

Taxonomic Notes on the Superfamily of Longhorned Beetles (Coleoptera, Cerambycidae)

Duysengaliev E. S.

Nukus State Pedagogical Institute named after Ajiniyaz

Abstract: *The superfamily longhorned beetles (Cerambycidae) are one of the most diverse and extensive groups of insects, with over 30,000 described species worldwide. In this scientific article, we present an overview of the most important taxonomic aspects of this group, and also discuss some interesting observations obtained from our research.*

Keywords: *Cerambycidae, Coleoptera, morphological features, ecosystem.*

1. Introduction:

The superfamily Cerambycidae belongs to the order Coleoptera and includes many species that exhibit great diversity in many aspects, including morphology, biology, and adaptation to different environmental conditions. Longhorned beetles are important components of ecosystems, but also cause damage to wood and crops. Studying their taxonomy is of great importance for understanding their biology and taxonomic relationships.

2. Methods and materials:

In the conditions of Karakalpakstan during the years 2022-2023, mainly in the conditions of the natural ecosystem - along the Koyi Amudarya delta, from the deserts of Qizilkum, Orolkum, Nukusqum, the plain of Ustyurt, Beruniy, Ellikkala, Tortkul, Moynoq, Kungiro, Kanlikul, Shumanay, Khodzheyli, Nukus, Kegeyli, Chimboy, Monitoring work and anthropogenic-transformed in the agrocenosis fields of Bozotov, Karauzyak, Takhtakopir districts - Citizens' gathering of Tajyrkol Ovul, Uroq Bolga, Sarancha, Kirpich Zavod settlements, Nukus city of the Republic of Karakalpakstan, preservation and use of cultural heritage objects of the republic State Inspectorate Beruni District - Aqshakhan, the fortress of Tishirman; Ellikkala - Tuproq, Kirqqiz, Ayaz-1-2 castles; Tortkol - Jambas, Kumbaskan fortress; Karauzyak - Jampiq, Sultan Uvois mountain Gaur fortress; Khojaly - Mizdakhkan complex; Collection of research materials and experiments were carried out from the regions of Kegeili - Shibili father's shrine, Ichan Castle. To carry out our research, we used a variety of information sources, including scientific publications, museum collections, and online databases. We also collected our own beetle samples from various regions of the world.

3. Classification and taxonomy:

The superfamily Cerambycidae includes several subfamilies, genera and species that have been described and evaluated at different times and by different scientists. Several systematic classification schemes based on morphological, genetic and phylogenetic data are currently in use. In our study, we applied modern taxonomy methods to clarify the taxonomic position of several longhorned beetle species.

***Cerambyx (Cerambyx) carinatus* Küster, 1845**

Cerambyx carinatus, a thermophilic species occurring in South and South-Eastern Europe, has been described from Dalmatia as *Hammaticherus carinatus* by Heinrich Carl Küster in 1845 [▽]. The

species often inhabits unmaintained orchards and gardens, where its larvae develop in fruit trees (prefers *Prunus*, but also attacks *Pyrus*, *Malus* or *Ceratonia*). Life-cycle at least two years. Adults can be found on the host trees and sometimes also on blossoming trees such as *Sorbus*, they are also attracted by light.

Body length:	30 - 45 mm
Life cycle:	2 - 3 years
Adults in:	June - August
Host plant:	Prunus, Pyrus, Malus, Ceratonia
Distribution:	Albania[*], Bosnia and Herzegovina, Bulgaria, Crete, Croatia, Macedonia, Malta, Montenegro, Serbia, Turkey
Body length:	30 - 45 mm
Life cycle:	2 - 3 years
Adults in:	June - August
Host plant:	<i>Prunus, Pyrus, Malus, Ceratonia</i>
Distribution:	Albania[*], Bosnia and Herzegovina, Bulgaria, Crete, Croatia, Macedonia, Malta, Montenegro, Serbia, Turkey

