

Littorina arcana Hannaford Ellis, 1978 – a new record from the eastern Barents Sea

Andrei I. Granovitch & Inna M. Sokolova*

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Andrei I. Granovitch, Dept. of Invertebrate Zoology, Faculty of Biology and Soil Sciences, St. Petersburg State University, 199034 St. Petersburg, Russia. – Inna M. Sokolova*, White Sea Biological Station, Zoological Institute of R.A.S., 199034 St. Petersburg, Russia.

* Corresponding author. Present address: Lab. Ecophysiology, Alfred-Wegener-Institute for Polar and Marine Research, Columbusstr., 27568 Bremerhaven, Germany.

E-mail: isokolova@awi-bremerhaven.de

In the intertidal zone of North Atlantic rocky shores at least three species of the *Littorina saxatilis* species complex (Gastropoda: Caenogastropoda: Littorinidae) are generally recognised – *Littorina saxatilis* (Olivi, 1792), *Littorina arcana* Hannaford Ellis, 1978, and *Littorina compressa* Jeffreys, 1865 (Reid 1996). Their distribution in the intertidal zone overlaps to a great extent and species identification is frequently difficult. The problems of species identification are especially acute for periwinkles from the northern parts of the species' distribution range. Thus, unlike the varieties from France and the British Isles, the northern variety of *L. compressa* var. *barentica* from the Barents Sea is often not recognisable from the co-occurring *L. saxatilis* based on the features of shell morphology alone (Reid 1996). Similarly, no species-specific characteristics of shell shape and sculpture have been found in *L. saxatilis* and *L. arcana* from northern Norway, which until now has been recognised as the most north-eastern point of the geographical distribution of *L. arcana* (Reid 1996). In both cases these species could only be reliably distinguished based on the anatomy of the reproductive system. Given these difficulties with species identification in the *L. saxatilis* species complex, the geographical distribution of these species requires reconsideration, especially in the northeastern part of their distribution. The aim of the present study was to revise the composition of the *L. saxatilis* species complex on the East Murman coast in the eastern Russian part of the Barents Sea.

Littorinids of the *L. saxatilis* species complex were collected at two localities on the East Murman coast of the Barents Sea (69°06'N, 36°05'E) in July 2000: 1) at

Dal'nij Plyazh and 2) in the Yarnyshnaya Bay separated by a distance of about 11 km along the shoreline. Both localities are sheltered shores situated in the middle part of a fjord. Animals were collected in the mid-littoral from gravel and small stones in the belt of the brown macroalga *Fucus vesiculosus*. In the laboratory snails were anaesthetised with 7 % MgCl₂ (vol:vol of hydrated crystals made up in fresh water) and rapidly killed by boiling. The snails were then dissected and the morphology of the reproductive system of mature individuals was examined under a binocular microscope. At least 150 individuals from each locality were examined. Only adult snails (shell diameter 5-11 mm) were considered.

In the samples from the two studied localities two forms from the *L. saxatilis* species complex were most abundant. Mature females of these two forms could be readily distinguished based on the morphology and relative size of different parts of the pallial oviduct. Females of the first form were characterised by the presence of brood pouch containing eggs and developing embryos, which replaces the jelly gland. Two other (albumen and capsule) glands are relatively small and make up not more than 1/4 of the total length of the pallial oviduct (Fig. 1C, D). These features correspond to the species diagnosis of *L. saxatilis* (Olivi, 1972) (Reid 1996). In contrast, females of the other form have relatively more developed albumen and capsule glands. Together they comprise up to a half of the distal part of the pallial oviduct (Fig. 1A, B). All mature females of this form have well-developed jelly glands and the brood pouch is absent. The copulatory bursa extends back along the full length of the jelly gland to the cap-

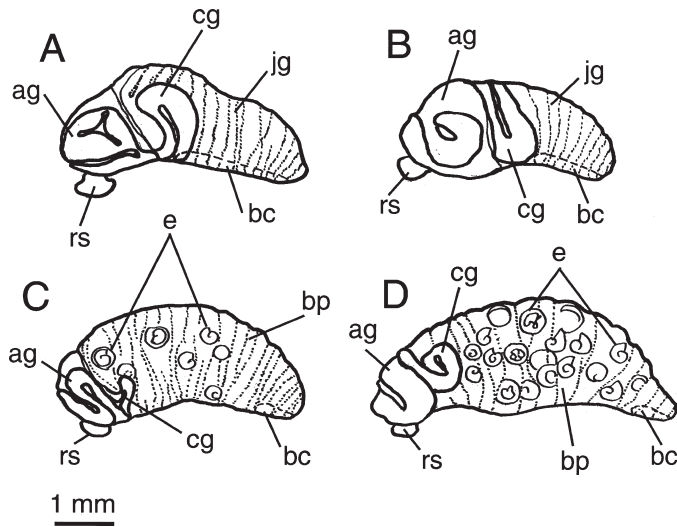


Fig. 1. Morphology of the pallial oviduct of *L. arcana* (A, B) and *L. saxatilis* (C, D) females (8-12 mm shell diameter) from the East Murman coast of the Barents Sea. Abbreviations: ag - albumen gland, bc - copulatory bursa, bp - brood pouch, cg - capsule gland, e - embryos, ig - jelly gland, rs - seminal receptacle.

