NAT. CROAT. | VOL. 8 | No 4 | 407–419 | ZAGREB | December 31, 1999

ISSN 1330-0520
UDK 594.3:591.91(197.5)

original scientific paper / izvorni znanstveni rad

A CONTRIBUTION TO KNOWLEDGE ABOUT THE DISTRIBUTION OF THE TROGLOBIONTIC SNAIL *Pholeoteras euthrix* STURANY, 1904 (MOLLUSCA, GASTROPODA)[1]

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Štamol, V., Jalžić, B. & Kletečki, E.: A contribution to knowledge about the distribution of the troglobiontic snail *Pholeoteras euthrix* Sturany, 1904 (Mollusca, Gastropoda). Nat. Croat., Vol. 8, No. 4., 407–419, 1999, Zagreb.

The terrestrial troglobiontic snail *Pholeoteras euthrix* Sturany, 1904 has so far been known from caves in southern Croatia, southern Herzegovina and Greece. The finds in Croatia were in only two localities from the wider Dubrovnik region, while seven localities were found in Herzegovina, all in the region of Popovo polje. In Greece the species has been found on Corfu, a locality about 350 km distant from localities established hitherto. Our research has extended knowledge about the distribution of this species in Herzegovina and Croatia. A find on the island of Vis is the first insular discovery of *Pholeoteras euthrix* in Croatia.

Key Words: Gastropoda, *Pholeoteras*, distribution, Croatia

Štamol, V., Jalžić, B. & Kletečki, E.: Prilog poznavanju rasprostranjenja troglobiontnog puža *Pholeoteras euthrix* Sturany, 1904 (Mollusca, Gastropoda). Nat. Croat., Vol. 8, No. 4., 407–419, 1999, Zagreb.

Kopneni troglobiontni puž *Pholeoteras euthrix* Sturany, 1904 dosad je bio poznat iz špilja južne Hrvatske, južne Hercegovine i iz Grčke. Nalazišta u Hrvatskoj bila su samo dva lokaliteta iz šire okolice Dubrovnika, a u Hercegovini je zabilježen na 7 lokaliteta, svi na području Popovog polja. U Grčkoj je nađen na otoku Krfu, lokalitetu oko 350 km udaljenom od onih dotad poznatih iz Hrvatske i Hercegovine. Našim istraživanjima proširili smo saznanja o rasprostranjenju ove vrste u Hercegovini i Hrvatskoj, a nalaz na otoku Visu predstavlja prvi otočni nalaz puža *Pholeoteras euthrix* u Hrvatskoj.

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[1] Major part of this paper was presented as a poster on the »XIVth International Symposium of Biospeleology« in Makarska (Croatia), 19th–26th September, 1999.

Ključne riječi: Gastropoda, *Pholeoteras*, rasprostranjenje, Hrvatska

INTRODUCTION

The terrestrial cave snail *Pholeoteras euthrix* (Fig. 1) was described by STURANY (1904:106/107) on the basis of shells gathered by Paganetti-Hummler in the Gluha Smokva cave near Trebinje (Herzegovina). On this occasion STURANY established a new genus because of the peculiarity of the shells, but its membership of a family was not defined, rather assumed. After STURANY, the unusual appearance of the

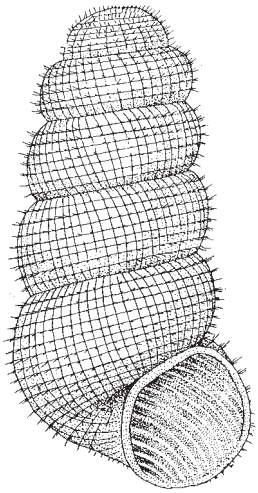

Fig. 1. *Pholeoteras euthrix* Sturany, 1904 after BOLE (1975:38, Fig. 1A), actual height 2.5 mm.

