mutilatus* Eppelsheim, 1888**  
Figs 1–2, 4A–B

*Quedius mutilatus* Eppelsheim, 1888: 58 (original description).

*Quedius mutilatus* – Gridelli 1924: 23 (redescription). — Coiffait 1978: 161 (redescription). — Smetana 1998: 118 (lectotype designation, illustrations, comparison with *Q. kalabi*).

**Material examined**

**Type material**

KYRGYZSTAN: Terskei Alatau mountain range, lectotype, ♂, “♂ / 245 [handwritten label]/Fluss. Tamgi [river Tamga in Karakol Gorge] Turkestan. Leg. Akinin [handwritten label]/c.Epplsh. Steind. d [printed label]/*Q. mutilatus* Epp. Type [handwritten label]/TYPUS [red printed label]/LECTOTYPE *Quedius mutilatus* Eppelsheim A. Smetana des. 1997 [red handwritten label]” (NMW).

**Additional material**

KYRGYZSTAN: Terskei Alatau mountain range: 2 ♂♂, Barskoon Valley [42.0900° N, 77.5900° E], 14–15 Jul. 1983, S. Alekseev leg. (cRyv); 4 ♂♂, 4 ♀♀, same collecting data as preceding, but 2400 m, 18 Jun. 1997, V. Dolin leg. (NMW, ZMUC); 2 ♂♂, Chon-Kyzyl-Suu River, 3000 m [42.1700° N, 78.2500° E], 29 Jul. 1955, D. Panfilov leg. (ZIN); 4 ♂♂, same collecting data as preceding, but 2500–2700 m, coniferous forest, 2 Jul. 1959, Zaslavsky leg. (ZMUC); 2 ♂♂, 3 ♀♀, at Kochevnikov stationary (25 km S of village Pokrovka [village Kyzyl-Suu]), 2450 m [42.1260° N, 78.0250° E], coniferous forest, leaf litter under moss and grass, 2–7 Jul. 1988, V. Yanushev leg. (cRyv); 4 ♂♂, 2 ♀♀, same collecting data as preceding, but 27–28 Jun. 1988 (cRyv); 2 ♂♂, 4 ♀♀, same collecting data as preceding, but coniferous forest, 2500 m, 12–31 Aug. 1984, N. Turtseva leg. (cRyv, ZMUC); 1 ♂, 4 ♀♀, same collecting data as preceding, but 15–18 Jun. 1985 (cRyv); 2 ♀♀, same collecting data as preceding, but 19 Jun. 1986 (cRyv); 4 ♂♂, ‘Turkestan Akinin-Tepe’ (NMW).

