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## The genus *Gunarus* Des Gozis, 1886 belongs to the subtribe Cylindrinotina (Coleoptera: Tenebrionidae: Helopini)

### Род *Gunarus* Des Gozis, 1886 относится к подтрибе Cylindrinotina (Coleoptera: Tenebrionidae: Helopini)

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**Key words:** Coleoptera, Tenebrionidae, Helopini, *Gunarus*, subtribal position, new combinations, morphology.

**Ключевые слова:** Coleoptera, Tenebrionidae, Helopini, *Gunarus*, положение в подтрибах, новые комбинации, морфология.

**Abstract.** The genus *Gunarus* Des Gozis, 1886 is transferred from the subtribe Helopina to the subtribe Cylindrinotina (Tenebrionidae: Helopini) based on the structure of male aedeagus and presence of posterior ventral grooves of lower aspect of eye in the type species *Gunarus hirtulus* (Reiche, 1861). New combinations are established: *Stenohelops* (*Stenomaleis*) *gayirbegi* (Nabozhenko et Keskin, 2009), **comb. n.** (from *Gunarus*), *Stenohelops* (*Stenomaleis*) *korkutelensis* (Nabozhenko et Keskin, 2009), **comb. n.** (from *Gunarus*) and *Ectromopsis ovipennis* (Allard, 1877), **comb. n.** (from *Gunarus*). The species *Gunarus arenicola* Antoine, 1949 and *G. bremondi* Antoine, 1949 must be transferred to the subtribe Helopina but its generic position is unknown. Generic position of other 7 *Gunarus* species must be revised accordingly to the position of the type species *G. hirtulus* in the system of the tribe Helopini. Key to similar genera *Nalassus*, *Gunarus*, *Ectromopsis*, *Xanthomus* is given.

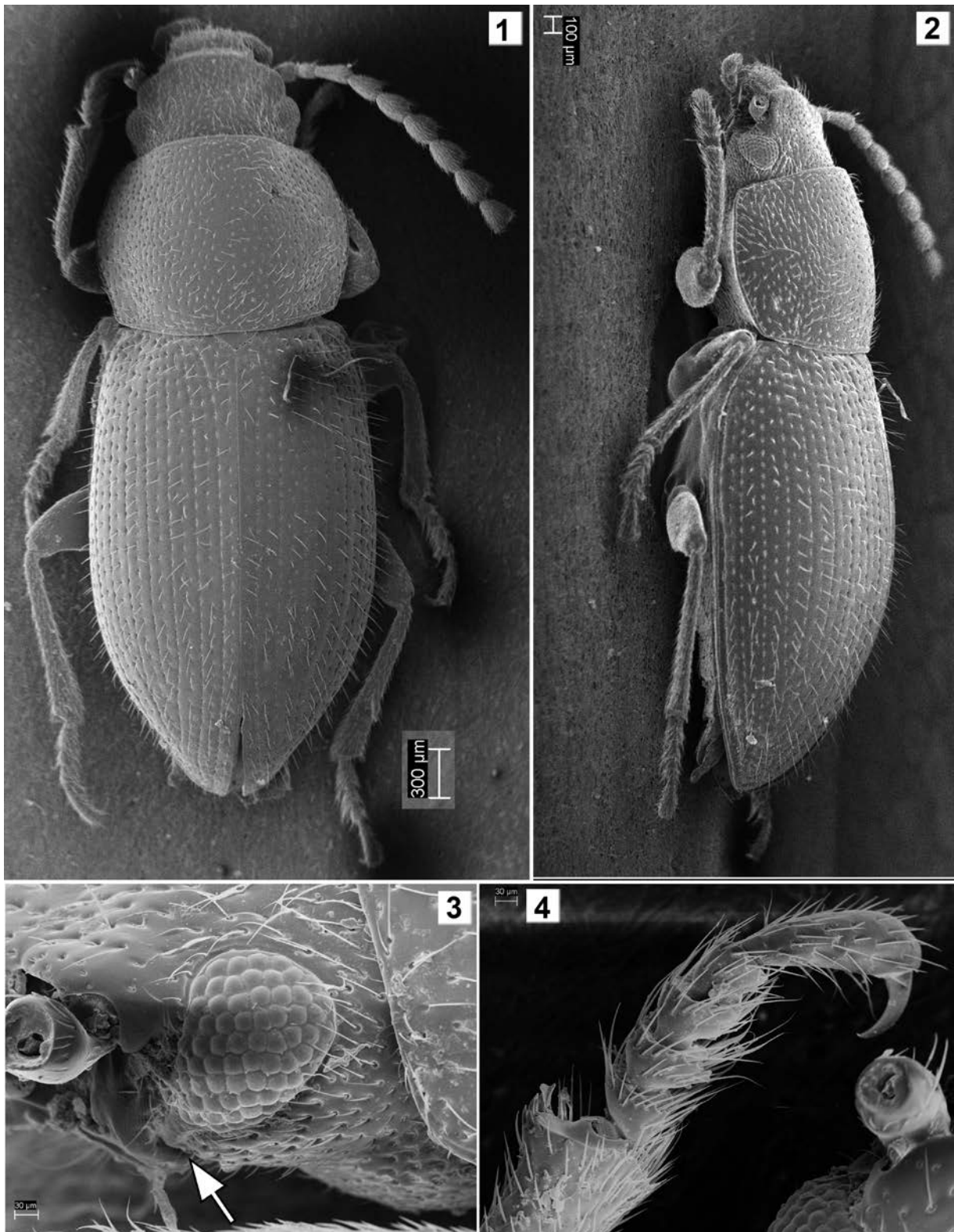
**Резюме.** Род *Gunarus* Des Gozis, 1886 переведен из подтрибы Helopina (Tenebrionidae: Helopini) в подтрибу Cylindrinotina на основании строения эдегуса самца и наличия вентральных бороздок, отходящих от нижнего края глаз, у типового вида *Gunarus hirtulus* (Reiche, 1861). Устанавливаются новые комбинации: *Stenohelops* (*Stenomaleis*) *gayirbegi* (Nabozhenko et Keskin, 2009), **comb. n.** (из *Gunarus*), *Stenohelops* (*Stenomaleis*) *korkutelensis* (Nabozhenko et Keskin, 2009), **comb. n.** (из *Gunarus*) и *Ectromopsis ovipennis* (Allard, 1877), **comb. n.** (из *Gunarus*). Виды *Gunarus arenicola* Antoine, 1949 и *G. bremondi* Antoine, 1949 должны быть переведены в подтрибу Helopina, но пока не установлено, в какой род. Родовая принадлежность