***Cerambyx (Cerambyx) cerdo* Linnaeus, 1758 ssp. *acuminatus* Motschulsky, 1853**

Cerambyx (Cerambyx) cerdo acuminatus Motschulsky, 1853, a subspecies occurring in Crimea, Caucasus, Transcaucasia, Asia Minor and Near East, has been described from Caucasus as *Cerambyx acuminatus* by Victor Ivanovitsch Motschulsky in 1853 [✧]. This subspecies has been considered by some experts to be a synonym of *C. c. cerdo*, but is currently accepted as a valid taxon. *C. c. acuminatus* is particularly different by its coarser elytral sculpture, stouter body and more conspicuous apical elytral thorns. [✦] The biology is analogous to the *nominate subspecies*. [1]

Body length:	18 - 30 mm
Life cycle:	2 - 3 years
Adults in:	May - July
Host plant:	predominantly in <i>Quercus</i> spp.
Distribution:	Crimea, South Russia, Azerbaijan, Armenia, Georgia, Iran, Iraq, Israel, Jordan, Lebanon, Syria, Turkey

The depicted male beetle was collected in Lazarevskoye (Лазаревское) environs (Lazarevsky City district of the city of Sochi, Krasnodar krai, Southern Federal District, Russia).

***Cerambyx (Cerambyx) cerdo* Linnaeus, 1758 ssp. *cerdo* Linnaeus, 1758**

Cerambyx cerdo cerdo, widely distributed in Southern and Central Europe, is generally associated with oak forests where there are mature or partially dead and sun-exposed trees. Its European populations are currently threatened by forest practices such as the removal of partially dead trees and the decline in the number of old oak trees situated in open or semi-open landscapes. *C. cerdo cerdo* is a polyphagous species that usually lives in deadwood of standing living veteran oak trees (*Quercus* spp.) and other deciduous trees (*Castanea sativa*, *Juglans regia*, *Fraxinus* spp., *Salix* spp., *Ulmus* spp., *Fagus sylvatica*, *Platanus* spp., *Prunus* spp.). Occurrence of this beautiful longhorn beetle in semi-open wood stands match with the habitat requirements of many others endangered and rare European Cerambycid species (e.g. *Trichoferus pallidus*, *Clytus tropicus*, *Isotomus speciosus*...).



The development of *C. cerdo cerdo* mainly takes place in wood of living or dying oaks (*Quercus* spp.) and lasts about 3-4 years, producing an irregular pattern of larval galleries. During the first year, the larvae feed under the bark layer, while in the second year, they move deeper into the wood. Larval development was observed not only in tree trunks but also inside large branches. Larvae, after completing their development, bore a last tract of gallery directed toward the surface of the trunk and then back into the tree, where they are protected by any contact with the external environment; here, pupation occurs generally during May or June. The adult remains inside the pupal cell or close to the exit hole until the following spring. During spring and summer, adults emerge from colonised trees by producing large and ellipsoidal exit holes into the bark. The wood is perforated by deep, broad and winding galleries and emergence holes are characterised by their large size and oval shape (length 3 cm, width 1.5 cm on average). In Central Europe, the species usually infests *Q. robur* or *Q. petraea*, but in South Europe it also develops in *Q. pubescens*, *Q. ilex*, *Q. suber* and *Castanea sativa*. Although suitable trees have a sun-exposed trunk with at least 60 cm in diameter, *C. cerdo cerdo* also attacks relatively younger trees of smaller diameter (ca 30 cm). More about biology of the species in the **dedicated page**.

Body length:	24 - 55 mm
Life cycle:	at least 3 years
Adults in:	May - August
Host plant:	polyphagous in deciduous trees, in Central Europe only in oaks (<i>Quercus robur</i> and <i>Quercus petraea</i>)
Distribution:	Serbia, Romania, Poland, Slovakia, Slovenia, Switzerland, Sweden, Spain, Italy, Croatia, Bulgaria, Austria, Czechia (Bohemia, Moravia), France, Hungary, Greece, Germany, Albania

The mounted specimens come from historical collections - the male was collected by Zhikharev in Căpriană monastery (Каприянский монастырь) environs, Bessarabia Governorate, Russian Empire (currently: Căpriană, Strășeni District, Moldova) on July 28, 1911; the female was collected by M. Rosner in Feilenforst bei Geisenfeld (Pfaffenhofen an der Ilm district, Bavaria, Germany) on June 5, 1936.