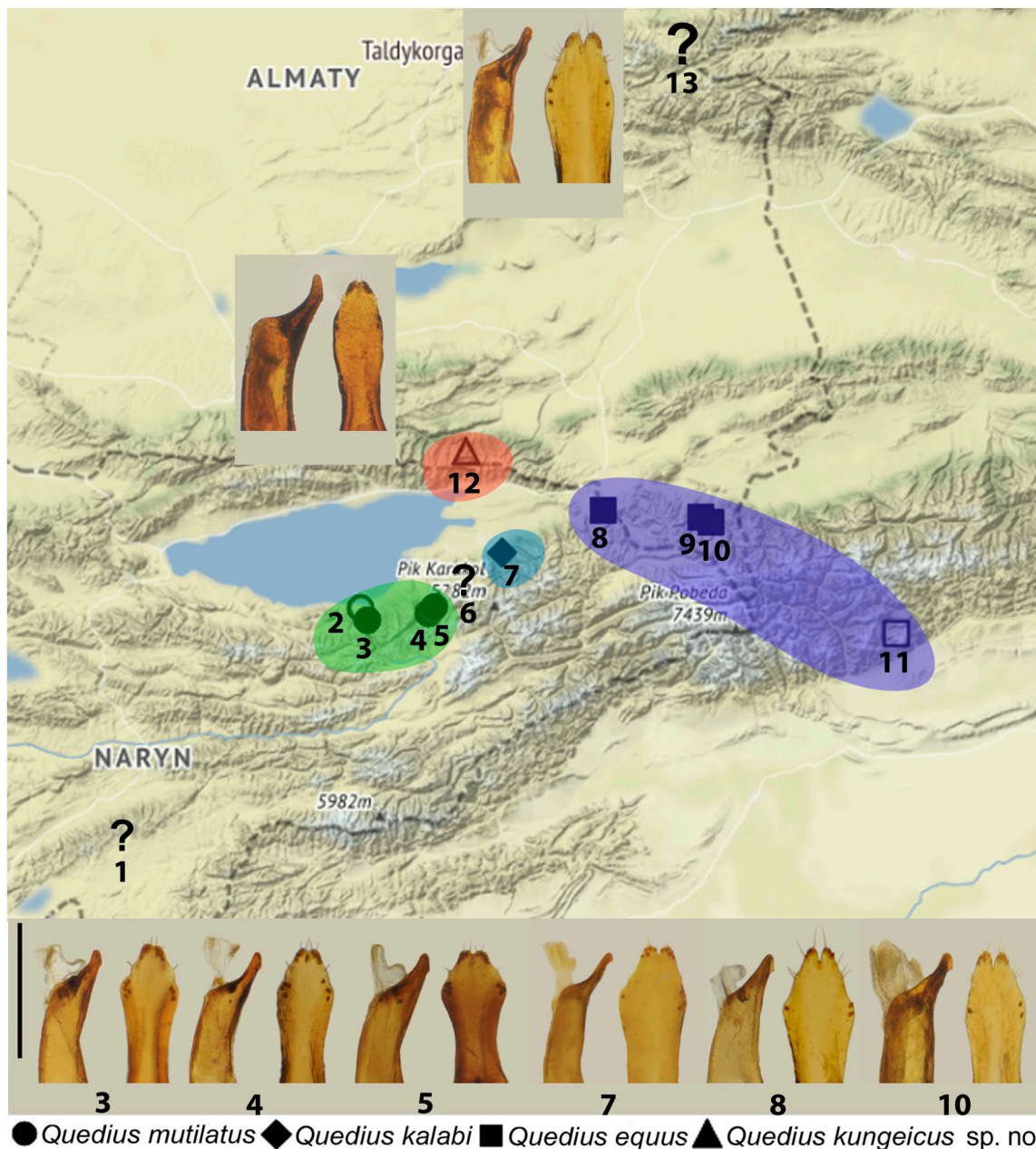
**Redescription**

MEASUREMENTS AND RATIOS. Lectotype: HL: 1.07, HW: 1.11, PL: 1.30, PW: 1.52, EL: 1.16, EW: 1.57, FB: 3.52, HL/HW: 0.96, PL/PW: 0.85, EL/EW: 0.74; non-type material (range, arithmetic mean, n = 30): HL: 1.18–1.64 (1.36), HW: 1.11–1.57 (1.29), PL: 1.32–.82 (1.50), PW: 1.48–2.02 (1.74), EL: 1.25–1.70 (1.42), EW: 1.52–2.00 (1.70), FB: 3.77–5.07 (4.28), HL/HW: 0.93–1.22 (1.03), PL/PW: 0.79–0.95 (0.87), EL/EW: 0.75–0.93 (0.83).

BODY. Length 8–12 mm; brown to light brown including appendages, elytra and abdominal tergites, becoming slightly paler toward apex, sometimes head and abdomen slightly darker than pronotum and elytra; distinctly flattened dorso-ventrally.



HEAD. About as long as wide [HL/HW: 0.93–1.22 (1.03)], with broadly arcuate posterior angles; surface with distinct microsculpture of transverse waves on disc, becoming more or less isodiametric on frons between eyes, and with distinct sparse non-setiferous micropunctuation. Eyes small and flat, not protruding over lateral contour of head; temples about 2.00–3.18 (2.54) times as long as longitudinal diameter of eye. Head disc on each side with setiferous punctures as following: anterior frontal puncture at inner margin of eye, posterior frontal puncture very close to neck, and pair of smaller vertical punctures immediately medio-posteriorly from the latter puncture. Each temple with two temporal punctures of which posterior temporal puncture closer to posterior margin of head than to posterior margin of eye; additionally, temples with some fine setiferous punctures bearing short pale setae.



**Fig. 1.** Distribution and aedeagus variability of the *Quedius mutilatus* group in the Tien-Shan Mountains. Numbers are specified in Table 1. Empty symbols = type specimens (for *Q. kalabi* precise locality of the holotype unknown); ? = ambiguously labelled or undetermined material. Scale bar: 0.5 mm.

**Table 1.** Geographical data for material mapped in Fig. 1. Geographic coordinates found for localities indicated on the labels are given in the square brackets, those communicated by collectors without brackets.

