

TERRESTRIAL SNAILS (MOLLUSCA: GASTROPODA) OF THE GYAROS ISLAND (CYCLADES, GREECE)

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ABSTRACT: Although most of the Cyclades and other Aegean islands and islets have been surveyed for land snails since the beginning of the 19th century, the island of Gyaros was not one of them. Five species were recorded by two geologists who studied the geology of the island in 1952. In our survey in March 2014 we found 20 species on the island. All species, with the exception of *Chilostoma arcadica* and *Monacha rothii*, are widespread in the Aegean and the Mediterranean.

KEY WORDS: Aegean, land snails, biodiversity

INTRODUCTION

Many Aegean islands have been surveyed for land snails since the late 18th and early 19th century. In general the malacofauna of most large Aegean islands is known, but most of the smaller ones, less than 20 km² in area, have not been studied. The work of FUCHS & KÄUFEL (1936) was the first study for Aegean land snails, including numerous islands, while MYLONAS (1982) studied most of Cyclades. The island of Gyaros, a Cycladic island, has not been surveyed by any malacologist, although the geologists PSARIANOS & CHARALAMBAKIS (1952) within their geological study of the island cite five land snails, namely *Eobania vermiculata* (O. F. Müller, 1774) [in their paper as *Helix (Pentataenia) vermiculata* Müller], *Metafruticicola noverca* (L. Pfeiffer, 1853) [as *Helix (Cressa) giurica* Krüp.], *Rumina saharica* Pallary, 1901 [as *Buliminus (Stenogyra) decollatus* L.], *Ena monticola* (Roth, 1856) [as *Buliminus monticula* Roth], and *Albinaria caerulea* (Deshayes, 1835) [as *Clausilia caerulea* Fér.].

Gyaros is an arid island of northern Cyclades located between Syros, Andros and Kea, with a total area of 17.76 km², and its highest peak reaches 489 m (Fig. 1). Nowadays it is uninhabited, but it used

to be a place of exile in the Roman times (GOUNARIS 2005) and after World War II discontinuously till 1974. The authorities did not allow anyone to visit the island until 2001. All around the island there are signs for scattered mines thus going around is quite risky.

In general the island appears quite uniform as far as its vegetation and geological substrate are considered (Fig. 2). The dominant vegetation type is phrygana, characterised by a number of shrub species rather common in the Cyclades area; thorny burnet (*Sarcopoterium spinosum* (L.) Spach), hairy thorny broom (*Calicotome villosa* (Poir) Link), Mediterranean thyme (*Thymbra capitata* (L.) Cav.), thyme rockrose (*Fumana thymifolia* (L.) Webb). The coastal marsh is dominated by rush (*Juncus heldreichianus* T. Marsson ex Parl.). Around the old buildings and settlements, there are various trees that have obviously been planted, such as cypress (*Cupressus sempervirens* L.), olive tree (*Olea europaea* L.), pine (*Pinus brutia* Ten.) and eucalypts (*Eucalyptus* sp.). The old abandoned cultivations on the island are nowadays covered with various shrubs (Fig. 2). On the eastern part of the island there is a freshwater spring.