shells of *Pholeoteras euthrix* was puzzling to malacologists trying to define the taxonomic status of this, then monotype, genus. Until live specimens were found, *Pholeoteras euthrix* was placed largely among the Pulmonata, in the Pupidae family (STURANY, 1904:107; WAGNER, 1914:37), or simply into the order of Stylommatophora without any particular assignment to a family (JAECKEL *et al.*, 1958:162; ZILCH, 1959/1960:172), or no further membership was defined for the genus (THIELE, 1931:742). The first to put the snail among the Prosobranchia, still on the basis of the shells, was BOLE (1969:26). Then *Pholeoteras euthrix* was annexed to the Aciculidae family. The find of live specimens solved the dilemma of the taxonomic status of the snail, and it was placed in the subclass Prosobranchia, order Mesogastropoda because of the primitive build of jaws, operculum and taenioglossate radula, and because of further (considering the order) primitive anatomical characteristics, in the Cyclophoracea superfamily, Cyclophoridae family, Cyclophorinae subfamily (BOLE, 1975:42,45). BOLE (1975:43,45) also established the hypothesis that this

species was an Early Tertiary relict, while related genera emerged in Europe in the upper Cretaceous, and became extinct in Europe already in the Oligocene. Thus *Pholeoteras* represents a relict and the only living genus of this family in Europe, so far represented by two species: *Ph. euthrix* i *Ph. zilchi* Subai, 1993, the latter being known only from empty shells from Epirus, Greece (SUBAI, 1993:63–65). From the Cyclophoracea superfamily, of recent species today in Europe there are only members of the Cochlostomatidae family with the genus *Cochlostoma*.

BOLE (1975:42) quoted all the finds of the species *Pholeoteras euthrix* known to that date, seven localities in Herzegovina and only two in Croatia. The position of the localities is in the Popovo polje area in Herzegovina and in southern Dalmatia in Croatia, in both of which areas a number of Tertiary relicts had been found, not only of mollusks but also of other animal taxa (BOLE, 1975:43). The find of *Pholeoteras euthrix* on the island of Corfu in Greece two years later was a considerable surprise because this site was some 350 km distant from the previously known range (GITTENBERGER, 1977:47). It can be surmised that the currently disjunct range of this species, as well as the genus, represents the remains of a previously continuous range that stretched at least from southern Dalmatia and Herzegovina in the north to northern Greece in the south. Questions remain as to when this continuous range formed, if it encompassed other areas, and where the original genus' range was, which is discussed in the paper.

We can suppose that *Pholeoteras euthrix* today inhabits other subterranean features within this currently disjunct range. In our research in southern Croatia (Dalmatia) we have attempted to ascertain its distribution in this region.

MATERIALS AND METHODS

We established the distribution of the snail *Pholeoteras euthrix* through a review of the available malacological literature, data from the malacological collection of France Velkovrh (from Lenart v Slovenskih goricah, Slovenia) and by field research in the area of southern Croatia.

Material was collected in 1995 and 1996 in subterranean features on the island of Vis during research into the fauna of the Croatian Adriatic islands, part of Project no. 183005 of the Ministry of Science and Technology of the Republic of Croatia.

From 1996 to 1998 material was collected in the area of Pelješac Peninsula and the general environment of Dubrovnik, as part of Project no. 108493 of the Ministry of Science and Technology of the Republic of Croatia, called »A Faunistic and Ecological study of Arthropods of the Fresh Water Part of the Mouth of the Neretva River.«

While caves were inspected, individual specimens of snails were taken, as well as samples of soil from which after drying and sieving, snails were isolated.

On the island of Vis, six caves were investigated, on Pelješac Peninsula six, and around Dubrovnik five. The names of the caves and their locations are shown in Fig. 2, and explained in the chapter on results.

Material deposited in the collection of France Velkovrh (address: Lackova 52, 2230 Lenart v Slovenskih goricah, Slovenia) was mostly collected during the biological expedition in Dalmatia and Herzegovina which was conducted by dr. Boris Sket and his co-workers in 1975.

In the literature quoted various names are sometimes used for the same sites (toposynonyms), in this case for subterranean features. The authoritative names are taken to be those in MALEZ (1970). We used the same work for the determination of the precise position of the sites. As for features not included in this work, we used the following references: BOLE, 1975; ŠTAMOL *et al.*, 1999.