N	Species	Material	Locality, altitude, date (for exact label data see Material examined)	Long	Lat
1	<i>Q. mutilatus</i> sp. ex gr. <i>mutilatus</i>	1 ♀	Kyrgyzstan, Central Tian Shan, Atbashi mt. range, S slope, 3000 m, 22 Jul. 1959, V. Zaslavsky leg.	[75.88]	[40.99]
2	<i>Q. mutilatus</i>	1 ♀	Kyrgyzstan, Terskey Alatau, Tamga riv., I. Akinin leg.	[76.23]	[42.24]
3	<i>Q. mutilatus</i>	2 ♂♂	Kyrgyzstan, Terskey Alatau, Barskoon riv. valley, 14–15 Jul. 1983, S. Alekseev leg.	[77.59]	[42.09]
4	<i>Q. mutilatus</i>	2 ♂♂	Kyrgyzstan, Terskey Alatau, Chon-Kyzyl-Suu riv., 3000 m, 29 Jul. 1955, D. Panfilov leg.	[78.25]	[42.17]
5	<i>Q. mutilatus</i>	2 ♂♂, 3 ♀♀	Kyrgyzstan, Terskey Alatau, 25 km S of vill. Kyzyl-Suu, coniferous forest, leaf litter under moss and grass, 2450 m, 2–7 Jul. 1988, V. Yanushev leg.	[78.025]	[42.126]
6	<i>Q. mutilatus</i> sp. ex gr. <i>mutilatus</i>	1 ♀	Kyrgyzstan, Terskey Alatau, Jety-Oguz, 20 km SW of Przewalsk, 3000–3500 m, 23–30 Jun. 1989, J. Kalab leg.	[78.22]	[42.32]
7	<i>Q. kalabi</i>	1 ♂, 1 ♀	Kyrgyzstan, E Terskey Alatau, Teploklyuchenka vill., 2600 m, 16 Jun. 1993, S. Ovchinnikov leg.	[78.52]	[42.44]
8	<i>Q. equus</i>	4 ♂♂, 2 ♀♀	Kazakhstan, Karkara valley, 2000–2500 m, 18 Jul. 1989, I. Kabak leg.	79°13'30" [79.216]	42°39'20" [42.651]
9	<i>Q. equus</i>	1 ♂	Kazakhstan, Baiankol valley, 2500–3000 m, 5 Jul. 1993, I. Kabak leg.	79°58'03" [79.968]	42°35'45" [42.591]
10	<i>Q. equus</i>	2 ♂♂	Kazakhstan, 28 km SW of Narynkol, 3400 m, 22 Jul. 1984, alpine meadows, B. Iskakov leg.	[79.892]	[42.618]
11	<i>Q. equus</i>	1 ♂	China, NW-Xinjiang ca 58 km WNW of Baicheng right trib. of Terek riv., 31 May–2 Jun. 2009, 3500 m, J. Kalab leg.	[81.25]	[42.02]
12	<i>Q. kungeicus</i> sp. nov.	1 ♂	Kazakhstan, Kungei Alatau, Kurmety valley, 18 km SW from Saty, <i>Picea</i> forest, 2600–2700 m, 12 Jun. 1987, I. Kabak leg.	78°16" [78.27]	42°57" [42.95]
13	<i>Q. mutilatus</i> sp. ex gr. <i>mutilatus</i>	2 ♂♂, 1 ?	Kazakhstan, Dzungarian Alatau, Toksanbai, upp. reaches of Taibuga riv., 11 Jun. 1991, V. Kastocheev leg.	[44.94]	[79.73]

**ANTENNAE.** Segments as following: second and third combined as long as first; third slightly longer than second; fourth and fifth, each, as long as wide; sixth to tenth, each, wider than long and gradually widening towards apex of antenna; last segment slightly shorter than two preceding segments combined.

**PRONOTUM.** Wider than long [PL/PW: 0.79–0.95 (0.86)] widest at about its middle, gradually narrowing anteriorly and vaguely posteriorly; anterior lateral portions sloping ventrad, posterior lateral portions slightly explanate; both anterior and posterior pronotal angles distinct; disc with microsculpture and non-setiferous micropunctuation similar to that on posterior part of head. Disc with three setiferous punctures in each dorsal row: one puncture before middle of pronotum, one close to its anterior margin, and one (smaller) latero-anteriorly at pronotal anterior margin; sometimes some punctures weak or absent, in both or one row, or sometimes smaller additional puncture near basalmost discal puncture. Antero-lateral area of pronotal disc with one to two sublateral punctures situated slightly anterior to large lateral puncture.

**SCUTELLUM.** Impunctate, with faint transverse microsculpture.

**ELYTRA.** Parallel-sided, relatively short [EL/EW: 0.74–1.12 (0.83)], about as long as pronotum [PL/EL: 0.98–1.20 (1.06)], and slightly narrower than pronotum at widest point [PW/EW: 0.94–1.34 (1.03)]; setiferous punctuation fine and moderately dense with interspaces larger than punctures diameter, shiny, with distinct minute irregularities; pubescence yellowish to brownish. Wings vestigial.

**ABDOMEN.** With fine and dense punctuation; interspaces with minute irregularities; posterior margin of tergite VII without palisade fringe (Fig. 2A).

### **Male**

**SECONDARY SEXUAL CHARACTERS.** First three segments of front tarsus more strongly dilated than in females; second segment slightly wider or as wide as apex of tibia. Sternite VIII with distinct roughly triangular medio-apical emargination; tergite X triangular, strongly narrowed apically with few strong and numerous smaller apical setae; sternite IX moderately elongate with wide and glabrous basal, and sparsely setose and vaguely bilobed apical portion.