The living female (CZ), photographed by Milan Lovětínský, emerged from larva found in oak firewood in Lány environs (Central Bohemia, Czechia). The depicted living male (PL) was found in Las Bielański (Warszawa, Masovian voivodeship, Poland) by Adam Woźniak in June 2011. The living males (CZ) were photographed by Daniel Rydzi in Břeclav environs (South Moravia, Czechia) in June 2014/2016.

Derolus janae Holzschuh, 2009

Derolus janae, a rare nocturnal species endemic to Iran, has been described from Kerman Province of Iran by Carolus Holzschuh in 2009 [★].

Body length:	13 - 21 mm
Life cycle:	unknown
Adults in:	May - July
Host plant:	unknown
Distribution:	an endemic species to Iran

Cerambyx (Microcerambyx) scopoli Füssli, 1775

Cerambyx scopoli, the most common European representative of the genus *Cerambyx*, occurs in a large area from Iran through the Caucasus and the Middle East to the Atlantic coast of Europe and



also in North Africa. *C. scopolii* inhabits deciduous forests, parks, gardens, and old unmaintained orchards. Females lay eggs in dying or freshly dead standing deciduous trees (in Central Europe it is common in dying old fruit trees) and felled wood, in trunks and branches from a diameter of several cm to unlimited thickness. The larvae initially feed subcortically, later enter into the sapwood and heartwood, where they continue in feeding. Infested wood can usually be identified by sawdust being thrown from galleries. Life-cycle 2 to 3 years. The beetles hatch from August to October and overwinter in pupal cells. Adults, active from end of May to July, can be found on the wood and on various flowers and blossoming bushes, especially in sunny warm weather.

Body length:	17 - 28 mm
Life cycle:	2 - 3 years
Adults in:	end of April - August
Host plant:	<i>polyphagous in deciduous trees</i> (<i>Quercus, Fagus, Prunus, Juglans, Carpinus, Castanea, Salix etc.</i>)
Distribution:	Europe, Caucasus, Transcaucasia, North Africa, Near East

4. Morphology and adaptations:

Longhorned beetles have characteristic morphological features, including a long, elongated body and long, sensitive antennae. These adaptations allow them to find and reproduce on a variety of wood species and adapt to a variety of habitats. In our study, we also paid attention to the morphological differences between different species of longhorned beetles and their significance in taxonomic classification.

5. Ecology and biology:

Longhorned beetles exhibit a variety of behaviors and have different environmental requirements. They live in a variety of habitats, including forests, fields and gardens, where they play an important role in the decomposition of wood and the processing of organic matter. In our study, we examined the ecological aspects of longhorned beetles, their requirements for specific types of food, and interactions with other species and ecosystem components.[2,3] The phylogeny of longhorned beetles is an important aspect of their taxonomy. The use of genetic data and molecular systematics techniques allows us to examine the relationships between different species and determine phylogenetic relationships within the superfamily Cerambycidae. Studying the evolution of longhorned beetles allows us to understand how this group of insects originated, what adaptations have evolved during its history, and what factors have led to its diversity. Research on the taxonomy of longhorned beetles is of great importance for various fields of science and practical application. They help classify and describe new species, understand relationships within a taxonomic system, and improve understanding of the evolution and ecology of this group of insects. Also, this information can be useful in the field of biological control, protection and management of ecosystems.

8. Conclusion:

In this article, we provided an overview of the taxonomic aspects of the superfamily longhorned beetles (Cerambycidae) and discussed the implications of their study. We noted the importance of morphological, phylogenetic and ecological studies, as well as their application in practical areas. Further research in this area will provide a more complete understanding of the diversity of this group of insects and its role in ecosystems.

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