

# **Insects in Cretaceous and Cenozoic Amber of Eurasia and North America**

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## Preface

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The amber is well-known as a source of the most valuable, otherwise inaccessible information on the biota and conditions in the past. The interest in studying Mesozoic and Paleogene ambers has recently sharply increased throughout the world. The studies included in this volume concern Coleoptera, Hymenoptera, and Diptera from the Cretaceous, Eocene, and Miocene amber of the Taimyr Peninsula, Sakhalin Island, Baltic Region, Ukraine, and Mexico.

Yantardakh is the most important Upper Cretaceous insect locality in northern Asia, which was discovered by an expedition of the Paleontological Institute of the Academy of Sciences of the USSR (at present, Borissiak Paleontological Institute, Russian Academy of Sciences: PIN) in 1970 and additionally investigated in 1971 by the second expedition of that Institute. Important impetus to intense studies of the Taimyr amber was given by the third expedition of PIN to Yantardakh, which occurred in 2012. In the present volume, the first gall midges and midges from the Upper Cretaceous of Asiatic ambers.

Until recently, the Sakhalinian amber was assigned in paleoentomological publications to the Paleocene; in so doing, an important argument for this point of view was the primitiveness of the ant fauna from the Sakhalinian amber, which differs considerably from the thoroughly investigated ant fauna from Late

Eocene ambers. However, based on paleobotanical data, confirmed by new paleoentomological data, it is dated Middle Eocene. Detailed discussions of dating and relationships of Sakhalinian ants is provided in the first paper of the present volume, in which the earliest ant of the subfamily Myrmicinae is described from the Sakhalinian amber and assigned to an extant genus. The earliest pedogenetic gall midge of the tribe Heteropezini from the Sakhalinian amber is also described here.

The Late Eocene Baltic amber is investigated better than any other; nevertheless, more than half of its fauna remains undescribed; the contemporaneous fauna from the Rovno amber is investigated to a considerably lesser degree. In the present volume, weevils, darkling beetles, erotyliids, and melyrids from the Baltic amber, weevils and melyrids from the Rovno amber, and one more new weevil species from the Miocene Mexican amber are newly described here. In addition, the first fossil representative of higher gall midges of the supertribe Mycodiplosidi from the Rovno amber is described.

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## A New Species of the Genus *Nalassus* Mulsant (Coleoptera: Tenebrionidae: Helopini) from the Baltic Amber

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**Abstract**—The first Eocene species of the tribe Helopini, *Nalassus klebsi* sp. nov., from the Baltic amber is described. The new species is included in the nominative subgenus and similar to the extant species *N. dermestoides* (Illiger) and *N. laevioctostriatus* (Goeze), from which it differs in the shape of eyes (eyes are considerably less transverse than in living Palearctic species of the genus *Nalassus* Mulsant), the shape of the pronotum with acute posterior angles (other Palearctic *Nalassus* have obtuse or straight pronotal angles) as well as convex elytral intervals. Species of the less specialized nominative subgenus are widespread in forests and (partly) alpine landscapes of Europe (eastwards up to the Urals) and eastern Asia.