RESULTS AND DISCUSSION

The results include literature data (mark L), data deriving from our field research (mark F) and data from the collection of F. Velkovrh (mark col. FV) about finds of *Pholeoteras euthrix,* and these are given in list A. This list gives all the finds

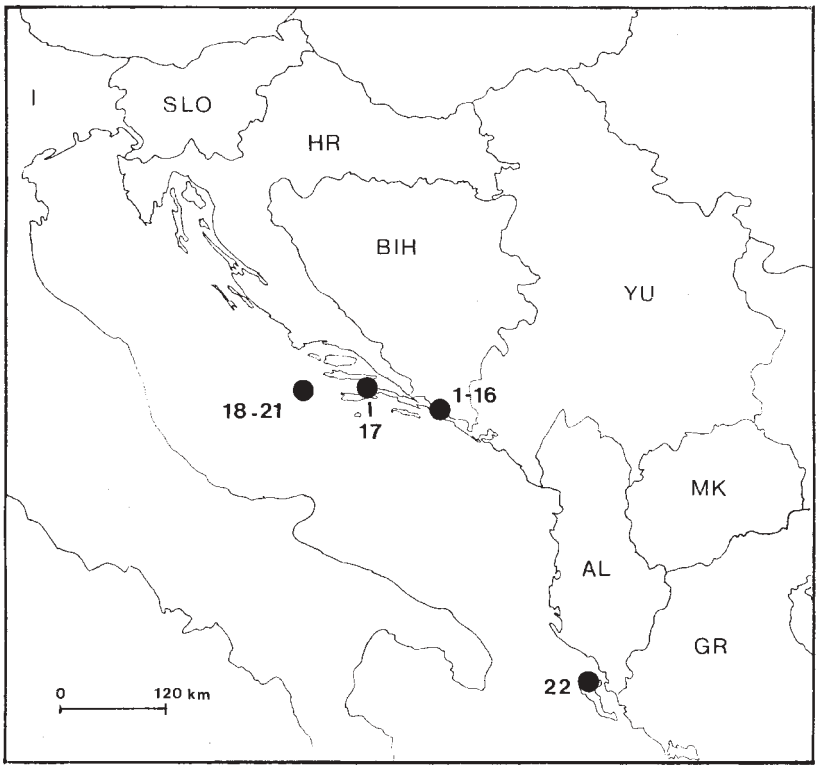

Fig. 2A. Distribution of *Pholeoteras euthrix* Sturany, 1904. Circles roughly present the location of speleological sites with *Ph. euthrix,* denoted by numbers 1–18 (see text).

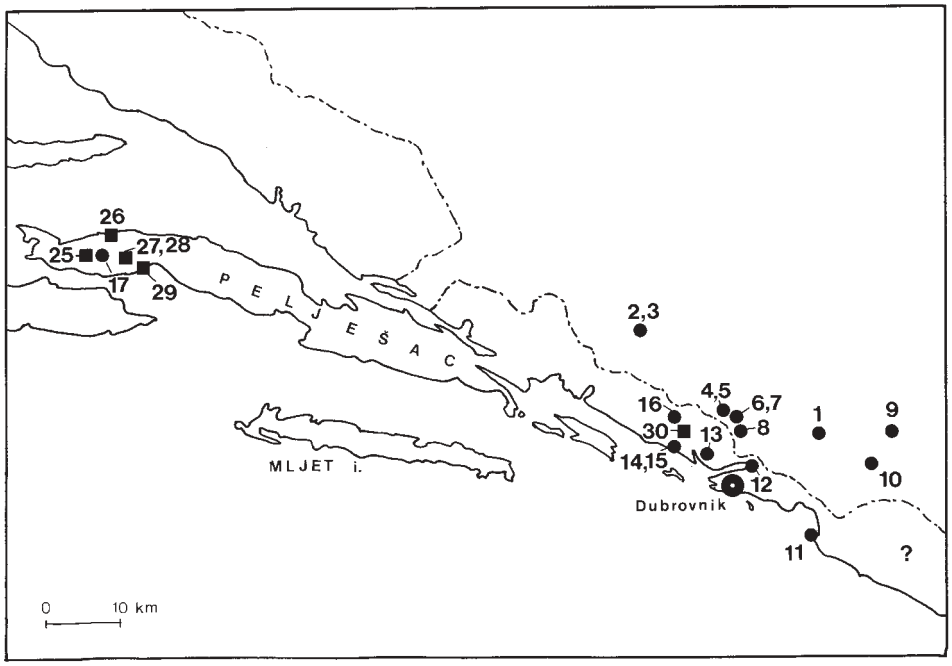

Fig. 2B. Sampling points in the speleological sites of the Popovo polje region (Herzegovina), and of the Dubrovnik region and Pelješac (Croatia). Sites are denoted by numbers referring to the list of sites in the text. Square = site without *Pholeoteras euthrix;* point = site with *Ph. euthrix;* bigger point = town.