других 7 видов, относимых к *Gunarus*, должна быть пересмотрена согласно положению *G. hirtulus* в системе трибы Helopini. Дана определительная таблица для схожих родов *Nalassus*, *Gunarus*, *Ectromopsis*, *Xanthomus*.

### Introduction

The genus *Gunarus* Des Gozis, 1886 was erected for the species *Helops hirtulus* Reiche, 1861 described from Algeria. Later several species from Southern Europe and Northern Africa were added to the genus [Reitter, 1922; Grimm, 1981; Nabozhenko, Keskin, 2009]. Some species previously included in the genus *Gunarus* were transferred to the genus *Ectromopsis* Antoine, 1949 [Nabozhenko, 2005]. Up to the present time the genus includes 13 species distributed in the Mediterranean region [Nabozhenko, Löbl, 2008; Nabozhenko, Keskin, 2009; Castro Tovar, 2016]. The genus is problematic (despite the small number of species), because the main diagnostic character is still the body size and comparative length of antennae [Antoine, 1949].

Antoine [1949], based on the structure of male genitalia divided the tribe Helopini into two group. The first group included the species with 'helopoid' aedeagus: apical piece with short strong backward spines and long alae (as extensions of ventral side of apical piece), which completely covered ventral side of the basal piece. The second group united the species with 'nalassoid' aedeagus: apical piece without spines, alae short, not completely covered ventral side of basal piece. *Gunarus hirtulus* and two Moroccan species *G. arenicola* Antoine, 1949 and



Figs 1–4. *Gunarus hirtulus*, habitus, details of structure.

1 – male, dorsal view; 2 – male, ventral view; 3 – head, lateral view; 4 – right protarsus. Arrow shows ventral groove.

Рис. 1–4. *Gunarus hirtulus*, габитус, детали строения.

1 – самец дорсально; 2 – самец вентрально; 3 – голова, вид сбоку; 4 – правая передняя лапка. Стрелкой показана вентральная бороздка.

