

On *Deroceras* (*Deroceras*) *ikaria* P.L. Reischütz, 1983 (Gastropoda Stylommatophora Agriolimacidae) from Ikaria Island (Aegean Sea, Greece)

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ABSTRACT

This paper shows new morphological data on *Deroceras ikaria* P.L. Reischütz, 1983 (Gastropoda Stylommatophora Agriolimacidae) an endemic species from Ikaria Island (Aegean Sea, Greece), known only for the type serie. This species is similar to *D. samium* Rähle, 1983 and more informations for a better understanding of both species are provided.

KEY WORDS

Slug; endemism; morphology; systematics; Eastern Mediterranean.

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INTRODUCTION

Deroceras ikaria was described by P.L. Reischütz (1983) based on some specimens sampled on Ikaria Island (Dodecanese Archipelago, Greece), in the surroundings of Chrysostomos. Later, this species was no longer found.

Wiktor (2000, 2001) re-examined the holotype and two immature paratypes, highlighting the similarity between *D. ikaria* and *D. samium* Rähle, 1983, a species spread on the East Aegean islands (Rhodes, Kos, Samos, Lesbos, Chios, Ikaria) and Turkey (Efos near Selçuk) (Fig. 1). These two species share the following features: the blackish external colour, a furrow that runs from the posterior margin of the mantle to the pneumostome, a short broad penis with a large spherical lateral pocket and on the opposite side an appendix, the vas deferens opens at the base of the appendix, a penial gland with numerous processes attached to a short common

stem, the penial retractor muscle attached to the base of the penial gland, a large fan-like stimulator that fills up the whole penis. Wiktor (2000, 2001) suggests that *D. ikaria* is a distinct species from *D. samium* due to the smaller size of the mollusc and the longer, cylindrical appendix (generally shorter and hook-like in *D. samium*). However, Wiktor (2000, 2001) stresses the need to examine further material.

The examination of five specimens of *D. ikaria*, recently sampled in three different localities of Ikaria Island (Fig. 2), allows us to better evaluate the variability of this species and to define its taxonomic status with respect to *D. samium*.

MATERIAL AND METHODS

Study area

The island of Ikaria lies in the central-eastern

Aegean Sea (Figs. 1, 2). It has an area of 255 km² and it is rectangular in shape with axis direction WNW – ESE. The eastern part of the island is made up of gneisses and schists, while the western part is almost entirely composed of granite and granodiorite. Limestone and marble occur in the central and southern part of Ikaria. The topography is mountainous, and the entire island is occupied by the Atheras mountain range (1037 m). Several torrents cutting through the mountain massifs, form deep gorges with powerful rivers, which during the winter have a considerable water flow. There are important wetlands with a remarkable environmental impact. The island has a steep southern side with precipitous cliffs and a smoother northern one. The climate is Mediterranean, with rainfall in winter and a long dry period from late April to early October (Christodoulakis, 1996a).

Ikaria is very varied and very rich in endemic species from a floristic point of view (Christodoulakis, 1996b). This is due to the considerable environmental heterogeneity. Different kind of soil, a noticeable amount of water, considerable altitudes, anthropic activity and destructive events such as fires have shaped the current ikarian landscape. The areas affected by the wildfires have lost their original character and the primitive forests of *Pinus brutia* Ten. and *Quercus ilex* L. have been replaced by a secondary maquis composed of *Erica manipuliflora* Salisb., *Arbutus unedo* L., *Cistus creticus* L. and *C. salviifolius* L. A large part of the island is covered in pine forests, *P. brutia* with a brushwood of *Erica arborea* L. and *A. unedo* and in the open areas there is a shrubby vegetation with *Pistacia lentiscus* L., *E. manipuliflora*, and *Cistus* sp. pl.

The highest concentration of endemisms occurs in the centre of the island, which is also the oldest part from a geological point of view, as it is formed of pre-alpine metamorphic rocks (Christodoulakis, 1996a). On the central mountains, at an altitude between 200 and 800 m, occurs the Randi Forest, a centuries-old Holm Oak forest of great scientific value, consisting of *Q. ilex*, *Q. coccifera* L., *A. unedo* and *A. andrachne* L., covering an area of 16 square kilometres. *Quercus ilex* and *A. unedo* are also quite present in the island, mainly on Mt. Atheras. Finally, the riparian habitats of the deep gorge of Halari, Nas, Myrsonas and Charakas Rivers are characterized by an association of

Platanus orientalis L., *Alnus glutinosa* L. (Gaertn.), *Vitex agnus-castus* L. and *Nerium oleander* L.

