

Typical features of *Mytilus edulis* Linnaeus, 1758 in the populations of *Mytilus galloprovincialis* Lamarck, 1819 (Mollusca: Bivalvia: Mytilidae) along the Bulgarian Black Sea Coast

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Abstract: Morphological characteristics and colouring, typical for *Mytilus edulis*, which are observed in *Mytilus galloprovincialis* from the southern Bulgarian Black Sea Coast, are scrutinized. Certain features and the distribution of species from the genus *Mytilus* are discussed.

Key words: *Mytilus edulis*, *M. galloprovincialis*, Bulgaria.

Introduction

Mytilus edulis Linnaeus, 1758 is recorded by Milaschewitsch (1916) under the names *M. galloprovincialis* var. *acrocyrta* Locard, 1889 and *M. retusus* var. *acrocyrta* Locard, 1889. Later Skarlato & Starobogatov (1972) reported *M. acrocyrta* Locard, 1889 noting that the species closely resembles *M. edulis* but identifying differences in the muscle scars, which they considered similar to *M. galloprovincialis* Lamarck, 1819. They retained the species name *M. acrocyrta* Locard, 1889 and mentioned it from the western Black Sea Coast.

Currently *M. retusus* Lamarck, 1819; *M. retusus* var. *acrocyrta* Locard, 1889; *M. galloprovincialis* var. *acrocyrta* Locard, 1889 and *M. acrocyrta* Locard, 1889 are accepted as synonyms of *M. edulis* Linnaeus, 1758 (Kantor & Sysoev 2005; Gardner 1992; Hilbish *et al.* 2000; Oyarzurn *et al.* 2021; Costello *et al.* 2026; WoRMS 2026).

According to Costello *et al.* (2026), PESI (2026) and WoRMS (2026), *M. edulis* is recorded from the Atlantic coast of Europe, while *M. galloprovincialis* Lamarck, 1819 – from the Mediterranean and Black Seas. This distribution is supported by DNA studies (WoRMS 2026).

From the Bulgarian Black Sea only the species *M. galloprovincialis* Lamarck, 1819 (Chichkoff 1912; Borcea 1931; Paspalev 1933; Caspers 1951; Valkanov 1957; Marinov 1990; Konsulov 1998; Hubenov 2024, 2025) is reported. Shells with colouring and morphological characteristics similar to *M. edulis* have been identified in the southern parts of the Bulgarian Black Sea Coast. In this article their presence is scrutinized.

Results and Discussion

Along the Bulgarian Black Sea coast, mussel shells similar to *Mytilus edulis* are occasionally found in the areas of Ahtopol town, the beach at the mouth of the Veleka River, and Lipite Beach (south of the village of Sinemorets), scattered among the typical *M. galloprovincialis* shells. Their density on the beaches is low; for every 150–200 specimens of *M. galloprovincialis*, there are approximately 1–2 specimens similar to *M. edulis*. It should be

noted that only the forms with radial rays are immediately recognizable. This form (Fig. 1) can likely be found in other parts of the Bulgarian coastline as well.

The shape of the shell is oval-triangular, elongated with rounded edges, convex and symmetrical, with fine growth lines. Smooth inner valve margins. The hinge lacks teeth. There are a few small denticles at the anteroventral end of the valves. The ventral margin is nearly straight, though a slight concavity may occur where the byssus appears. Ventrally, the valves are evenly rounded. Flexures lack. Viewed from the front, the shell appears more rounded than the typical *M. galloprovincialis*, which is flatter on the ventral side. The ligament is external, immersed and longer than the typical form. The ratio of the shell height to length is variable. The configuration of the shell margins also varies; the dorsal margin is evenly curved or forms an obtuse angle, while the ventral margin is usually slightly concave but may be straight or curved downwards. The shape of the valves is influenced by the substrate. Shell length is approximately 50–60 mm, reaching a maximum of 90 mm (Skarlato 1981). Sexual dimorphism is absent.

The colour varies significantly. Forms with radial rays are the easiest to distinguish; these are typical predominantly for the European seas (Skarlato 1981). Sometimes the rays are pale, indistinct or blurred and difficult to distinguish. Brown, light brown, black-brown, black-purple, blue-purple, pearly blue-purple and olive-green specimens have been described. The shell material beneath the periostracum is purple. In general, the periostracum colour of *M. edulis* is bluer compared to *M. galloprovincialis* (Table 1).

The pallial sinus is not present. The anterior retractor scar is horizontally elongated. Above it posteriorly is an attachment scar of the anterior pedal retractor. The posterior adductor scar is circular and significantly larger than the anterior retractor. Anteriorly to it is the posterior pedal retractor scar, which is horizontally elongated and twice the adductor scar. Thus, in the combined posterior muscle scar, the narrow section is nearly twice as long as the wide section and half as wide.

An eurybiontic, littoral-sublittoral species. It is usually found at depths of 0 to 60 m but also inhabits greater depths. In the Sea of Okhotsk (might be a different species), it has been recorded at a depth of 1,450 m (Skarlato 1981). It is an euryhaline species, tolerant to significant salinity changes (4‰–34‰) in the oceans, seas, and river estuaries. The species belongs to the sessile benthos. An eurytopic organism which attaches to both hard and soft substrates. It forms dense colonies with biomass densities up to 50 kg/m² (mussel beds) and creates its own substrates which form specific biological communities. The species can live up to 24 years. Macrofouler, which distribution range is determined by its ecological requirements. The largest specimens have been found in the sublittoral zone.

M. edulis encrust on the port works and ships. The species is known as blue mussel or common mussel. It is a species of commercial importance, consumed worldwide and cultivated in mussel farms.