*G. bremondi* Antoine, 1949 were included in the first group but Antoine figured only the last two species having apical piece with backward spines.

Subsequently Español [1956] separated the tribe Cylindrinotini (now the subtribe Cylindrinotina) for Antoine's second group. The genus *Gunarus* was included in the tribe Helopini sensu Español (now the subtribe Helopina). Later Español and Comas [1989: fig. 2] incorrectly figured and interpreted an aedeagus of *G. hirtulus* with spines on apical piece and short alae (extensions of apical piece), which did not cover the basal piece. Really representatives of the subtribe Cylindrinotina have short setae which are directed forward, while species of the subtribe Helopina have thick or thin spines which are directed backwards [Nabozhenko et al., 2016b].

The study of a male of *Gunarus hirtulus* from Algeria allowed to revise the position of the genus *Gunarus* in the system of the tribe Helopini.

## Material and methods

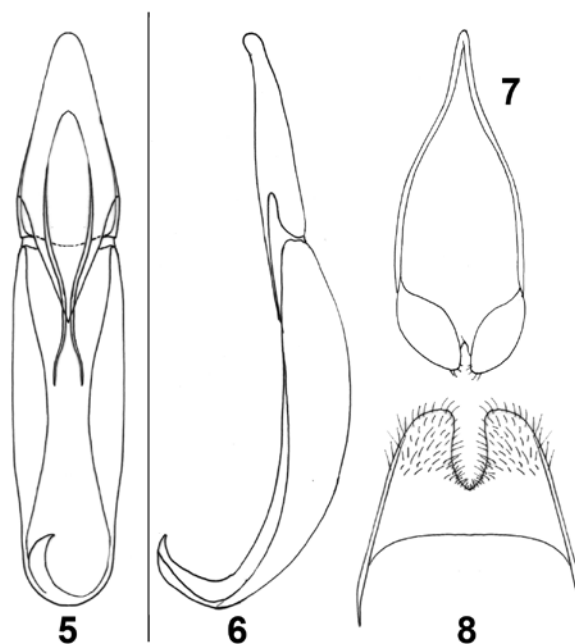
The study is based on the examination of adult beetles from Zoological Institute of Russian Academy of Sciences (ZIN, St. Petersburg, Russia), Hungarian Natural History Museum (HNHM, Budapest, Hungary), Zoological Department of Ege University (ZDEU, Izmir-Bornova, Turkey; specimens of *Nalassus*). Scanning electron microscopy was performed in the analytic laboratory of Institute of Arid Zones of Southern Scientific Centre RAS with the SEM EVO-40 XVP (LEO 1430VP). We also used Zeiss Supra 55VP Field Emission Scanning Electron Microscope in MEİTAM (Mersin University, Yenışehir, Turkey) and SEM Quanta 250 (Izmir Institute of Technology, Urla, Turkey) for SEM images.

Terms of structure of male aedeagus are taken from Matthews and Bouchard [2008].

### *Gunarus hirtulus* (Reiche, 1861) (Figs 1–8)

**Material.** 1♂ with label: "*Helops (Gunarus) hirtulus* Rche Alger" (ZIN).

**Brief redescription.** Male. Body small (length 4 mm), robust, ochreous, shiny. Head and pronotum covered with suberected hairs, elytra covered with long erected hairs. Ventral side pubescent with recumbent hairs. Lower aspect of eye with a deep posterior ventral groove. Prothoracic hypomera with smooth wrinkles and distinct punctation. Elytra with deep stria punctures without long setae; interstriae with only one line of deep punctures, each puncture with long erected setum. Interstria 8 not more convex apically than other ones, connected with 2<sup>nd</sup> interstria (not with elytral margin) on apex. Coeloconic sensilla are absent on elytra. Pro- and mesotarsi widened (Figs 1, 4). Aedeagus of male is 'nalassoid', weakly sclerotised (Figs 5, 6): apical piece with laterally flattened keel on apex, without backward spines, only with sparse punctation and apically directed very small and short seta in each puncture; alae as extensions of apical piece short, basal piece not covered ventrally; medial piece with narrowly rounded apex and two not connected baculi. Gastral spicula without processes on lobes and rods (Fig. 7). Inner male sternite VIII weakly sclerotized, without additional strongly sclerotized areas (Fig. 8).