**Keywords:** Coleoptera, Tenebrionidae, Helopini, Baltic amber, new species

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### INTRODUCTION

Tenebrionidae is a vast family of coleopterans, which is represented mostly as dendrobiont species in the fossil record. To date, more than 110 fossil taxa of darkling beetles have been described. Among them, 88 taxa were described to species (Ponomarenko and Kirejtshuk, 2014). However, early descriptions (especially those by Oswald Heer) need careful revision, because there are some doubts as to whether or not many taxa belong to the family Tenebrionidae. Amber representatives of the family are known mostly from the Middle Miocene Dominican and Late Eocene Baltic ambers, and one species is described from the earliest Eocene Oise amber (Kirejtshuk et al., 2010). Darkling beetles from the Dominican amber are rather thoroughly studied (Kaszab and Schawaller, 1984; Doyen and Poinar, 1994; Arillo and Ortuño, 2005; Vitali, 2007, 2008), while tenebrionids from the Baltic amber are less studied. Edmund Reitter (Klebs, 1910) identified 14 genera of Baltic darkling beetles: two genera from the subfamily Lagriinae, six from Tenebrioninae, and six from Alleculinae. The collection of the Berlin Museum includes 27 specimens of Tenebrionidae from the Baltic amber: 16 species are identified as Alleculinae, one specimen as Lagriinae, and ten as Tenebrioninae (Hieke and Pietrzeniuk, 1984). Among all Baltic tenebrionids, only two alleculine species were named at the end of the 19th century (Schaufuss, 1888; Seidlitz, 1896). Larsson (1978) in his mono-

graph used data from the paper of Klebs. The first representative of the subfamily Diaperinae (*Pentaphillus cioides* Kirejtshuk, Merkl et Kernegger, 2008) from the Baltic amber has relatively recently been described by Kirejtshuk et al. (2008). Thus, to date, three tenebrionid species from the Baltic amber have been described (Alekseev, 2013).

Reitter found four “bei Helops Fabricius” specimens of the tribe Helopini (subfamily Tenebrioninae) among darkling beetles of the Baltic amber (Klebs, 1910) (on the whole, he found 12 tenebrionids in the collection of Klebs). This vast tribe, which includes about 800 extant species from 45 genera, is reliably known since the Middle Paleocene (Purchart and Nabozhenko, 2012). The genus *Cryptohelops* Nabozhenko et Kirejtshuk, 2014 of the subtribe Helopina, which has recently been described from the Paleocene of Menat (France), is close to the extant West European species of *Probatiscus* Seidlitz, 1896 and has some features of specialization: extended forelegs in males, protibial base emarginate from inside. These features were found in many living representatives of the tribe. Thus, it is plausible that the differentiation of the group occurred much earlier than the Paleocene.

Other fossil representatives of the tribe Helopini are not numerous; all of them were either described or identified within the genus *Helops* sensu lato (Heer, 1847, 1883; Heyden and Heyden, 1865; Redtenbacher in Unger, 1867; Klebs, 1910). Imprints of all four spe-

cies are dated as Miocene. Since descriptions with figures cause doubts that these species belong to the tribe Helopini and even to the family Tenebrionidae, they are considered as *species inquirendae* (Nabozhenko and Kirejtshuk, 2014).

It is quite natural that representatives of the tribe Helopini were found in the Baltic amber, because most species of this group are associated with the life on the trunks of coniferous and deciduous trees, where they feed on lichens (known from the Baltic amber: Rikkinen and Poinar, 2002; Rikkinen, 2003). The highest generic and species diversity of the tribe is observed in the coniferous forests and woodlands composed of *Cedrus*, *Pinus*, and *Juniperus* in the Mediterranean as well as in western North America, especially in California, where 21 species have been recorded (Aalbu and Smith, 2014) and the forests with *Sequoia*, *Sequoiadendron*, and *Pinus* are widespread. One trunk of the Lebanon cedar is sometimes simultaneously inhabited by four or five species of Helopini (according to M.V. Nabozhenko's personal observations in Turkey). Many species live in the deciduous forest with *Quercus*, *Fagus*, and other tree species. Some specialized groups of Helopini turned to the life in open landscapes of steppes, deserts, or alpine meadows. They are geobionts, but still feed on lichens from stones, soil, and shrubs. Phytophagy has only been known in the genera *Hedyphanes* Fischer de Waldheim and *Catomus* Allard (Nabozhenko, 2007).