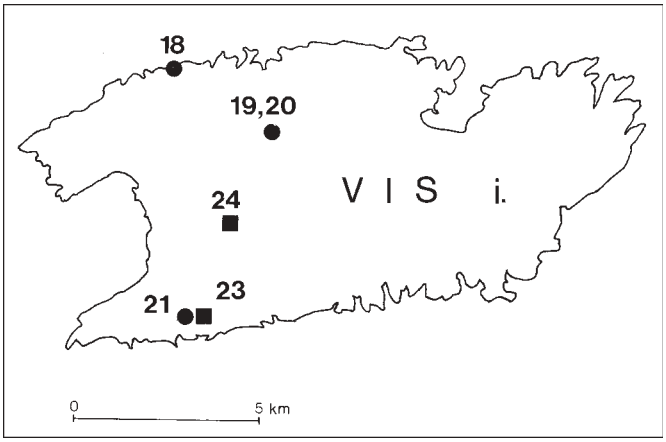

Fig. 2C. Sampling points in the speleological sites of the island of Vis. Sites are denoted by numbers referring to the list of sites in the text. Square = site without *Pholeoteras euthrix;* point = site with *Ph. euthrix*.

of *Pholeoteras euthrix* mentioned in the available literature, irrespective of the precision of the definition and the extent of the site. Localities marked with a question mark are those that because of the unclarity of the writing do not allow us to be certain whether they are *Pholeoteras euthrix* sites, while those that mark only the general area are indicated by the letter Σ. The finding of live specimens in a given locality is highlighted in the list. List A is a »positive« list, i.e. a list of finds of *Pholeoteras euthrix.* List B is »negative«, i.e., a list of localities in the research area in which we were not able to find *Pholeoteras euthrix.* All the localities defined are given an ordinal number, and their positions are shown in Fig. 2.

A) List of finds according to literature data, our field research and from the collection of France Velkovrh (Figs. 2A-C):

Localities in Herzegovina:

1. Gluha smokva (cave), 8.5 km W from Trebinje (town), Popovo polje (region); UTM: BN73.

   L: STURANY, 1904:107 (»Gluha smokwa«); JEANNEL *et al.*, 1914:344 (»Gluha-Smokva); ZILCH, 1959/1960: 172 (»Gluha smokwa«); BOLE, 1975:37,42,44,45; GITTENBERGER, 1977:47.

2. Bjelušnica (cave), Zavala (village), Popovo polje (region); UTM: YH44.

   L: ? WAGNER, 1914:43 (»Zavala«); BOLE, 1975:42,45 (»Bjelušica«).

   Col. FV: No. 19391/1 ex col. Kuščer No. 3120 , leg. Tomlin, 04.1934; No. 30404/3, leg. Sket and co-workers, 09.1975.

3. Vjetrenica (cave), 0.5 km SE from Zavala (village), Popovo polje (region); UTM: YH44.

   Col. FV: No. 30770/2, leg. Sket and co-workers, 09.1975.

4. Đurkovica (cave), 0.65 km NNW from Grebci /or Grepci/ (village), Vlaka (village), Popovo polje (region); UTM: BN63.

   L: BOLE, 1975:42,45 (»Đurkovina pećina stara«); GITTENBERGER, 1977:49, Figs. 5–10 (»Djurkovina pećina«).

   Col. FV: No. 30545/70 (»Stara Đurkovica«), leg. Sket and co-workers, 09.1975.

5. Nova Đurkovica (cave), 0.7 km NNW from Grebci /or Grepci/ (village), Vlaka (village), Popovo polje (region); UTM: BN63.

   L: BOLE, 1975:42,45 (»Đurkovina pećina nova«).

   Col. FV: No. 30459/1, leg. Sket and co-workers, 09.1975; No. 30497/100, leg. Sket and co-workers, 09.1975.

6. Poganjača (cave), 0.5 km E from Grebci /or Grepci/ (village), Vlaka (village), Popovo polje (region); UTM: BN63.

   Col. FV: No. 30506/2, leg. Sket and co-workers, 09.1975; No. 30527/1, leg. Sket and co-workers, 09.1975.