Sampling methods

All specimens were collected by eye-sight on the ground and under rocks. Photographs were taken in nature of both the specimens found and the localities where they lived (by M. Grano and C. Cattaneo). The specimens were analysed with regards to size, colour, external morphology and genitalia's morphology. In order to study and illustrate genitalia, the specimens were fixed in 75% ethanol. Reproductive apparatus was extracted by means of scalpel, scissors and needles. All the specimens were studied and observed under a stereomicroscope (Leica MZ 7.5). Photographs were taken with a digital camera. The maximum length and width of the molluscs together with the shell and some parts of genitalia were measured (in millimeters) by a digital gauge. In the anatomical description, proximal denotes the part which is closest to the gonad and distal the one closest to the gonopore. The proximal female genitalia, sometimes indicated in the plates, are not described because they are not very informative. Voucher specimens are stored in the collection of the first author. Taxonomical references are based on the checklist of land and freshwater Gastropoda of Europe (Bank & Neubert, 2018).

ACRONYMS. AG = albumen gland; BC = bursa copulatrix; DBC = duct of the bursa copulatrix; FO = free oviduct; GA = genital atrium; HD = hermaphrodite duct; L = length; LP = lateral pocket; O = ovotestis; OV = ovispermiduct; P = penis; PA = penial appendix; PG = penial gland; PR = penial retractor muscle; S = stimulator; V = vagina; VD = vas deferens; W = width; ex/x = specimen/s. CL = Liberto Fabio collection, Cefalù, Italy.

RESULTS

Systematics

Classis GASTROPODA Cuvier, 1795
 Superordo EUPULMONATA Haszprunar et Huber, 1990
 Ordo STYLOMMATOPHORA Schmitd, 1855
 Superfamilia LIMACOIDEA Lamarck, 1801