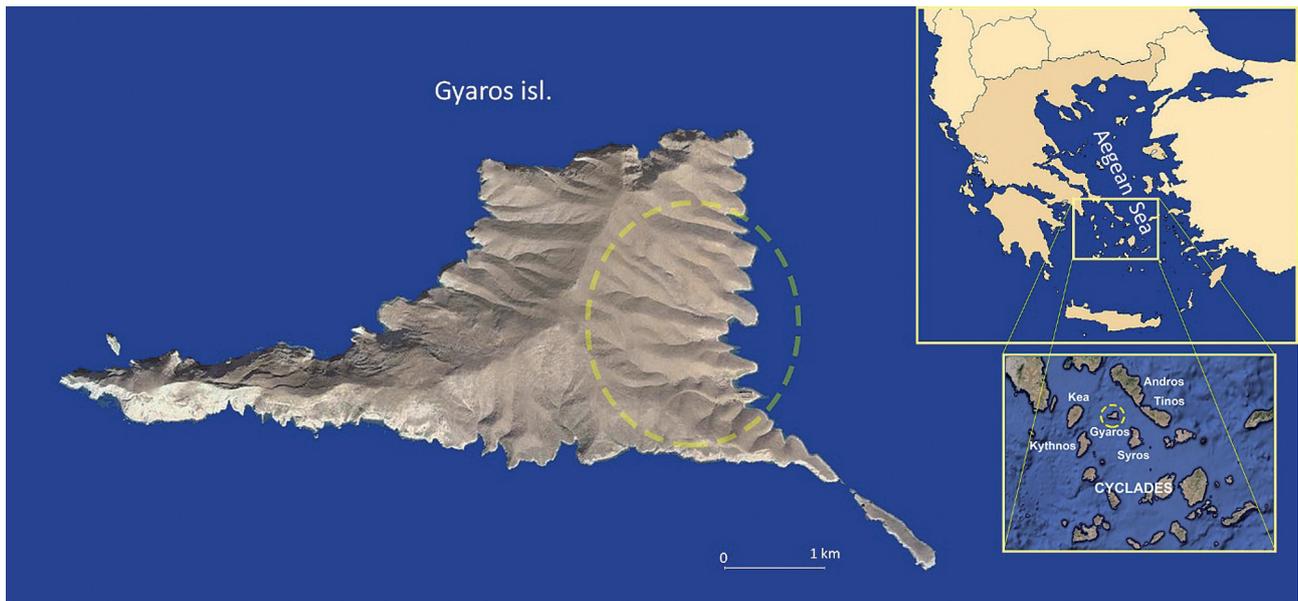


Fig. 1. Map of Gyaros Island – the area where land snails were collected is within the dashed yellow circle, its position relative to other Cycladic islands is depicted on the inlaid maps

Geologically the substratum of the island is blue schist, a metamorphic rock mainly volcanic but it also includes marbles, thus in certain parts of the island the substratum is calcareous (PSARIANOS & CHARALAMBAKIS 1952, KATAGAS 1996).

The whole island belongs to the NATURA 2000 European network.

In this paper, the terrestrial land snails will be presented, as well as an analysis and comparison of the malacofauna with the Cycladic and other Aegean islands.



Fig. 2. Photographs of Gyaros – views of the areas which were sampled in the eastern part. Photos: APOSTOLOS TRICHAS



MATERIAL AND METHODS

We visited the island (KV & MM) in March 2014 and collected land snails in its eastern part (Fig. 1, yellow circle) within the framework of a project for the whole biodiversity of the island. We looked for snails in this particular area because on the one hand, the island is quite uniform, and on the other, it was very difficult and risky to look around due to the mines scattered all over the island. However, we searched in the most diversified part of the island, human constructions (buildings, old reservoirs etc.), abandoned cultivations, phrygana, maquis, coastal areas, the area with a freshwater spring and surface runoff of freshwater and the larger of the two spots

with limestone on the island. Thus, we surveyed all the different ecotypes, geotypes and land snails' habitats on the island.

Land snails, leaf litter and the upper part of soil were collected by hand. Snails were drowned and then preserved in 75% ethanol. Litter and soil were sieved in the laboratory for small size snails. Some species were also preserved in 95% ethanol for further molecular studies.

Specimens were identified at species level on shell and anatomical characters, using the most recent scientific papers concerning each taxon. All the material is held at the Natural History Museum of Crete.

RESULTS

GENERAL REMARKS

In total we found 20 species on the island, which are presented in Table 1. In the same table additional data for these species are given: 1) their presence/absence on the neighbouring Cycladic islands, Syros south of Gyaros, Tinos and Andros northeast of Gyaros, Kea and Kythnos northwest of Gyaros, 2) their status in the Red Book of Endangered Animals of Greece (VARDINOYANIS *et al.* 2009), and 3) the chorotype for each species. Chorotypes are distinguished in six categories following TRIANTIS *et al.*

(2008): Cycladic – species distributed only on the Cyclades, Aegean – species which are also present on other Aegean islands or/and nearby coastal mainland areas of Greece and Turkey, Greek – species distributed within the Greek mainland or/and islands, Balkan – species which occur in other countries of the Balkan peninsula, Mediterranean – species which are found in other Mediterranean countries either all around the Mediterranean or in the eastern part, European – species found in various countries of Europe. Their percentage on the island is given in Fig. 3.

Table 1. List of species on Gyaros and their presence on the neighbouring islands – Syros, Tinos, Andros, Kea and Kythnos; status of the species in the Greek Red Book (LC – least concern, “–” – not included) and their chorotype (Aeg – Aegean, Blk – Balkan, Cyc – Cyclades, Eur – European, Gre – Greek, Med – Mediterranean)