7. Reznica (cave), 0.6 km SE from Grebci /or Grepci/ (village), Vlaka (village), Popovo polje (region); UTM: BN63.

   Col. FV: No. 30486/1, leg. Sket and co-workers, 09.1975.

8. Debelin-pećina (cave), 1 km NW from Slavogostići (village), Popovo polje (region); UTM: BN63.

   L: BOLE, 1975:42,45 (»Vodena peć /=Debeljin peć/«).

9. Pećina u Zelenikovcu (= Matulić Höhle) (cave), 2.5 km SSE from Trebinje (town), Popovo polje (region); UTM: BN82.

   L: BOLE, 1975:42,45.

10. Doli (cave), 5.5 km SW from Trebinje (town), Popovo polje (region); UTM: BN82.

    L: ? WAGNER, 1914:43 (»Eliashöhle«); BOLE, 1975:38,42,44,45 (»Doli pećina /= Elias Höhle/«; live specimens).

: Southern Herzegovina

L: BOLE, 1969:68; GITTENBERGER, 1977:47 (»southern Herzegovina, near Zavala and Trebinje«).

: Herzegovina

L: THIELE, 1931:742; JAECKEL *et al.*, 1958:162; BERNASCONI *et al.*, 1994:57.

Localities in Croatia:

11. Šipun (cave), Cavtat (town); UTM: BN71.

    Col. FV: No. 30420/1, leg. Sket and co-workers, 09.1975.

12. Vilina pećina (cave), Rijeka Dubrovačka (=Ombla), spring, 5 km NNE from Dubrovnik (town); UTM: BN62.

    L: BOLE, 1975:38,42,43,44,45 (»Vilin stan«), live specimens; SUBAI, 1993:94.

    Col. FV: No. 5826/17(»Vilin stan«), leg. ?, date ?; No. 19381/60 (»Vilin stan«) ex col. Kuščer No. 10816 , leg. L. Kuščer, date ?; No. 5639/30 (»Vilin stan«), leg. J. Bole, 09.1975.

13. Močiljska pećina (cave), 2.8 km S from Osojnik (village), 6.5 km NW from Dubrovnik (town); UTM: BN53.

    L: BOLE, 1975:42,43,45.

14. Špilja na vrh Toraca (cave), 1.2 km S from Ljubač (village), 10 km NW from Dubrovnik (town), Croatia; UTM: BN53.

    F: leg. B. Jalžić, 18.06.1998.

15. Aragonka (cave), 1 km SSW from Ljubač (village), 10 km NW from Dubrovnik (town), Croatia; UTM: BN53.

    F: leg. B. Jalžić, 18.06.1998.

16. Špilja za Gromačkom vlakom (cave), 2 km NE from Gromača (village), 10 km NW from Dubrovnik (town), Croatia; UTM: BN53.
F: leg. B. Jalžić, 06.03.1998.

17. Mladenova jama (pit), Potok (region), 3 km W from Sv. Ilija (summit), 4.5 km SW from Orebić (town), Pelješac (peninsula), Croatia; UTM: XH76.
F: leg. B. Jalžić, 11.02.1998.

18. Kraljičina špilja (cave), 1.3 km NW from Oključna (village), 3.2 km NNE from Komiža (town), island of Vis, Croatia; UTM: WH87.
F: leg. E. Kletečki, B. Jalžić, 03.04.1995.

19. Špilja od Vore (= Banda od Ribinova = Ribinova banda = Ribinova špilja) (cave), 0.75 km NW from Kostirna (village), 4 km ENE from Komiža (town), island of Vis, Croatia; UTM: WH96.
F: leg. E. Kletečki, B. Jalžić, 14.06.1996.

20. Njivice (cave), 0.75 km WNW from Kostirna (village), 3.8 km ENE from Komiža (town), island of Vis, Croatia; UTM: WH96.
F: leg. V. Štamol, E. Kletečki, 13.06.1996.

21. Tanki rot (cave), 1.4 km SW from Podhumlje (village), 4 km SSE from Komiža (town), island of Vis, Croatia; UTM: WH96; live specimens.
F: leg. B. Jalžić, 14.06.1996.