The representative of the tribe Helopini, which is described below, belongs to the genus *Nalassus* Mulsant, most species of which are dendrobionts (Nabozhenko, 2007). Species of *Nalassus* are widespread in the Palearctic and have a disjunctive geographical range (Nabozhenko, 2013). The highest diversity of the genus is registered in the mountainous areas of the western Palearctic from the Atlantic to Iran and the Urals (Nabozhenko and Löbl, 2008), an isolated exclave of the genus is in eastern Kazakhstan (Medvedev, 1987); the third center of diversity is in eastern Asia (Nabozhenko, 2012). *Nalassus* species also occur in North America (Nabozhenko, 2013). The new species has well-pronounced humeral angles, a rather wide and oval (in the dorsoventral direction) body weakly, but distinctly dilated protarsomeres (typical of *Nalassus* males), long antennae typical of Helopini males, fine transverse wrinkled sculpture of prothoracic hypomeres, which is typical of the subtribe Cylindrinotina, a wide dorsal carina of the epipleura, which do not reach the apex; interstria 9 limited by interstria 8. The eyes of the new species are large and weakly transverse, which is typical of forest-dwelling species of *Nalassus*. The absence of hair brush on abdominal ventrite 1 of male of the new species is observed in some extant European species of the nominative subgenus, such as *Nalassus dermestoides* (Illiger), *N. laevioctostriatus* (Goeze), and in East Asian representatives of the genus. The shape of the body and pronotum, absence of hair brush on the abdominal

ventrites suggests that the new species from the Baltic amber belongs to the nominative subgenus of the genus *Nalassus*. Furthermore, considering the size and weight of the amber piece, it developed at the trunk base (Perkovsky, 2009, 2010). As a rule, imagines of forest-dwelling *Nalassus* hide during the daytime in the bark cracks near the trunk base or in soil at the border between the substrate and tree bark. In the evening and at night, they actively move along the trunk and branches. *Nalassus* representatives have lost the ability to fly. Their wings vary from almost completely reduced to well developed and slightly exceeding the elytral length.

The rarity of Helopini in amber, taking into account the mode of life characteristic of this tribe, has not received adequate explanation. In modern resins exuded by coniferous trees, Helopini species have not been recorded (Zherikhin et al., 2009), which is not surprising, because the analyzed samples come mostly from Poland, Central Russia, Siberia, where species of the tribe are either not found or represented by one or two species associated mostly with deciduous trees. Actually, Helopini do occur in resin. We have found dry samples of *Nalassus kartvelius* Nabozhenko, 2013 embedded in resin on the trunks of *Picea orientalis* in Georgia (Rioni valley, Utsera) (Nabozhenko, 2013) as well as numerous living and dry specimens of *Armeno-helops amasiae* (Seidlitz, 1896) in resin on the trunks of *Pinus nigra* in Turkey (Amasya, Ormanözü).

## MATERIALS AND METHODS

One well-preserved specimen from the collection of the Borissiak Paleontological Institute of the Russian Academy of Sciences, Moscow (PIN) was studied. It was collected by A.G. Sharov at the Kaliningrad Amber Plant, Yantarnyi (Valter quarry) in 1948; a part of his collection that remained unprocessed was studied by A.P. Vlaskin and E.E. Perkovsky. Photographs were taken using a Leica 16M stereomicroscope at the Center of the Collective Usage of the Scientific Equipment Animalia, Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kiev.