Species	Gyaros	Syros	Tinos	Andros	Kea	Kythnos	Red Book	Chorotype
<i>Truncatella subcylindrica</i> (Linneaus, 1767)	+	–	–	–	–	–	–	Eur
<i>Cecilioides acicula</i> (O. F. Müller, 1774)	+	+	–	+	+	+	–	Eur
<i>Lauria cylindracea</i> (Da Costa, 1778)	+	+	+	+	–	+	–	Eur
<i>Orculella critica</i> (L. Pfeiffer, 1856)	+	+	+	+	+	+	–	Aeg
<i>Granopupa granum</i> (Draparnaud, 1801)	+	+	+	+	+	+	–	Med
<i>Mastus etuberculatus</i> (Frauenfeld, 1867)	+	+	+	+	–	+	–	Aeg
<i>Rumina saharica</i> Pallary 1901	+	+	+	+	+	+	–	Med
<i>Albinaria caerulea</i> (Deshayes, 1835)	+	+	+	+	–	–	–	Aeg
<i>Vitrea contracta</i> (Westerlund, 1871)	+	+	+	+	–	–	–	Eur
<i>Oxychilus hydatinus</i> (Rossmässler, 1838)	+	+	+	+	+	+	–	Med
<i>Eopolita protensa</i> (Férussac, 1832)	+	+	+	–	–	–	–	Med
<i>Tandonia aff. cretica</i>	+	+	+	–	–	–	–	Gre
<i>Limax conemenosi</i> O. Böttger, 1882	+	–	+	+	–	–	–	Blk
<i>Deroceras oertzeni</i> (Simroth, 1889)	+	–	+	+	–	–	–	Aeg
<i>Monacha rothii</i> (L. Pfeiffer, 1841)	+	+	+	+	–	–	LC	Cyc
<i>Xerocrassa cretica</i> (Férussac, 1821)	+	+	+	+	+	+	–	Med
<i>Metafruticicola pellita</i> (Férussac, 1832)	+	+	+	–	–	–	–	Aeg
<i>Chilostoma (Thiessea) arcadica</i> (Frauenfeld, 1867)	+	+	–	–	–	–	LC	Cyc
<i>Eobania vermiculata</i> (O. F. Müller, 1774)	+	+	+	+	+	+	–	Med
<i>Cryptomphalus aspersa</i> (O. F. Müller, 1774)	+	+	+	+	+	–	–	Med

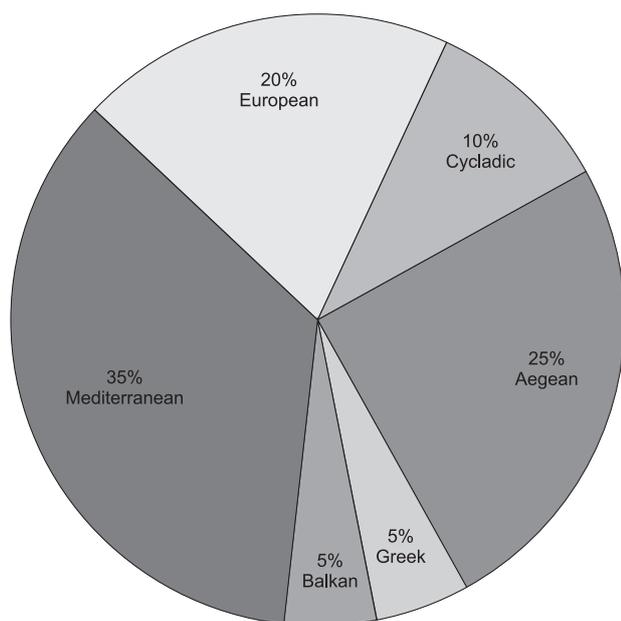


Fig. 3. Percentage of chorotypes among the species found on Gyaros

TAXONOMIC REMARKS AND ECOLOGICAL DATA

Truncatella subcylindrica – a land snail found by the seashore, usually in areas with large quantities of washed up *Posidonia oceanica* (L.) Delile 1813. It has been reported from very few Aegean islands (Skyros, Limnos, Rodos) but it occurs on more islands (VARDINOYANNIS pers. obs.).

Cecilioides acicula, *Mastus etuberculatus*, *Vitrea contracta*, *Eopolita protensa*, *Limax conemenosi*, *Monacha rothii*, *Xerocrassa cretica* – all these species were found everywhere, on all types of habitats of the island.

Metafruticicola pellita – it was found everywhere, in all types of habitats of the island. The identification of the species was based on the study of BANK et al. (2013) which deals with the eastern Mediterranean taxa of *Metafruticicola* von Ihering, 1892. According to their study, in the north-

ern Cyclades *M. pellita* is found on many islands, e.g. Tinos, Syros, Sifnos, Milos, Makronisos etc. Also according to MYLONAS (1982) and based on his collection (deposited in the Natural History Museum of Crete) this species is found in many Cycladic islands. The specimens from Gyaros have hairs and a reddish and whitish band on the periphery.

Lauria cylindracea – it was found in the abandoned cultivations around the freshwater spring.

Orculella critica, *Granopupa granum* – we found these species only in phrygana near the old cemetery.