Figs 5–8. *Gunarus hirtulus*, male genitalia and terminalia.  
5 – aedeagus, ventral view; 6 – aedeagus, lateral view; 7 – gastral spicula; 8 – inner sternite VIII. Scale bar 1 mm.

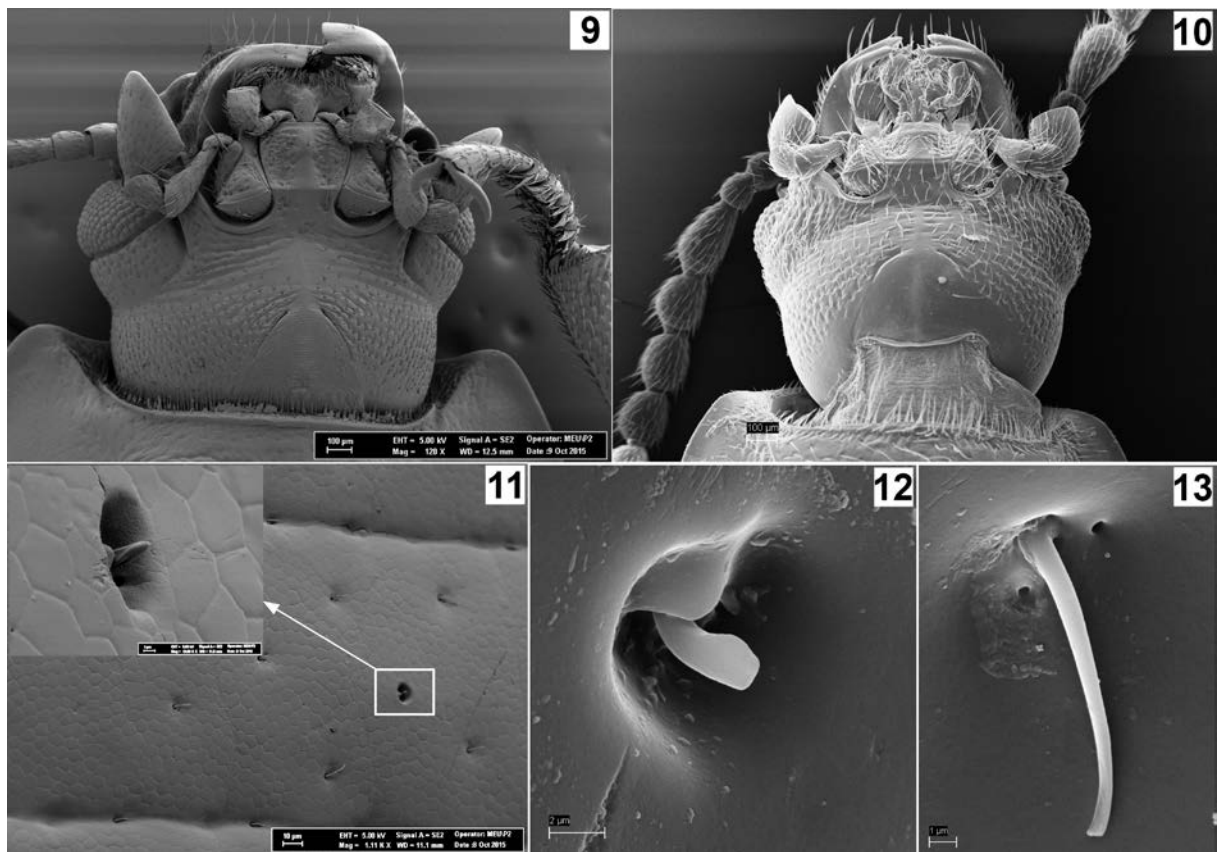
Рис. 5–8. *Gunarus hirtulus*, гениталии и терминалии самца.  
5 – адеагус вентрально; 6 – адеагус латерально; 7 – гастральная спикула; 8 – внутренний стернит VIII. Масштабная линейка 1 мм.