**AEDEAGUS** (Fig. 2B). Median lobe: (in parameral view) parallel-sided, with obtusely pointed apex; (in parameral or lateral view) with minute tooth situated near its apex. Paramere (in parameral view) as wide as median lobe, lanceolate, with slightly incised apex; underside with irregular groups of sensory peg setae, including a pair of apical groups with ca 3–7 peg setae in each group, and a pair of lateral groups with ca 4–6 peg setae each; additionally, parameral apex with normal setae including pair of apical setae on each side of apical incision and ca 1–4 lateral setae on each side below. Internal sac without large, strongly sclerotized structures.

### **Female**

**SECONDARY SEXUAL CHARACTERS.** First four segments of protarsi dilated, but slightly narrower than in males. Tergite X triangular, gradually narrowed apically, pigmented and with long setae medioapically.

### **Distribution and bionomics**

*Quedius mutilatus* is endemic to the central Terskei Alatau mountain range, where it is known from Karakol Gorge in the west (type locality) to the Chon-Kyzyl-Suu River in the east. Examined material has been collected from the second half of May through the end of August, all at high elevations around 2000–3000 m. At least some specimens without bionomic records were presumably found under stones as a by-catch by various entomologists, including specialists targeting Carabidae and Elateridae who, as a rule, intensively turn stones at elevations above the timber line. A few specimens with recorded bionomics have been found in coniferous leaf litter and other ground-based debris like grass or moss.





**Fig. 2.** Lectotype of *Quedius mutilatus* Eppelsheim, 1888. **A.** Habitus. **B.** Permanent preparaion of the aedeagus. Scale bars: 1 mm.



Some specimens from NMW bear clearly written, but ambiguous geographical labels with ‘Turkestan Akinin-Tepe’, which we could not interpret in spite of consulting historical literature about I.Y. Akinin’s travels in Middle Asia (Jacobson 1902). Based on the structure of the aedeagus, though, these specimens clearly belong to *Q. mutilatus*.

### Comparison

*Quedius mutilatus* differs from *Q. kungeicus* sp. nov. by the rhomboid (as opposed to ovoid) apical portion of the paramere and a slight, but distinct incision on its apex (as opposed to indistinct incision; aedeagus in parameral view), as well as the less curved apical portion of the median lobe, with stronger ventral sub-apical tooth (aedeagus in lateral view). From *Q. kalabi* it differs by the more robust and less curved apical portion of the median lobe with its shorter apical part (aedeagus in lateral view) and, usually, by the larger number of sensory peg setae in lateral groups on the paramere. From *Q. equus* it differs by the less incised apex of the paramere and a distinctly greater number of sensory peg setae in the lateral groups on the paramere.

### Notes on the type material

*Quedius mutilatus* Eppelsheim, 1888 was described based on two specimens with unclearly recorded collecting localities. Of these, a male comes from ‘Fluss. Tamgi’ which we interpret as River Tamga in the Karakol Gorge of Terskei Alatau, while a female comes from ‘Lake Issyk-Kul’, an even less precisely outlined area around a large lake in Kyrgyzstan. Smetana (1998), who designated the male as a lectotype, interpreted the female paralectotype label literally as the Lake Issyk-Kul at ca 1500 m of elevation and suggested that, unlike the high altitudinal *Q. kalabi*, *Q. mutilatus* is confined to lower elevations. However, such an interpretation is not confirmed here with new and better georeferenced material.

Before Smetana’s lectotype designation and his latest taxonomic treatment of this species, the male syntype was examined by Gridelli (1924), who noted some morphological characters, and by Coiffait (1978), who first illustrated the aedeagus for *Q. mutilatus*.

It is noteworthy that the paralectotype female of *Q. mutilatus* from ‘See Isyk-Kul [Lake Issyk-Kul]’ is teneral, slightly smaller than the lectotype and notably smaller than the size range of the non-type specimens. Given its small size and a lack of precise locality information, the species identity of the paralectotype of *Q. mutilatus* remains unclear. Therefore, we list it among other undetermined material of the *Q. mutilatus* group at the end of this paper.

### *Quedius kalabi* Smetana, 1995

Figs 1, 3, 4C–D

*Quedius kalabi* Smetana, 1995: 77 (original description).

*Quedius kalabi* – Smetana 1998: 118 (comparison with *Q. mutilatus*). — Solodovnikov & Hansen 2016: 7 (distribution).

### Material examined

#### Type material

KYRGYZSTAN: Holotype, ♂, “SU – Tien Shan NE part of Terskey Ala Too [Terskei Alatau] ridge 3000–3600 m” (NMW).

### Additional material

KYRGYZSTAN: 1 ♂, 1 ♀, E Terskei Alatau, Teploklyuchenka Village, 2600 m [42.4400° N, 78.5200° E], 16 Jun. 1993, S. Ovchinnikov leg. (cSch).