? Pridvorje (village), Konavle (region); UTM: BN81.
L: WAGNER, 1914:43 (»Pridvorje, Canalitale«);

: Southern Dalmatia

L: WAGNER, 1914:43 (»Süddalmatien«); BOLE, 1969:68; GITTENBERGER, 1977:47 (»southern Dalmatia...near Dubrovnik«); MAASSEN, 1989:95 (»in der Gegend von Dubrovnik«).

: Dalmatia

L: JAECKEL et al., 1958:162; BERNASCONI *et al.*, 1994:57.

Locality in Greece (Fig. 2A):

22. Grava Tsouca, 3 km W from Sokraki, W from the Pantokrator, Corfu.

L: GITTENBERGER, 1977:47; MAASSEN, 1989:95; BERNASCONI *et al.*, 1994:57 (»Corfou«).

B. List of localities in which our field research did not reveal *Pholeoteras euthrix* (Figs. 2B, 2C):

23. Mramorčina špilja (cave), 1.2 km SW from Podhumlje (village), 4 km SSE from Komiža (town), island of Vis, Croatia; UTM: WH96.
13.06.1996, leg. B. Jalžić.

24. Titova špilja (cave), 1 km WNW from Borovik (village), 3 km ESE from Komiža (town), island of Vis, Croatia; UTM: WH96.

    04.04.1995, leg. V. Štamol.

25. Jugova jama (pit), Potok (region), 3 km W from Sv. Ilija (summit), 4.5 km SW from Orebić (town), Pelješac (peninsula), Croatia; UTM: XH76.

    11.02.1998, leg. B. Jalžić.

26. Tomasova spilja (cave); 1.5 km W from Duba Pelješka (village), 4 km NNW from Orebić, Pelješac (peninsula), Croatia; UTM: XH76.

    28.02.1996, leg. B. Jalžić.

27. Jama ispod vrha Sv. Ilija (= Pothole under the summit St. Ilija), Sv. Ilija (summit), 2.5 km NW from Orebić (town), Pelješac (peninsula), Croatia; UTM: XH76.

    25.02.1996, leg. B. Jalžić.

28. Pothole near the mountain hostel, Sv. Ilija (summit), 2.5 km NW from Orebić (town), Pelješac (peninsula), Croatia; UTM: XH76.

    25.02.1996, leg. B. Jalžić.

29. Jurčevića spilja (cave); 2.5 km NO from Orebić (town), Pelješac (peninsula), Croatia; UTM: XH76.

    15.07.1997, leg. B. Jalžić.

13. Močiljska pećina (cave), 2.8 km S from Osojnik (village).

    09.02.1998, leg. B. Jalžić.

30. Banova Ljut (cave), 0.5 km SSW from Ljubač (village), 10 km NW from Dubrovnik (town); UTM: BN53.

    18.06.1998, leg. B. Jalžić.

Through a review of the available literature it was determined that in Herzegovina *Pholeoteras euthrix* was recorded in seven localities, and only in two in Croatia. There is unclear information about a site (sites?) of *Pholeoteras euthrix* connected with the distribution of the snail »*Agardhia truncatella biarmata*« Boettger, 1880 (WAGNER, 1914:43). WAGNER mentions as a site for the finding of the stated *Agardhia*: »Höhlen in Süddalmatien (Pridvorje im Canalitale), Hercegovina in der Umgebung von Trebinje (Zavala, Eliashöhle) und Süddalmatien«. Somewhat later, WAGNER writes: »*Agardhia truncatella biarmata* Bttg. lebt ausschliesslich in den genannten Höhlen in Gesellschaft des *Pholeoteras euthrix* Stur., *Speleoconcha polymorpha* m. und *Caecilioides spelaea* m....«. From this it is not clear whether *Pholeoteras euthrix* also comes to every site of the taxon *Agardhia truncatella biarmata* mentioned or only to some of them, or one of them. For this reason list A gives Wagner's data with a question mark. Thus there are only two certain literature localities in Croatia (Vilina pećina and Močiljska pećina caves), and seven certain localities in Herzegovina.

Material deposited in the collection of F. Velkovrh (Slovenia) completed the range of *Ph. euthrix* species in Popovo polje in Herzegovina with 3 new finds, and

with one new find for Croatia (Cavtat) which represents the southernmost certain find of this species in Croatia.