## Discussion

The genus *Gunarus* belongs to the subtribe Cylindrinotina by the presence of posterior ventral grooves on lower aspect of eye and structure of male aedeagus. These ventral grooves are typical only for the genera of the subtribe Cylindrinotina: *Cylindrinotus* Faldermann, 1837, *Nalassus* Mulsant, 1854, *Stenomax* Allard, 1876, *Odocnemis* Allard, 1876, *Armenohelelops* Nabozhenko, 2002, *Eustenomacidius* Nabozhenko, 2006, *Microdocnemis* Nabozhenko et Keskin, 2010, *Idahelops* Keskin et Nabozhenko, 2012, *Taurohelelops* Keskin et Nabozhenko, 2015.

The structure of aedeagus relates *Gunarus* with 'nalassoid' genera of the tribe Helopini, which are represented in Western Mediterranean by the genera *Nalassus*, *Xanthomus* Mulsant, 1854 and *Ectromopsis* Antoine, 1949. *Gunarus hirtulus* is also psammophilous supralittoral species as the representatives of two last genera. Español [1953] noted that this species inhabits marine zone and was collected under Thymus.

All three genera of darkling beetles (*Ectromopsis*, *Xanthomus* and *Gunarus*) are morphologically very similar. *Xanthomus* as probably derivative of the genus *Ectromopsis*, is more specialized group and has some characters related to the thickness of the sand they inhabit: yellow, sometimes weakly translucent body, more or less flattened protibiae, erected hairs on outer margin of protibiae (sometimes meso- and metatibiae), sometimes pubescent elytra. *Gunarus hirtulus* also has specialized characters for psammobionts: body ochreous or light-brown, pubescent. *Gunarus* has not coeloconic sensilla on elytra unlike most



Figs 9–13. *Nalassus* and *Ectromopsis*, details of structure.

9 – *N. plebejus* (Küster, 1850), head, ventral view; 10 – *E. tantilla*, the same; 11 – *N. adzharius* Nabozhenko et Dzhambazishvili, 2001, elytra with trichoid and coeloconic (arrow) sensilla; 12 – *E. tantilla*, elytral coeloconic sensillum; 13 – *E. tantilla*, elytral trichoid sensillum.

Рис. 9–13. *Nalassus* и *Ectromopsis*, детали строения.

9 – *N. plebejus* (Küster, 1850), голова вентрально; 10 – *E. tantilla*, то же; 11 – *N. adzharius* Nabozhenko et Dzhambazishvili, 2001, надкрылья с трихоидными и целоколическими (стрелка) сенсиллами; 12 – *E. tantilla*, целоколическая сесилла надкрылий; 13 – *E. tantilla*, трихоидная сенсилла надкрылий.

Helopini [Nabozhenko et al., 2016a], that also relates with sand inhabitation.

The disjunctive distribution of *Ectromopsis* indicates relict range of this genus. Ancestral species (*Nalassus* at least is known from Eocene Baltic amber [Nabozhenko et al., 2016c]) of the genus were associated with the coast of Paratethys and Mediterranean basins [Nabozhenko, 2011]. Representatives of this genus are distributed near the Mediterranean Sea in the western part of generic range: *E. mendizabali* Cobos, 1953 is known from Almeria; *E. politicollis* (Allard, 1876) from drying up reservoir (sebha) on Tell Atlas plateau; *E. bulgarica* (G.S. Medvedev et Angelov, 1981) from Struma River basin; *E. ovipennis* (Allard, 1877) from watershed between Nestos and Struma rivers in the lower reaches. Other species of *Ectromopsis* relate with relict continental reservoirs in the eastern part of range: *E. tantilla* (Ménétriés, 1848) is distributed in Northern Caspian Region; *E. bogatschevi* (Iablokoff-Khnozorian, 1957) is known from Ararat plain between Sevan Lake and Aras River; *Ectromopsis* sp. from sand dunes of relict Eğirdir Lake.

Considering the information above some species must be excluded from the genus *Gunarus*. Two species described from Turkey [Nabozhenko et Keskin, 2009] belonging to

the genus *Stenohelops* Reitter, 1922: *Stenohelops gayirbegi* (Nabozhenko et Keskin, 2009), **comb. n.** and *Stenohelops korkutelensis* (Nabozhenko et Keskin, 2009), **comb. n.** have 'helopoid' male aedeagus and female genital tubes, small, strongly shining body, developed humeral angles as other *Stenohelops*. Unlike *Gunarus*, turkish *Stenohelops* inhabit mountain landscapes and live on trees (*Juniperus excelsa*, *Quercus coccifera*). These two species must be included in the subgenus *Stenomaliés* Español, 1957 by the wrinkled prothoracic hypomera.