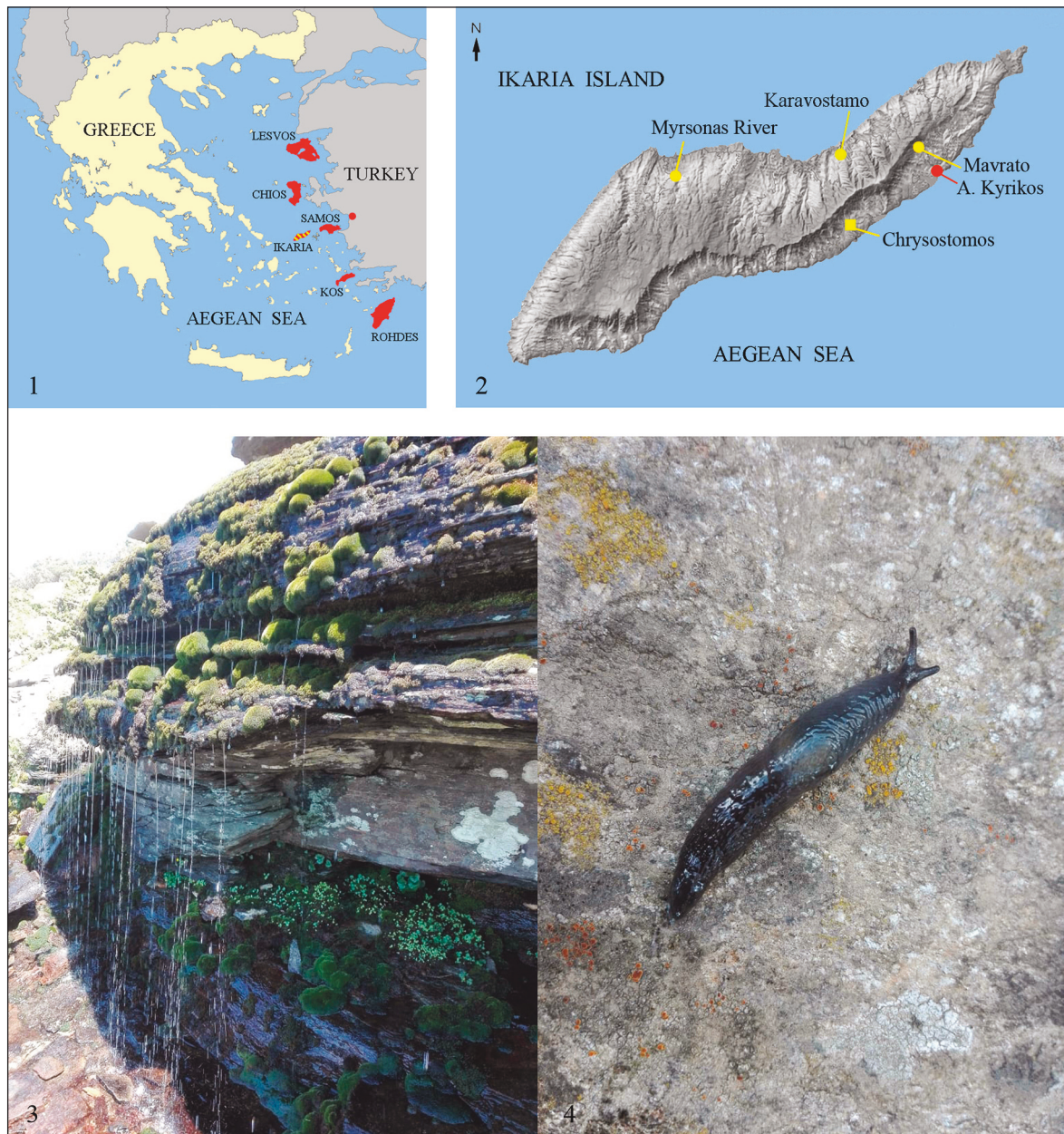


Figure 1. Distribution map of *Deroceras samium*: areas in red. Figure 2. Map of Ikaria Island (Greece); yellow square: type locality of *D. ikaria*; yellow points: sampling localities of *D. ikaria*; red point: sampling locality of *D. samium* by Wiktor, 2001. Figure 3. Detail of the environment (Chrysostomos). Figure 4. *Deroceras ikaria* in natural habitat.

Familia AGRIOLIMACIDAE H. Wagner, 1935
 Subfamilia AGRIOLIMACINAE H. Wagner, 1935
 Genus *Deroceras* Rafinesque, 1820
 Subgenus *Deroceras* Rafinesque, 1820

***Deroceras* (*Deroceras*) *ikaria* P.L. Reischütz, 1983**

MATERIAL EXAMINED. Aegean Sea, Greece,

Ikaria Island, Mavrato, 37°37'58"N, 26°16'49"E, 547 mt, legit Mauro Grano and Cristina Cattaneo, 1 ex (CL G1285); idem, Karavostamo, 37°34'49"N, 26°13'12"E, 98 mt, legit M. Grano and C. Cattaneo, 3 exx (CL G1286-G1288); idem, Myrsonas River, 37°36'59"N, 26°06'15"E, 184 m, legit M. Grano and C. Cattaneo, 1 ex (CL G1308).

DESCRIPTION. The three specimens from Karavostamo measure 24 mm, 20 mm and 19 mm in length respectively. The specimen from Mavrato is the largest with 25 mm in length and that one from Myrsonas River is the smallest, only 18 mm (all specimens were measured after preservation in alcohol and were slightly contracted). The five specimens examined have well-developed genital organs, although the Myrsonas specimen shows a not fully developed penial gland and appendix (Figs. 14, 15).

The mollusc is blackish in colour with lighter brown or whitish sides (Fig. 4); uniform cream foot or tripartite in colour with the two blackish side areas. All the specimens examined have the characteristic furrow that runs from the posterior margin of the mantle to the pneumostome, causing a slight bending in the evenly rounded posterior mantle edge (Fig. 5). Thin, opaque, whitish, elliptical or sub-rectangular shell (L: 6 mm, W: 3.6 mm), with apex on the central axis and weak irregular growth lines (Figs. 6, 7, 17, 18).