During our biospeleological field research in southern Croatia, *Pholeoteras euthrix* was found in caves in the broader vicinity of Dubrovnik, on Pelješac Peninsula and on the island of Vis (Figs. 2A-C). The caves around Dubrovnik are a logical extension of sites so far known in Croatia and Herzegovina. The new Pelješac locality is about 70 km from this area and is a link to the new finds on Vis, which are about another 70 km distant again. The finds on Vis are the first insular finds in Croatia, and apart from the find on the island of Corfu in Greece this is the only insular site of this species. It is interesting that *Pholeoteras euthrix* has not been found so far in the lower course of the Neretva River, although research has been carried out in as many as 52 subterranean features in the area (JALŽIĆ *et al.*, 1997); nor has it been found on the island of Mljet (ŠTAMOL, unpublished data).

The list of localities in which in our research *Phleoteras euthrix* was not found is to some extent debatable because we cannot conclude for certain that the snail does not live in these features. Because of the very local appearance of this tiny snail within subterranean features, its existence can quite easily be overlooked. This is proved by our failure to find *Pholeoteras euthrix* in Močiljska pećina cave, although literature data claim that it does live there. Thus, only research into these sites that is repeated several times will be able to provide certain data about the non-existence of this snail in the caves.

Today's disjunctive range of the species *Pholeoteras euthrix* (and the whole *Pholeoteras* genus) is very likely the remains of a once-continuous range that stretched from at least Herzegovina and southern Dalmatia in the north to northern Greece in the south. Since there are no palaeological data about the period of the origins or distribution of this genus, we are obliged to speculate about the original range and the changes of its borders during geological periods. A hypothesis about the age of the species *Pholeoteras euthrix* and indeed of the whole genus was established by BOLE (1975:43,45), designating it an Early Tertiary relict. BOLE (1975:43) said that related genera, *Cyclotus, Cyclophorus* and *Leptopoma* appeared in Europe in the Upper Cretaceous period, and had become extinct as early as the Oligocene. During the Cretaceous period there was a link between the European and Asian landmasses, and it was possible for representatives of the group of the Cyclophoracea to spread from the original home in what is today tropical Asia (BOLE, 1975:43) to the European area. If we assume that *Pholeoteras euthrix* too originated in the Upper Cretaceous period, then the only explanation about the original range of this genus is that it was to the east and north east of Herzegovina and Dalmatia, in which it lives today, because in the region of today's southern Dalmatia, Herzegovina and Greece, there was sea during the whole of the Cretaceous. Hypotheses about the further sequence of changes in its range in the Tertiary depend on hypotheses about the distribution of sea and land during that age. One, which is based on the premise of POMEROL (1973, 1975) that in the region of today's coasts of the eastern Adriatic and the north east Ionian Sea and the neighbouring mainland areas there was sea right until the Oligocene, suggests that the terrestrial snail *Pholeoteras euthrix* spread towards the west after the withdrawal of the sea from the mentioned

areas of Herzegovina, Dalmatia and Greece, which started in the Oligocene, was accomplished to a great extent in the Miocene and was completely finished in the Pliocene. The second hypothesis, based on the assumption that as early as from the Eocene there was mainly land in the area of Herzegovina and southern Dalmatia, the area of northern Greece still being sea (RÖGL, 1998; plate 1), enables the supposition that then already, in the Eocene, *Pholeoteras* arrived, from its more easterly Cretaceous habitats, in the region of the northern part of today's disjunctive range. During the Middle Miocene *Pholeoteras* could have colonized the Dalmatian islands and the area of northern Greece, because at that time there was continuous land from Istria to Greece, including most of the Adriatic Sea (RÖGL, 1998, plate 7). Later climatic changes in the original areas led to *Pholeoteras* becoming extinct there, surviving in the subterranean habitats in the area of today's disjunctive range.

If we accept the assumption that *Pholeoteras* appeared in the period of the Eocene, and not, like genera akin to it, in the Upper Cretaceous (BOLE, 1975:43,45), which does not stop it being classified as an Early Tertiary relict, then we can assume that *Pholeoteras* has been present ever since its first appearance in the Early Tertiary in Herzegovina and the neighbouring part of Dalmatia, and that that is in fact its original range. For, as has already been said, RÖGL (1998, Plate 1) assumes the existence of land in the Late Eocene in the area of the current range of the genus *Pholeoteras* in Herzegovina and more or less in the land area of Dalmatia. Since land remained in this part until the Middle Miocene (RÖGL, 1998: Plates 3–10) and until today, *Pholeoteras euthrix* could have remained the whole of the period, and, during the Middle Miocene, spread towards the Dalmatian islands and northern Greece. The further sequence will be the same as in the previous hypotheses: because of the cooling that began as early as the Pliocene, *Pholeoteras* made its way into subterranean habitats, and there remained.