### Distribution and bionomics

*Quedius kalabi* is known from the three specimens examined here, collected in the Terskei Alatau mountain range at high elevations around 2600–3600 m (Fig. 1). Only two of them bear labels that specify the date and exact collecting locality (16 Jun. 1993, Teploklyuchenka Village). All previously published material for *Q. kalabi*, except the holotype, but including the paratype, was apparently misidentified (see below). Like other species of the *Q. mutilatus* group, *Q. kalabi* presumably occurs in talus-associated microhabitats.

### Notes on the type material

Smetana (1995) based his description of *Q. kalabi* on the holotype (male, see above for details) and one paratype (female, for information see the undetermined or ambiguous material at the end of this paper), both from the north-eastern part of Terskei Alatau. The precise geographic origin of the holotype is unknown, while the paratype comes from a locality called Jety Oguz. The aedeagus preparation of the holotype of *Q. kalabi* in Canada balsam allows an examination of its lateral side, not illustrated in Smetana (1995) (Fig. 3B). It confirms our identification of *Q. kalabi*, which differs from other species of the *Q. mutilatus* group by its narrower and somewhat curved apical portion of the median lobe of the aedeagus, with a relatively short blade of its subapical tooth (aedeagus in lateral view). In the shape of the apical portion of the paramere and degree of its incision, *Q. kalabi* displays a transition between *Q. mutilatus* with a less incised paramere bearing more lateral peg setae, and *Q. equus* with a more incised paramere bearing fewer lateral peg setae. The characters indicated by Smetana (1988) in a comparison of *Q. kalabi* with *Q. mutilatus* were based, as revealed here, on non-conspecific males and females of both species. They do not align with the more extensive material examined here. The collecting locality of the paratype of *Q. kalabi* is, in fact, located closer to the distribution area of *Q. mutilatus*. Except for the holotype, the distributional records of *Q. kalabi* summarized in Solodovnikov & Hansen (2016) were based on misidentified specimens of *Q. mutilatus*. The specimens of *Q. kalabi* from Teploklyuchenka Village, examined here and compared with the holotype, are the first precisely georeferenced material for this species. Based on the shape of aedeagus, three possibly mislabeled specimens from Toksanbai in Dzungarian Alatau seem to belong to *Q. kalabi* as well (for details see below).

### *Quedius equus* Smetana, 2014

Figs 1, 4G–N

*Quedius equus* Smetana, 2014: 35 (original description).

*Quedius equus* – Solodovnikov & Hansen 2016: 8 (distribution).

**Type material** (not examined, listed according to Smetana 2014)

#### Holotype

CHINA: ♂, “CHINA: NW-Xinjiang ca 58 km WNW Baicheng right trib. of Terek riv. 42°01' N, 81°15' E/31.5. – 2.6.2009 3500 m alp. meadows, screes leg. J. Kalab” (NMW).