In the examined specimens, the stimulator is folded on itself producing a groove, but if spread out it takes the form of a fan with a narrow base and the furrow is no longer visible (Figs. 9, 10, 20, 21). In the holotype examined by Wiktor (2000) the stimulator is stretched out and this might explain why Wiktor (2000) was unable to observe the median groove described by Reischütz (1983).

The penial gland is composed of 12/17 very long end generally unbranched processes, set on a common short trunk (Figs. 8-13, 19, 21).

The appendix in two specimens from Karavostamo is 2.9 mm (Fig. 13) and 2 mm (Fig. 8) long respectively, cylindrical and with a rounded apex, in the third specimen it is introflexed, wrapped around itself and 2 mm long (Figs. 11, 12). In the sub-adult specimen from Myrsonas River the appendix is pocket-like, 1 mm long and the penial gland is not fully developed (Figs. 14, 15). Finally, the appendix seems almost absent in the adult specimen from Mavrato.

DISTRIBUTION AND BIOLOGY. In the course of our researches on Ikaria Island, terrestrial molluscs were sampled in twenty-four localities, but *D. ikaria* have been found only in three of these. *D. ikaria* appears rather localized in moist environments with a plant association mainly characterized by *Equisetum ramosissimum* Desf.,

E. telmateia Ehrh., *Pteris vittata* L., *P. dentata* Forssk., *Adiantum capillus-veneris* L., *Lythrum hyssopifolia* L., *Epilobium obscurum* Schreb., *E. parviflorum* (Schreb.) Schreb., and *Ranunculus* sp. pl. (Fig. 3).

To date, *D. ikaria* is considered in the IUCN red list of threatened species as a Data Deficient category (Parmakelis, 2017), but it could be assigned a Vulnerable status, given the range restricted to only a few localities on the island of Ikaria.

COMPARATIVE NOTES. *Deroceras ikaria* appears similar to *D. samium* not only in the appearance of the body (colorations and furrow in the posterior mantle section) but also in the morphology of the genital organs.

The aim of this study, the morphological analysis carried out on specimens of *D. ikaria*, allowed us to better understand the main morphological characters of this little known species.

In particular, what was observed by Wiktor (2000, 2001) is confirmed. *Deroceras ikaria* is characterized by smaller dimensions and a usually longer penial appendage (Table 1) compared to the similar *D. samium* which shows greater dimensions, being able to exceed 42 mm in length, and a penial appendage which is proportionally shorter.