sule gland. These features of reproductive anatomy identify these females as belonging to *L. arcana* Hannaford Ellis, 1978 (Reid 1996). In our samples, the ratio of abundance of *L. saxatilis* to *L. arcana* was 1:1.5 to 1:2 among the adult females. We have found no morphological or anatomical differences in males of the two forms. There were no discrete groups according to the penis shape and/or number or form of the penial glands (data not shown). Shell morphology was similar in all analysed animals irrespective of gender or species and no diagnostic features of shell shape or sculpture could be found to distinguish between *L. saxatilis* and *L. arcana* from the studied localities (Fig. 2).

Several representatives of the *L. saxatilis* species complex were previously recorded for the studied area of the East Murman Coast of the Barents Sea. However, outside in the excellent review by Reid (1996), there is no detailed account of anatomical and/or morphological characters used for the species identification by other researchers studying the *L. saxatilis* species complex from the East Murman. Besides *L. saxatilis*, *L. nigrolineata* was reported from Yarnyshnaya Bay (Galaktionov & Rusanov 1983; Galaktionov & Marasajev 1986) but was later identified as *Littorivaga jugosa* (Golikov A.N., pers. comm., cit. after Galaktionov 1993). In the latter work it was mentioned that females of this species lay egg masses, and males have the arrangement of the penial glands

characteristic of *L. nigrolineata* (Galaktionov 1993). It should be noted that *Littorivaga jugosa* (*sensu* Galaktionov 1993) cannot be used as a valid name for this form, because *Turbo jugosus* Montagu, 1803 is a synonym of *L. saxatilis sensu stricto* (Reid 1996) and could not be applied to the oviparous form mentioned by Galaktionov (1993). Possibly, the species recorded by Galaktionov and co-workers is *Littorina compressa* Jeffreys, 1865 (= *L. nigrolineata*, see Reid 1996). Reid (1996) later confirmed the occurrence of *L. compressa* in the eastern Barents Sea. A single male of this species was also found in our samples from Dal'nij Plyazh.

Until now, *L. arcana* has never been recorded from the eastern Barents Sea. The closest localities, where this species has been found are in the northern Norway (Vardø and Vadsø areas) (Reid 1996). Our finding significantly extends the known distribution range of *L. arcana* to the north-east and requires critical re-appraisal of the data on population biology, physiology and parasitology of the *L. saxatilis* species complex so far collected for the eastern part of the Barents Sea (in particular, for the East Murman coast). In order to establish the eastern limit of the distribution range of *L. arcana*, additional collections are necessary from the eastern parts of Scandinavia and the Kola Peninsula, as well as from the eastern parts of the Barents Sea, the Pechora and Laptev seas.

Reference samples of *L. saxatilis* and *L. arcana* from

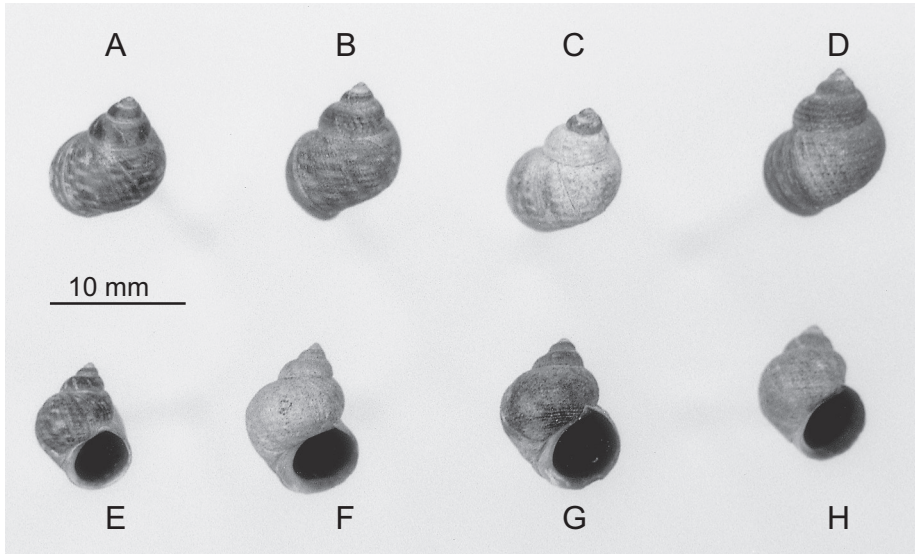


Fig. 2. Shell morphology of typical *L. arcana* (A, B, E, F) and *L. saxatilis* (C, D, G, H) from the East Murman coast of the White Sea. Specimens A, C, E, G are from Dal'nij Plyazh, B, D, F, H - from Yarnyshnaya Bay.

Dal'nij Plyazh have been deposited in the Natural History Museum, London (registration numbers BMNH 20001304, BMNH 20001305).

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