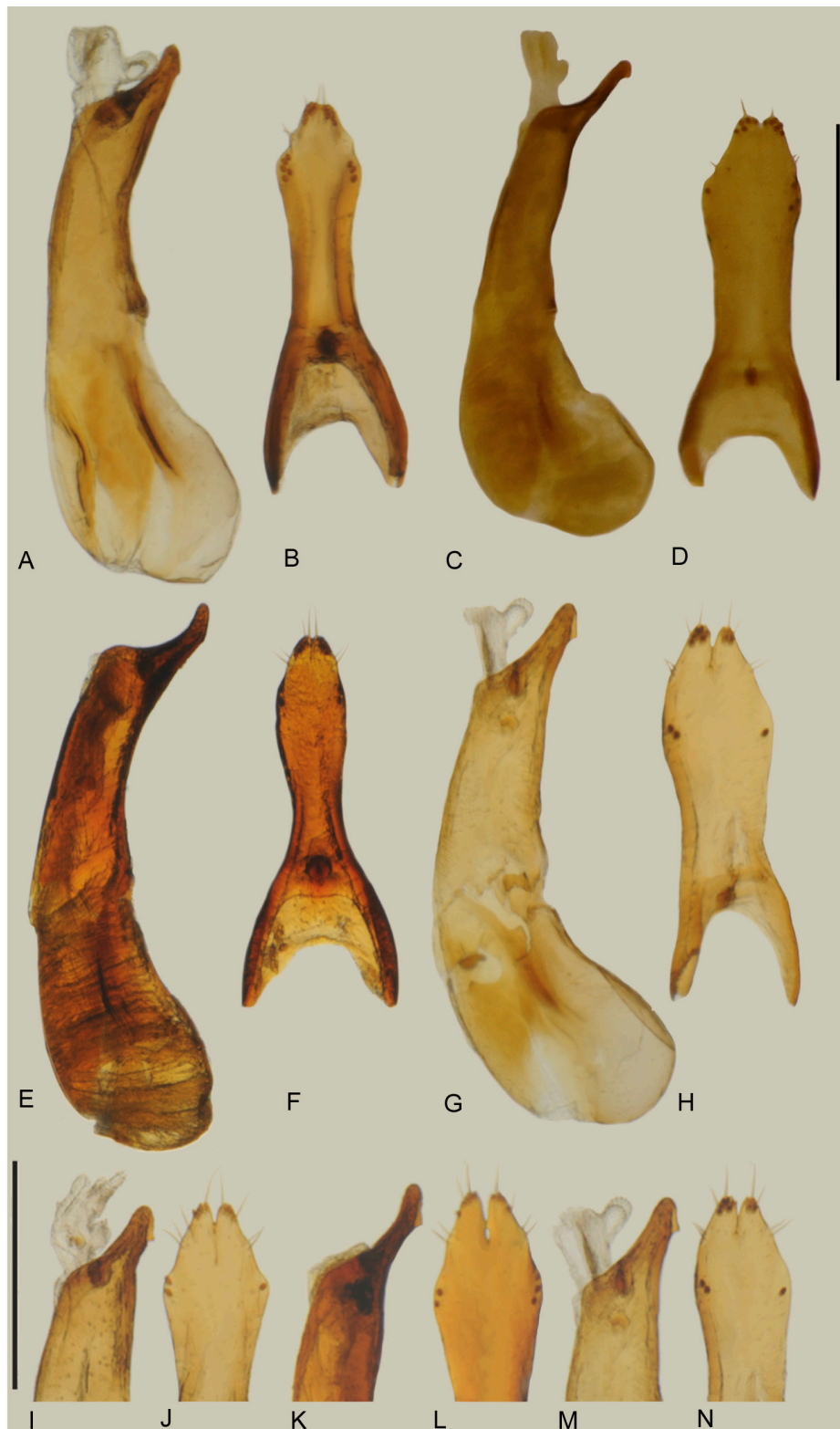
#### Paratypes

CHINA: 2 ♂♂, same collecting data as for holotype (Smetana 2014).



**Fig. 3.** Holotype of *Quedius kalabi* Smetana, 1995. **A.** Habitus. **B.** Permanent preparation of the aedeagus. Scale bars: 1 mm.





**Fig. 4.** Aedeagi in the *Quedius mutilatus* group. **A–B.** *Quedius mutilatus* Eppelsheim, 1888. **C–D.** *Quedius kalabi* Smetana, 1995. **E–F.** *Quedius kungeicus* sp. nov. **G–N.** *Quedius equus* Smetana, 2014 (Karkara Valley, Kazakhstan), variability of the structure of the aedeagus. **A, C, E, G, I, K, M** = median lobe, laterally. **B, D, F, H, J, L, N** = paramere (dissected from median lobe), underside (side facing median lobe). Scale bars: 1 mm.

### Material examined

KAZAKHSTAN: 4 ♂♂, 2 ♀♀, Karkara Valley, 2000–2500 m [42°39'20" N, 79°13'30" E], 18 Jul. 1989, I. Kabak leg. (ZIN); 1 ♂, Baiankol Valley, 2500–3000 m [42°35'45" N, 79°58'03" E], 5 Jul. 1993, I. Kabak leg. (ZIN); 2 ♂♂, 28 km SW of Narynkol, 3400 m, alpine meadows [42.618° N, 79.892° E], 22 Jul. 1984, B. Iskakov leg. (ZIN).

### Distribution and bionomics

Previously, *Q. equus* was known from the holotype and two paratypes (all males) only, collected together at the type locality in Xinjiang Province in China. New material examined here matches well with the original description and significantly expands the distribution of this species westwards (Fig. 1). All newly studied specimens were collected at high elevations around 2000–3400 m in July. For only two of them does the label specifies alpine meadows as the habitat, which is the same as for the type material.

### Comparison

*Quedius equus* differs from all other species in the *Q. mutilatus* group by the deep incision on the apex of the paramere and by fewer (1–3) sensory peg setae in the lateral groups arranged in longitudinal rows.

### *Quedius kungeicus* sp. nov.

[urn:lsid:zoobank.org:act:FAD25BCE-73E2-4BC0-90EC-5D31FB2F8DBD](https://zoobank.org/act:FAD25BCE-73E2-4BC0-90EC-5D31FB2F8DBD)

Figs 1, 4E–F, 5

### Etymology

The specific epithet ‘*kungeicus*’ is a latinized adjective derived from the mountain range where this species was collected.

### Material examined

#### Holotype

KAZAKHSTAN: ♂, “Kazakhstan, Kungei Alatau Mountain Ridge, Kurmety valley, 18 km SW from Saty, 2600–2700 m, *Picea* forest [ca 42°57'00" N, 78°16'00" E], 12.VI.1987, leg. I. Kabak” (ZIN).

### Description

MEASUREMENTS AND RATIOS. HL: 1.61, HW: 1.48, PL: 1.75, PW: 2.16, EL: 1.64, EW: 2.14, FB: 5.00, HL/HW: 1.09, PL/PW: 0.81, EL/EW: 0.77.