M. edulis is distributed from the subtropical to the polar regions (Skarlato & Starobogatov 1972; Skarlato 1981; Naumov *et al.* 1987; Kantor & Sysoev 2005; Gardner 1992; Hilbish *et al.* 2000; Oyarzún *et al.* 2021; Melbourne *et al.* 2024). In the Pacific Ocean, it is found in the Sea of Okhotsk, the Bering Sea, and the Sea of Japan, as well as around South America, Australia and New Zealand. In the Arctic Ocean, it inhabits the Barents, White, Kara, Chukchi and Beaufort Seas, the Canadian Arctic Archipelago, Hudson Bay and Alaska. In the Atlantic Ocean, it is known from the coasts of North and South America, Greenland, Iceland and Europe. According to the latest data from WoRMS (2026), it is considered a complex of species, each with its own distribution range.

The unlimited possibilities for distribution of *M. edulis* as a fouling organism, combined with its wide eurybiontic nature, leads to the formation of hybrids with the native species (Oyarzún *et al.* 2021). This explains the appearance of features typical for *M. edulis* within the populations of other species belonging to the genus *Mytilus*.

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Table 1. Differences between *Mytilus edulis* and *Mytilus galloprovincialis* (Skarlato & Starobogatov 1972; Skarlato1981; Naumov *et al.* 1987; Oyarzún *et al.* 2021).

Features	<i>Mytilus edulis</i>	<i>Mytilus galloprovincialis</i>
Shell, form	triangular-oval, wedge-shaped	quadrangular wedge-shaped
Shell, ventrally	more rounded	flatter
Ligament	elongated	shorter
Exterior colouring	radial stripes	no radial stripes
Internal colouring	more pronounced purple hue	blue, blue-purple

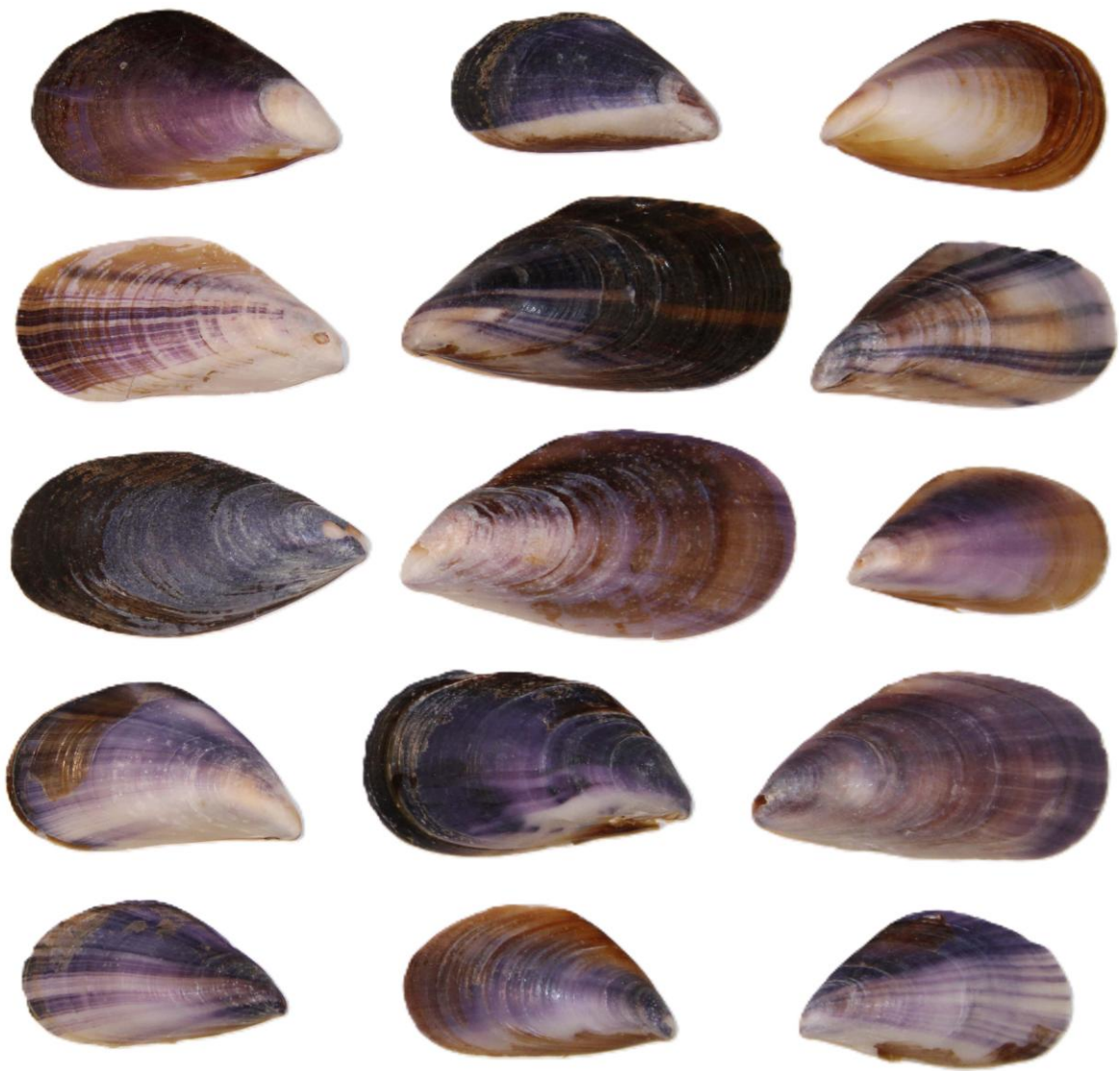


Fig. 1. Shells with colors and morphological characteristics of *Mytilus edulis* from the south Black Sea Coast.