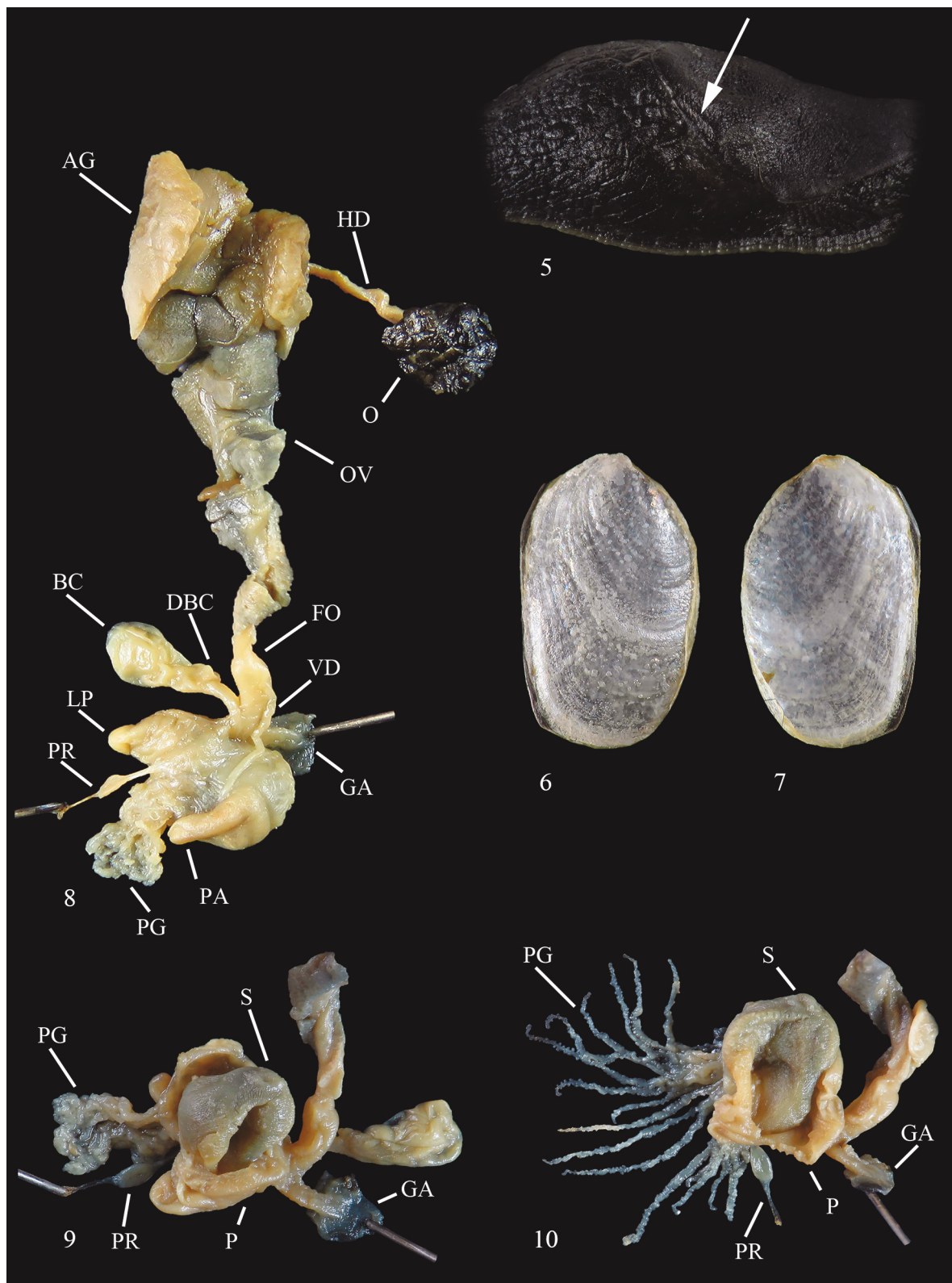
In the holotype of *D. ikaria*, Wiktor (2000) observed some irregular bumps on the penis wall, that are not present in our five examined specimens.