BODY. Length: 10 mm; dark brown, hind margins of abdominal tergites slightly paler; appendages of the same coloration as body; body flattened dorso-ventrally. Overall external morphology as in *Q. mutilatus*, but eyes slightly protruding over lateral contour of head (Fig. 5 A).

#### Male

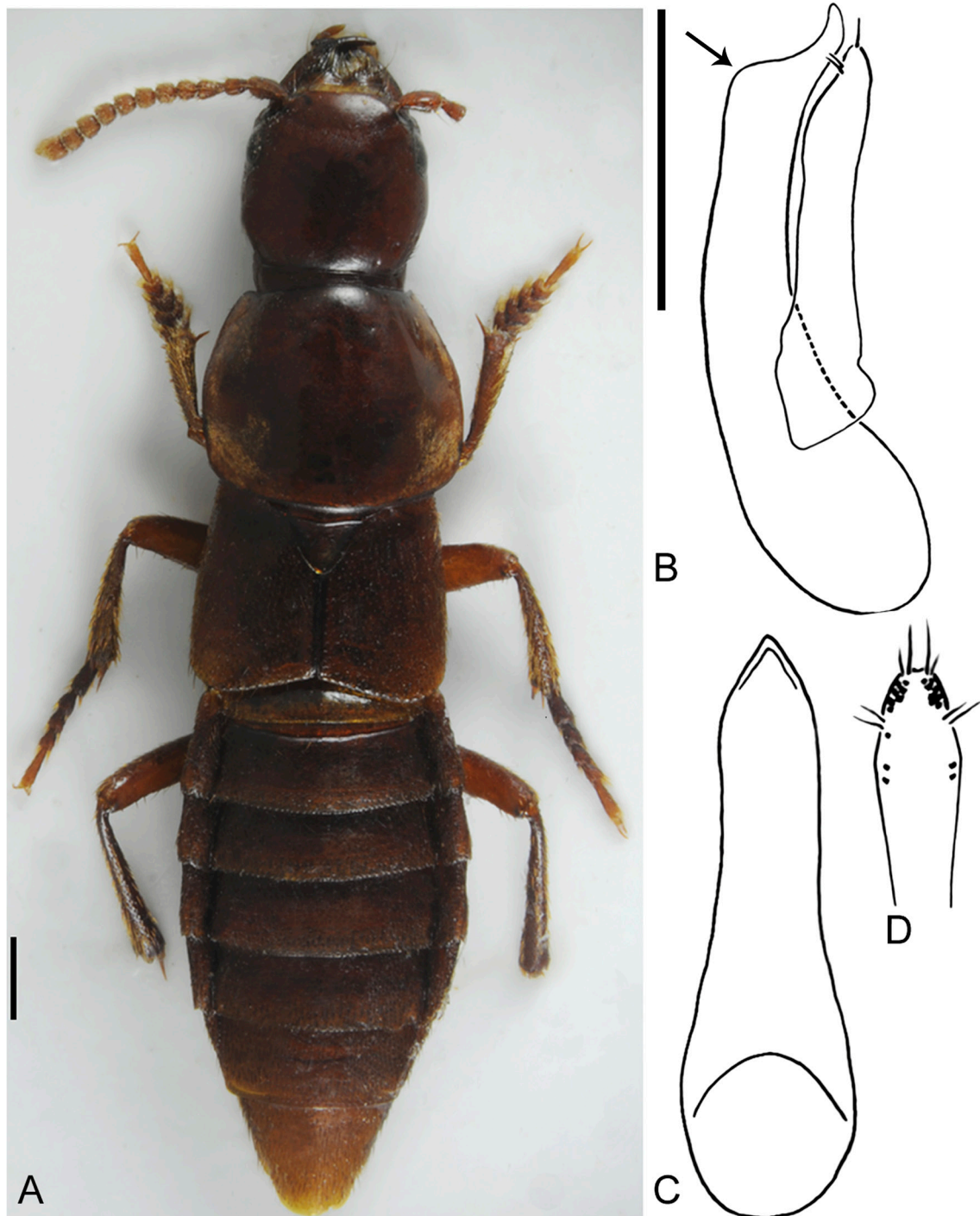
AEDEAGUS (Figs 4 E–F, 5B–D). Apical portion of median lobe (in lateral view) with characteristic ‘hump’ (shown by arrow in Fig. 5B) more pronounced than in other species of the group and with relatively more elongate apical portion that does not have a pronounced ventral sub-apical tooth; paramere (aedeagus in parameral view) as wide as median lobe, apically ovoid and with hardly visible apical emargination; parameral underside with apical groups of ca 7–8 sensory peg setae on each side of emargination and with two lateral groups of 2–3 peg setae each; parameral apical contour with two pairs of apical setae and two pairs of lateral setae. Internal sac without strong and obvious sclerotized structures.

#### Female

Unknown.