## SYSTEMATIC PALEONTOLOGY

### Family Tenebrionidae Latreille, 1802

### Subfamily Tenebrioninae Latreille, 1802

### Tribe Helopini Latreille, 1802

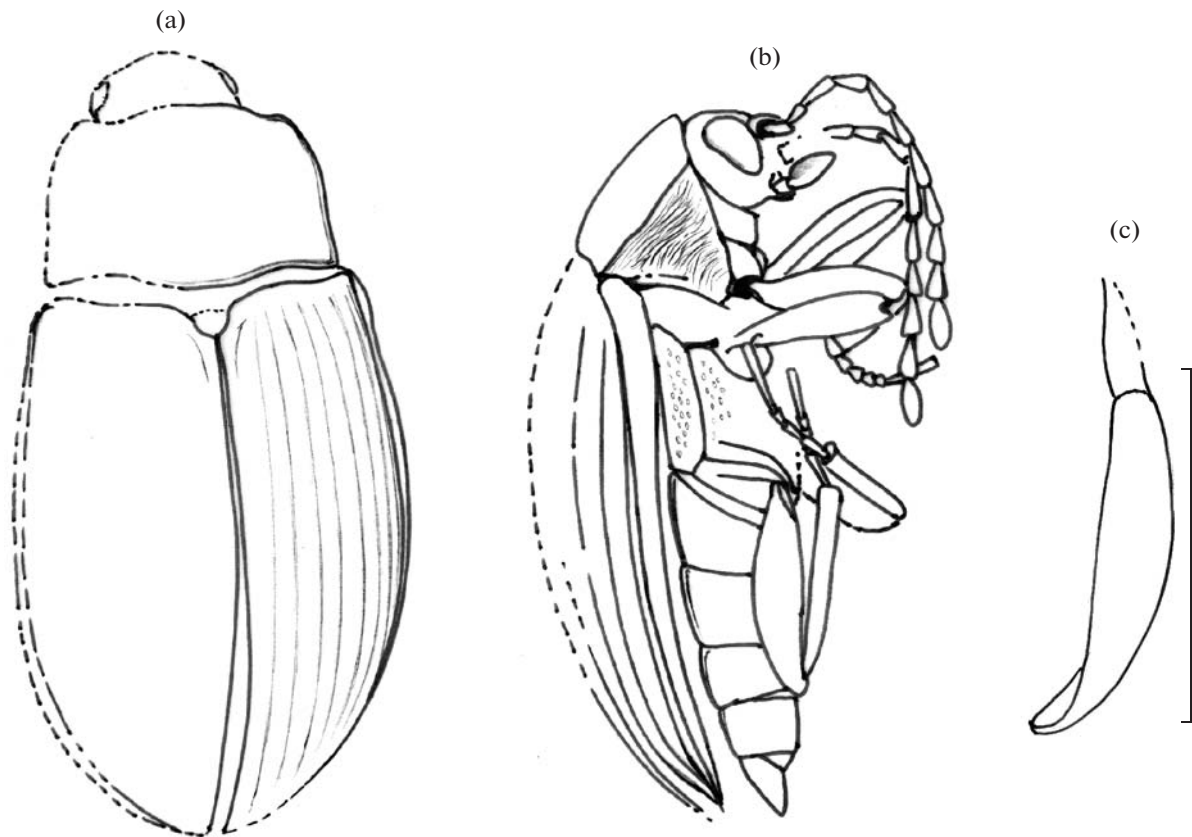
### Subtribe Cylindrinotina Español, 1956

### Genus *Nalassus* Mulsant, 1854

#### *Nalassus* (s. str.) *klebsi* sp. nov.

Plate 1, Fig. 1

**E t y m o l o g y.** The species is named after Richard Klebs, who significantly contributed to the study of insects from the Baltic amber.



**Fig. 1.** *Nalassus klebsi* sp. nov., male, reconstruction: (a) habitus, dorsal view; (b) habitus, lateral view; (c) aedeagus. Scale bar, 0.5 mm.

**Holotype.** PIN, no. 964/2026, Yantarnyi, Baltic amber; Late Eocene. Syninclusion: PIN, no. 964/2025, Orthoclaudiinae (Chironomidae) male from an amber piece  $120 \times 44 \times 20$  38.2 g of weigh.