CONCLUSIONS

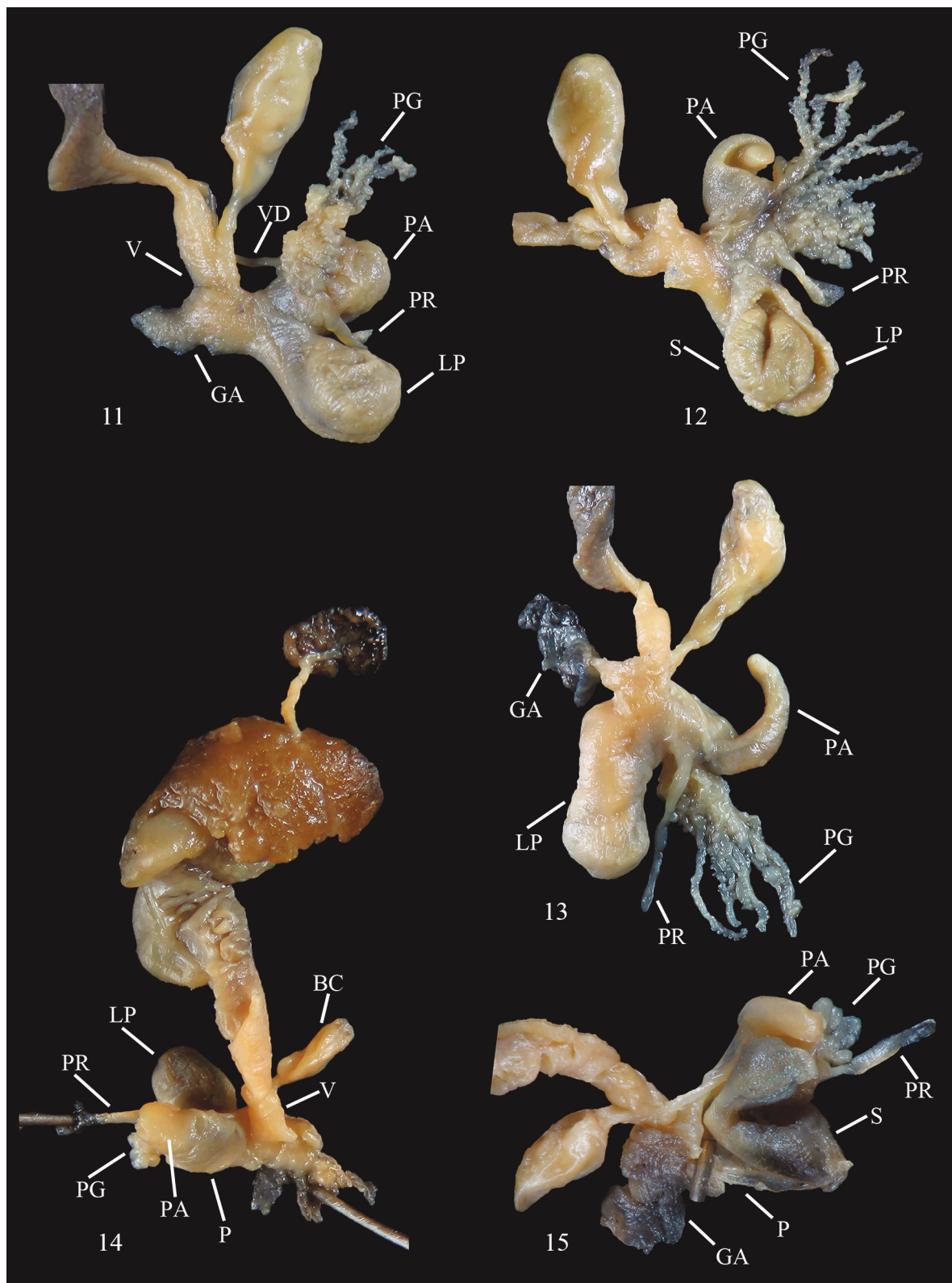
At present, *D. ikaria* appears to be a valid species distinguished from the related *D. samium* by morphological and anatomical characters.