Rumina saharica, *Oxychilus hydatinus*, *Tandonia* aff. *cretica* – they were found in the abandoned cultivations and around the old buildings. Specimens of *Tandonia* were not fully grown, but they had many of the characteristics of *T. cretica*. However, because we did not find any spermatophores, which is necessary for the identification of the species, we cite it as *T. aff. cretica*.

Albinaria caerulea – it was found only at a small spot on the northeastern part of the island, on limestone rocks.

Deroceras oertzeni – it was found in abandoned cultivations.

Chilostoma (Thiessea) arcadica – this species was found near abandoned cultivations; live specimens were found under a pile of stones.

Eobania vermiculata – it was found everywhere on the island; one of the commonest snails of any Aegean island, even the tiniest ones.

Cryptomphalus aspersa – it was found in abandoned cultivations and around old buildings. It is a species found on many Aegean islands. We use the generic name *Cryptomphalus* Charpentier, 1837 since in the work of SCHILEYKO (2006) its taxonomic status, both by shell and anatomical studies, is justified. This species is placed in different genera without any justification, while there is a lot of scientific debate about its generic status (WELTER-SCHULTES et al. 2013).

DISCUSSION

The whole malacofauna of the island is a subset of the nearby Cycladic islands of Syros, in the south, and Tinos, in the northwest. With the exception of *Truncatella subcylindrica*, two species are found on Syros but not on Tinos, while two other species are found on Tinos and not on Syros. Apart from *A. caerulea* which was found only on the limestone rocks at the northeastern part, *L. cylindracea* near the spring and *T. subcylindrica* by the coast, all the other species can be found all around the island.

In general, species with a wide distribution dominate on the island. Mediterranean and Aegean (in-

cluding Cycladic) chorotypes are equally represented (35% each) on the island (Fig. 3), which is in agreement with other studies on Aegean land snails (MYLONAS 1982, VARDINOYANNIS 1994, BOTSARIS 1996, TRIANTIS 2004). Also widespread species are an indication that its malacofauna consists of good dispersers over time. Only two species (20%) are endemic to the Cyclades, namely *Chilostoma arcadica* which is present also on Syros Island (SUBAI 1977) and *Monacha rothii* distributed in various islands and islets of the Cyclades (MYLONAS 1982, HAUSDORF 2003). These two species are the only ones that are



included in the Red Book of Greece, and under the category “least concern”.

The number of land snail species present on the island is similar to the Cycladic islands of roughly the same area, such as Irakleia (18 species) (MYLONAS 1982) and Makronisos (18 species) (MYLONAS & VARDINOYANNIS 1989), but higher than Polyaios (11 species) (MYLONAS 1982) (Table 2). The latter island consists of volcanic rocks therefore it hosts fewer species. On the other hand, on Gyaros fewer species are present compared to Greek islands of smaller area but close to a large source area, e.g. Dia – satellite of Crete (VARDINOYANNIS 1994, GITTENBERGER & HAUSDORF 2004, MESHER & WELTER-SCHULTES 2008), Agkistri (BOTSARIS 1996) – within the Saronikos gulf, Pserimos (TRIANSTIS 2004) – satellite of Kalymnos (Table 2). On the contrary, remote islands, but larger than Gyaros, host almost the same number of species, for example Antikythira, and Saria (VARDINOYANNIS 1994) (Table 2).

The island of Gyaros became an island at 18 kyrs BP (KAPSIMALIS et al. 2009, LYKOUSIS 2009), and although it is among the first Cycladic islands to separate from the “Cyclades mega plateau” of the Late Pleistocene (PERISSORATIS & CONISPOLIATIS 2003, KAPSIMALIS et al. 2009, LYKOUSIS 2009) it is still a “recent” island in terms of geological time. Thus the high number of species can be explained by 1) its palaeogeographical evolution, since the reduction of its area from the “Cyclades mega plateau” to the present day island has not yet led to significant loss of species (TRIANSTIS et al. 2008, and references therein), 2) its heterogeneity, as in the case of plants on small

Table 2. Aegean islands with their area and number of species (c – Cycladic island, r – remote island, s – island near a large source area)

Island	Area (km ²)	Number of species
GYAROS	17.8	20
Polyaios (c)	18.2	11
Makronisos (c)	18.0	18
Irakleia (c)	17.6	18
Agkistri (s)	11.7	32
Dia (s)	11.8	24
Pserimos (s)	14.6	32
Antikythira (r)	20.0	23
Saria (r)	21.1	20

Aegean islands (PANITSA et al. 2010), and 3) the long presence of man, who probably added species on the island directly or indirectly (MYLONAS 1984). However, one should have in mind that stochastic events could also have played a role on the composition of the malacofauna of this small Aegean island.

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