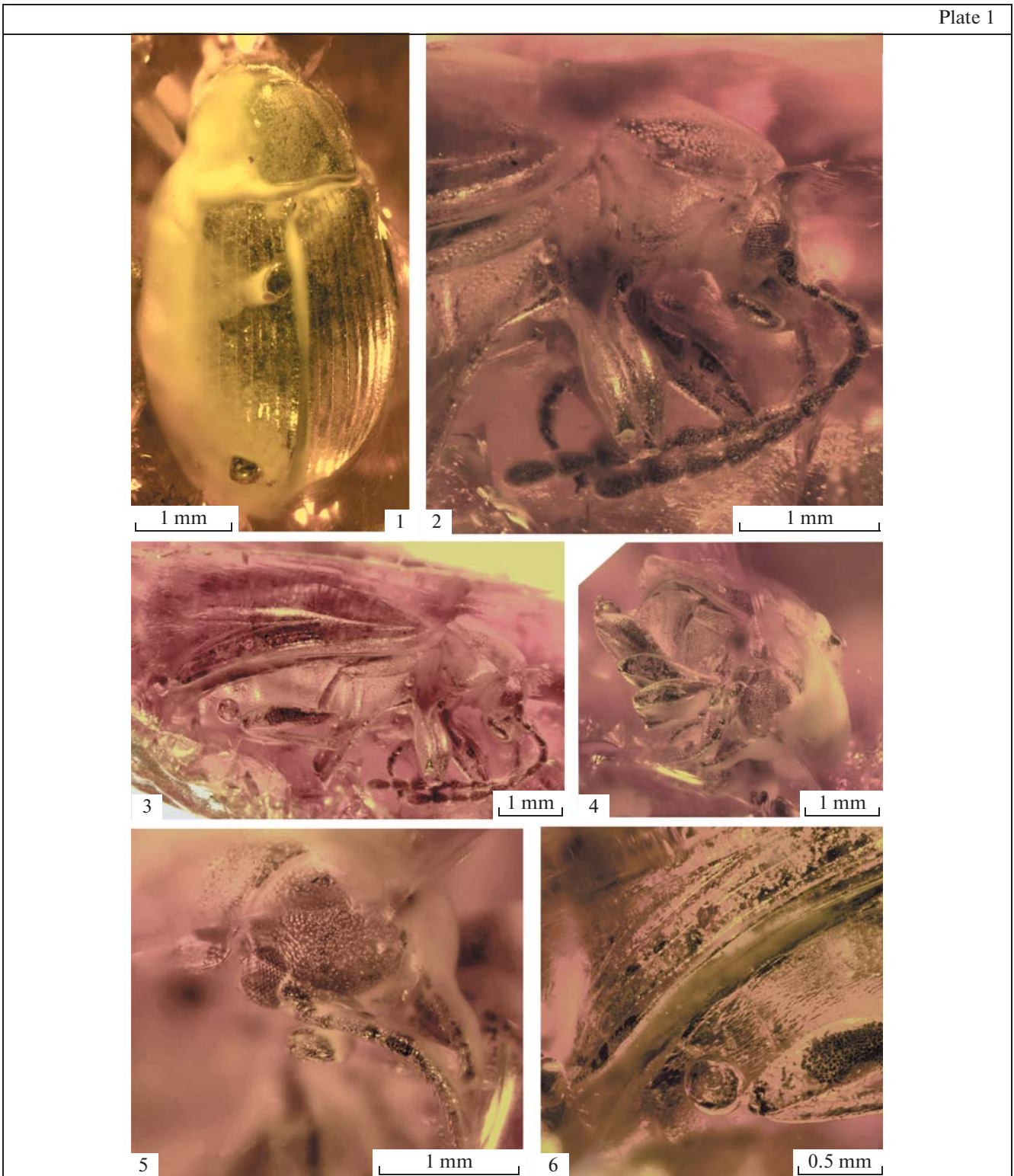
**Description.** Male. The body is relatively small and robust.