*Gunarus ovipennis* (we studied one specimen from Greece by Ottó Merkl) has typical characters of the genus *Ectromopsis*: dark brown body with metallic shine, absence of posterior ventral groove in lower aspect of eye, presence of coeloconic elytral sensilla. As a result, the new combination is established: *Ectromopsis ovipennis* **comb. n.**

Unfortunately we did not study other species included in the genus *Gunarus*, but it is clear from figures and descriptions that *G. bremondi* and *G. arenicola* belong to the subtribe Helopina and must be excluded from this genus. The species *Gunarus kaszabi* (Grimm, 1981) belongs to 'nalassoid' group according to the description and images [Grimm, 1981], however its generic position must be corrected considering characters of vertex and

Table 1. Composition of the genus *Gunarus*.  
Таблица 1. Состав рода *Gunarus*.

Tribe Helopini		
Subtribe Cylindrinotina	Subtribe Helopina	Species incerta sedis (subtribal belonging is unknown / принадлежность к подтрибе неизвестна)
<i>G. hirtulus</i> (Reiche, 1861)	<i>G. arenicola</i> Antoine, 1949	<i>G. tingitanus</i> Allard, 1877
<i>G. lapidicola</i> (Küster, 1850)	<i>G. bremondi</i> Antoine, 1949	<i>G. laeviusculus</i> Kraatz, 1883
<i>G. kaszabi</i> Grimm, 1981		<i>G. nodicornis</i> Reitter, 1922
<i>G. velai</i> Castro Tovar, 2016		

structure of 8<sup>th</sup> interstria on apex. The species *Gunarus tingitanus* Allard, 1877 requires the study of type material and designation of lectotype, because 3 syntypes of this species (site of Muséum National d'Histoire Naturelle (Paris, France): [https://science.mnhn.fr/taxon/species/nalassus/tingitanus#allard%2C\\_1877](https://science.mnhn.fr/taxon/species/nalassus/tingitanus#allard%2C_1877)) belong to 2 different species and at least one of them is *Nalassus*. Antoine [1949] figured 'helopoid' aedeagus for this species. Finally, three from seven remaining species, *G. lapidicola* (Küster, 1850), *G. parvulus* Lucas, 1846 and *G. nodicornis* Reitter, 1922, also must be revised.

Recently Castro Tovar [2016] in the review of Spanish *Gunarus* added a new 'nalassoid' species to the genus and resurrected *G. laeviusculus* Kraatz, 1883 from the junior synonym of *G. tingitanus*. As a result, the polyphyletic genus *Gunarus* includes 9 species from different subtribes (Table 1).

Thus, further descriptions and revision of the genus *Gunarus* must (is necessary) considering the position of the type species *Gunarus hirtulus* in the system of the tribe Helopini.

#### Key to the 'nalassoid' genera of Western Mediterranean region

- 3(6). Lower aspect of eye has a posterior ventral groove (Figs 3, 9). Elytra with or without coeloconic sensilla.
- 4(5). Elytral interval 8 convex on apex and connected apically with elytral margin. Winged beetles (wings can be well developed or reduced and very small). Elytra with multipunctured interstriae and coeloconic sensilla (Fig. 11). Male pro- and mesotarsi not widened (only *N. laevioctostriatus* have widened tarsi) .....  
..... *Nalassus*
- 5(4). Elytral interval 8 not convex on apex and connected with 2<sup>nd</sup> interval apically. Wingless beetles. Elytral interstria only with one line punctures and only long erected trichoid sensilla in interstitial puncture line (Figs 1, 2). Male pro- and mesotarsi widened, transverse (Fig. 4) ..... *Gunarus*
- 6(3). Lower aspect of eye without posterior ventral groove (Fig. 10). Wingless beetles. Elytra with trichoid and coeloconic sensilla (Figs 12, 13).
- 7(8). Body dark-brown, strongly shining, often with metallic shine. Protibiae not flattened or subfossorial. Tibia with recumbent hairs on outer margin. Male antennae often thickened ..... *Ectromopsis*
- 8(7). Body yellow, moderately shining, without metallic shine. Protibia less or more flattened, often

subfossorial. At least protibiae with erected hairs on outer margin. Male antennae not thickened .....  
..... *Xanthomus*

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