There is still another hypothetical possibility that the original range of the genus *Pholeoteras* was the area of the southern part of its today's disjunctive range, the area of northern Greece. Since according to POMEROL (1973, 1975), it is only since the Middle Miocene that there has been land there, this would mean that *Pholeoteras* is not an Early but a Later Tertiary relict. According to RÖGL (1998) there was some land of an insular character in the region of northern Greece from the Early Oligocene, but with a relatively small area and with borders that changed during subsequent periods. Sea divided this land from Asia (where BOLE 1975:43, assumed the original area of the Cyclophoracea to be) and from the more easterly areas of Europe right until the Middle Miocene. And from the northern areas too, including Dalmatia and Herzegovina, this island was separated by the sea until the Middle Miocene. It is hard to imagine that the original area of the Early Tertiary genus of the terrestrial snail *Pholeoteras*, or the species *Pholeoteras euthrix* could have been in such a relatively small land area, existing from the Oligocene, isolated by the sea from the centre of distribution of the group until the Miocene.

In the light of everything, and because of the fact that in Popovo polje (Herzegovina) and southern Dalmatia (Croatia) there are many Tertiary relicts (BOLE, 1975: 43), we are inclined to accept the hypothesis that *Pholeoteras* is an Early Tertiary relict, which developed during the Eocene in Popovo polje and southern Dalmatia,

spreading during the Middle Miocene towards northern Greece. The land link with the originating area of the whole group of Cyclophoracea terrestrial snails, which according to BOLE (1975:43) was tropical Asia, did exist in the Cretaceous. In the Eocene there was already land in the area of the original range (Herzegovina and southern Dalmatia) (RÖGL, 1998), and the conditions for this terrestrial snail to evolve were created. In the Middle Miocene land was laid down as far as Greece (RÖGL, 1998), and objective conditions were created for the spread of *Pholeoteras* to the area of northern Greece. Because of later climatic changes, mainly the cooling that occurred at the end of the Pliocene, the species managed to survive only in subterranean habitats of certain localities.

ACKNOWLEDGMENTS

We would like to thank Slovenian malacologist France Velkovrh from Lenart v Slovenskih goricah who allowed us to use the data from his collection and for his help while working on the data.

Received September 17, 1999

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SAŽETAK

Prilog poznavanju rasprostranjenja troglobiontnog puža *Pholeoteras euthrix* Sturany, 1904 (Mollusca, Gastropoda)

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Pregledom dostupne speleološke i malakološke literature ustanovljeno je da je troglobiontni puž *Pholeoteras euthrix* Sturany, 1908 bio poznat s ukupno 10 lokaliteta: sedam lokaliteta u Hercegovini (područje Popovog polja), dva u Hrvatskoj (područje šire okolice Dubrovnika) i jednog u Grčkoj (Otok Krf). Našim speleološkim istraživanjima na području južne Hrvatske i pregledom zbirke slovenskog malakologa F. Velkovrha utvrđeno je 12 novih lokaliteta za *Ph. euthrix*, od čega su 3 u Hercegovini, a 9 u Hrvatskoj. Sva nova nalazišta u Hercegovini nalaze se na području Popovog polja, tj. na području gdje su smješteni i od prije poznati lokaliteti. Novi lokaliteti u Hrvatskoj su iz područja južne i srednje Dalmacije, i to s područja šire okolice Dubrovnika (4 špilje), poluotoka Pelješca (1 jama) i s otoka Visa (4 špilje). Otok Vis je prvo otočno nalazište *Pholeoteras euthrix* u Hrvatskoj, a Cavtat je zasada najjužnije nalazište u Hrvatskoj.

Današnji disjunktni areal starotercijarne vrste *Pholeoteras euthrix*, pa i čitavog starotercijarnog roda *Pholeoteras*, vjerojatno je ostatak kontinuiranog areala koji se u miocenu mogao protezati barem od područja Hercegovine i srednje Dalmacije na sjeveru do sjeverne Grčke na jugu.