**Head.** The anterior margin of clypeus is straight. The head is widest near the middle of eyes. Eyes are strongly dorsally convex. Genae are moderately rounded; genal lobes are slightly raised. The lateral margin of the head at the junction of the gena and clypeus is weakly emarginate. Eyes are large, slightly convex, egg-shaped; their anterior margin is weakly emarginate, the posterior margin is rounded (lateral view). Ventral posterior grooves beginning at lower aspect of eyes are indiscernible. The apical segment of the maxillary palps is large, strongly dilated, dolabri-form. The head is coarsely and densely punctate; the diameter of punctures is about two times larger than the distance between them. Punctures are round, slightly elongated near the eyes; the head surface near the eyes has smoothed wrinkles. Antennae are long, 0.77 as long as the elytra; antennomeres 8–11 are slightly flattened and wider than the preceding ones. Antennomeres 3–10 are conical dilated towards the apex; the diameter of antennomeres 8–10 near the

apex is almost thrice larger than at the base. The length ratios of antennomeres 2–11 are 0.7 : 1.4 : 1 : 1 : 1.2 : 1.3 : 1.3 : 1.2 : 1.2 : 1.6. Antennomere 11 is long, oval, symmetrical. Antennomeres are densely covered with recumbent hairs.

The pronotum is transversal, 1.4 times wider than long, with the greatest width behind the middle. The external sides of the pronotum are slightly rounded, widely emarginate in the basal one-third. The anterior margin is slightly widely emarginate, almost straight; the base is biemarginate, straight in the middle. The anterior angles are widely rounded, slightly protruding; the posterior angles are acute, narrowly rounded at the apex. The bead of the lateral sides is wide at the base. The bottom is clearly beaded. The anterior margin is distinctly beaded only near the angles. The pronotal disk is weakly convex; the lateral sides are flattened. At the base, closer to the middle, the pronotum has a longitudinal impression on each side. The pronotum is coarsely and densely punctate, more densely along the sides from the middle (the diameter of punctures is 2–3 times larger than the distance between them); punctures are finer in the center (the diameter of punctures almost equals the distance between punctures). The punctures are round. Prothoracic hypomeres have fine and dense longitudinal





## Explanation of Plate 1

**Figs. 1–6.** *Nalassus klebsi* sp. nov., holotype, male; Baltic amber: (1) habitus, dorsal view; (2) anterior part of body, lateral view; (3) habitus, lateral view; (4) habitus, anterior view; (5) head; (6) elytral apex and abdominal ventrites, lateral view.

wrinkles; their external margin is flattened near the anterior margin and has isolated punctures near the coxa.

The elytra are long, 1.45 longer than wide, 1.3 times wider and 3.3 times longer than the pronotum, with the greatest width in the middle. The elytral base is slightly wider than that of pronotum. The scutum is wide triangular, with slightly rounded sides. The interstriae are convex, clearly and sparsely punctate. The striae punctures on the elytra are connected in long and narrow continuous grooves. The epipleura and their dorsal carina are wide, sharply narrowing on the elytral apex.

Mesepimera, metepisterna, and metaventrite have coarse, moderate dense puncturation of round punctures. The abdominal ventrites have fine rare punctures and smoothed longitudinal wrinkles. Abdominal ventrite 1 has rare longitudinal puncturation in the middle, without long hairs. Intersegmental membranes between abdominal ventrites 3 and 4 and 4 and 5 are well pronounced, wide.

Legs are long; the femora are thickened, coarsely and densely punctate. The tibiae are straight, with long setae at the apex. Pro- and mesotarsomeres 1–3 are slightly dilated, longitudinal; metatarsomeres are not dilated, long, slightly shorter than metatibiae. Claws are large, curved. Legs are evenly covered with recumbent hairs.

Inner sternite VIII in part and aedeagus in particular light conditions are visible.

**C o m p a r i s o n.** The new species is similar to the extant species *N. laevioctostriatus* and *N. dermestoides*, which also have a robust body and the glabrous first abdominal ventrite in males. It differs from both species in the shape of eyes (much less convex than in the previously known Palearctic *Nalassus*), the shape of the pronotum with acute posterior angles (angles of other Palearctic *Nalassus* are obtuse or right), and in the convex elytral interstriae.

**D i m e n s i o n s,** mm. Body length without head (head turned downwards), 4.7; length with head, slightly more than 5; width about 2.

**M a t e r i a l.** Holotype.

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