The two species were recorded by Wiktor (2001) on the same island of Ikaria (Figs. 1, 2), maintaining their distinctive morphological characters. This is confirmed by our data, although an adult specimen of *D. ikaria* from Myrsonas River seems to have no appendix.

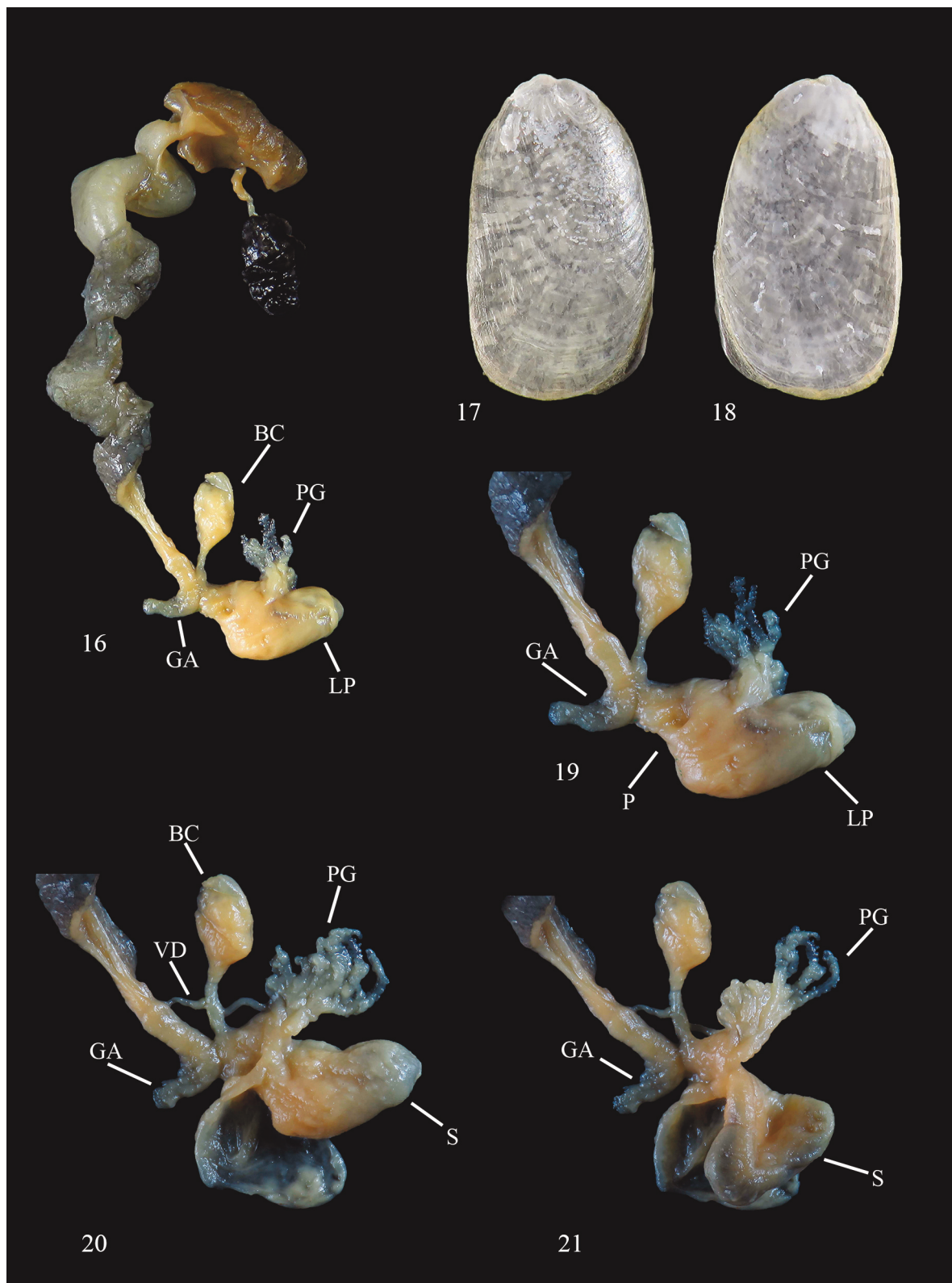
The study of further material from Ikaria Island could lead to consider the two taxa as subspecies, or in a lumpers' view as the same species, in this case *D. ikaria* will have priority because it was described in June 1983 while *D. samium* was described in October 1983.



Figures 5–10. *Deroceras ikaria*, Karavostamo, Ikaria Island. Fig. 5: mantle, the arrow indicates the furrow from the posterior margin of the mantle to the pneumostome. Fig. 6: shell in dorsal view, L: 6.1 mm, W: 3.7 mm. Fig. 7: shell in ventral view. Fig. 8: genitalia. Fig. 9: open distal genitalia with stimulator folded on itself. Fig. 10: idem of Fig. 9 with stimulator spread out and stretched out penial gland.



Figures 11–13. *Deroceras ikaria*, Karavostamo, Ikaria Island. Fig. 11: distal genitalia. Fig. 12: idem of Fig. 11 with stimulator and stretched out penial gland. Fig. 13: distal genitalia. Figures 14, 15: *Deroceras ikaria*, Myrsonas River, Ikaria Island. Fig. 14: genitalia. Fig. 15: open distal genitalia with stimulator.



Figures 16–21. *Deroceras ikaria*, Mavrato, Ikaria Island. Fig. 16: genitalia. Fig. 17: shell in dorsal view, L: 6.3 mm, W: 3.7 mm. Fig. 18: shell in ventral view. Fig. 19: distal genitalia. Fig. 20: open distal genitalia with stimulator folded on itself. Fig. 21: idem of Fig. 20 with stimulator spread out.

Locality	Mollusc L - W	Penial gland	Penial appendix	Stimulator
Mavrato	25 - 5	13 processes	Missing	Fan-shaped, folded
Karavostamo (CL 1286)	24 - 7	17 long processes	2 mm long	Fan-shaped, folded
Karavostamo (CL 1287)	20 - 6	16 long processes	2.9 mm long	Spherical with groove
Karavostamo (CL 1288)	18 - 5	12 processes some long some short	2 mm long	Spherical with groove
Myrsonas River	16 - 4	Not fully developed penial gland, with only 5 short processes	1 mm long and wide	Fan-shaped, folded

Table 1. Morphological characters and dimensions of the examined specimens of *Deroceras ikaria* from Ikaria island.

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