### Distribution and bionomics

*Quedius kungeicus* sp. nov. is known from the holotype only, which was collected in the Kungei Alatau mountain range at an elevation of around 2600–2700 m in spruce forest. According to Ilya Kabak, who collected the holotype of *Q. kungeicus* sp. nov., it was most likely taken from under stones. This and the habitus of the species suggest an association with talus.



**Fig. 5.** *Quedius kungeicus* sp. nov. **A.** Habitus. **B.** Aedeagus, laterally. **C.** Median lobe, in parameral view (paramere detached). **D.** Paramere, underside (side facing median lobe). Scale bars: 1 mm.



### Comparison

*Quedius kungeicus* sp. nov. can be reliably distinguished from all other species of the *Q. mutilatus* group by the structure of the aedeagus, namely by the ovoid contour of the apical portion of the paramere without a distinct apical incision (aedeagus in parameral view) and by the characteristically curved and longer apical portion of the median lobe that lacks a distinct sub-apical tooth (aedeagus in lateral view).

### *Quedius* spp. from the *Q. mutilatus* group, ambiguously labelled or undetermined material

The following material could not be identified:

#### Type material

KYRGYZSTAN: paralectotype of *Q. mutilatus* [Kyrgyzstan], ♀, “*mutilatus mihi* See Isyk-Kul [Lake Issyk-Kul], Turkestan Akinin [handwritten label]/c.Epplsh. Steind. d [printed label]/TYPUS [red printed label]/Paralectotype *Quedius mutilatus* Eppelsheim, 1888 M. Salnitska & A. Solodovnikov rev. 2016” (NMW); paratype of *Q. kalabi* [Kyrgyzstan], ♀, “SU – Tien-Schan Mts, – 3000–3500 m NO part of Terskey Ala Too ridge JETY-OGUZ, – 20 km SW from Przewalsk J. Kalab leg. 23.–30.6.1989’/QUEDIUS (*Microsaurus*) sp. nov. ♀” (Smetana 1995).

#### Other material

KAZAKHSTAN: 2 ♂♂, 1 ♀, Dzungarian Alatau, Toksanbai, upper reaches of Taibuga River [79.7300° E, 44.9400° N], 11 Jun. 1991, V. Kastcheev leg. (ZIN); 1 ♀, Central Tien-Shan, Atbashi mountain range, S slope, 3000 m [75.8800° E, 40.9900° N], 22 Jul. 1959, Zaslavsky leg. (ZIN); 1 ♀, ‘Turkestan leget Akinin, dedet Faust’ (NMW).

For reasons why the paralectotype of *Q. mutilatus* and the paratype of *Q. kalabi*, both females, are likely non-conspecific with the primary type material and cannot be identified, see the comments for the respective species above.

Three specimens from Dzungarian Alatau in ZIN are damaged by dermestids and among them only one of the two males has the aedeagus intact. Based on external morphology, these specimens, collected during the same collecting event, appear conspecific. The structure of the aedeagus preserved in one of them suggests they may be conspecific with *Q. kalabi* or at least represent a very similar taxon. This, in turn, suggests their origin from Terskei Alatau and therefore a case of mislabeling. The presence of the *Q. mutilatus* group in Dzungarian Alatau, which is outside the known distribution pattern of the group, needs confirmation by other material.

A female specimen from NMW from an indefinite locality recorded as ‘Turkestan’, and a female from ZIN from the Atbashi mountain range cannot be identified further than being members of the *Q. mutilatus* group without associated males. It is noteworthy that a female from the Atbashi Range so far represents the southwesternmost and a relatively isolated record of the *Q. mutilatus* group.

### Discussion

The shared, very uniform external morphology (similar habitus and chaetotaxy), shape and chaetotaxy plan of the aedeagus, as well as biogeographic considerations suggest that the *Q. mutilatus* group is monophyletic. The phylogenetic affinities of this species group within the subgenus *Microsaurus* remain unclear. Beetle morphology and the currently known distribution records suggest that the *Q. mutilatus* group consists of hypogean (*sensu* Solodovnikov & Hansen 2016) allopatric species. Both assumptions, however, need to be explored and confirmed by robust data, currently unavailable because the group has very rarely been collected. At present, four species of the *Q. mutilatus* group can be separated

from each other by clear morphological differences in the structure of the aedeagus only (Fig. 1). The examined material displays notable intraspecific variability, suggesting that species-level taxonomy and the distribution pattern of the *Q. mutilatus* group may appear more complex with denser sampling. In future cases of specimens where morphology and biogeography would not give a clear answer of their species identity, our suggestion would be to downgrade current species of *Q. mutilatus* group to the subspecies level and treat ambiguous material as *Q. mutilatus* ssp. *incertae sedis*. Such an approach would allow effective documentation of new material until the next level of taxonomic understanding is reached. We would like to stress that our current, exclusively morphology-based species concepts at most set an initial taxonomic frame for a deeper phylogeographic investigation of the *Q. mutilatus* and similar groups of montane species.

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