

# TERRESTRIAL SNAILS (MOLLUSCA: GASTROPODA TERRESTRIA) OF THE TELAŠĆICA NATURE PARK (DUGI OTOK, CROATIA)

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**Štamol, V.: Terrestrial snails (Mollusca: Gastropoda terrestria) of the Telašćica Nature Park (Dugi otok, Croatia). Vol. 13, No. 2., 95–113, 2004, Zagreb.**

In field research into the Telašćica Nature Park (Dugi otok, Croatia), 38 species of terrestrial snails were determined. Of these, only 14 taxa had been recorded in the literature. Among the species, particularly prominent were the narrowly endemic *Delima edmirani* Štamol et Slapnik, 2002 the range of which is restricted exclusively to the borders of the Park, the endemic *Agathylla lamellosa* (Schubert et Wagner, 1829), which has so far been known from South Dalmatia and Montenegro, *Testacella scutulum* G. B. Sowerby I, 1820, for which Telašćica is the second and at the same time the most southerly site in Croatia, the endemic *Chondrina spelta ventilatoris* (Westerlund, 1875), for which this is the westernmost finding site, and *Paralaoma servilis* (Schuttleworth, 1852), for which this is the sixth site recorded in Croatia. Because of the many visitors whose movements represent a potential threat to the habitats of endemic species, it is proposed that this area be protected.

**Key words:** terrestrial snails, the island of Dugi otok, Croatia

**Štamol, V.: Kopneni puževi (Mollusca: Gastropoda terrestria) Parka prirode »Telašćica« (Dugi otok, Hrvatska). Vol. 13, No. 2., 95–113, 2004, Zagreb.**

Terenskim istraživanjima Parka prirode Telašćica (Dugi otok, Hrvatska) ustanovljeno je 38 vrsta kopnenih puževa s kućicom. U literaturi je bilo od toga zabilježeno 14 taksona. Među vrstama ističu se stenoendemična *Delima edmirani* Štamol et Slapnik, 2002 čiji je areal samo u granicama Parka, endemična *Agathylla lamellosa* (Schubert et Wagner, 1829) koja je dosada bila poznata iz južne Dalmacije i Crne Gore, *Testacella scutulum* G. B. Sowerby I, 1820 kojoj je Telašćica drugi, ujedno i najjužniji lokalitet u Hrvatskoj, *Chondrina spelta ventilatoris* (Westerlund, 1875) kojoj je ovo najzapadnije nalazište, i *Paralaoma servilis* (Schuttleworth, 1852) kojoj je ovo 6. lokalitet u Hrvatskoj. Zbog brojnih posjetitelja čije kretanje staništima endemičnih vrsta predstavlja potencijalnu opasnost za njihov opstanak predlaže se zaštita područja.

**Ključne riječi:** kopneni puževi, Dugi otok, Hrvatska

## INTRODUCTION

The Telašćica Nature Park covers the southern part of the Dalmatian island of Dugi otok (Croatia) (Fig. 1).

Dugi otok [Long Island] belongs to the outer group of North Dalmatian islands that stretch in parallel with the coast in a NW-SE direction. It is dominated by cretaceous limestones, and there are also calcareous dolomites and dolomites on which terra rossa, red earth, has formed (POLJAK, 1930). The climate is typically Mediterranean, with dry summers and with mild and rainy winters, the mean annual temperature being 16 °C. The mean January temperature is 6.4 °C, the mean August temperature 24.1 °C. In the southern part of the island there are an average 85 rainy days a year, while the number of sunny hours is about 2600. In the cold part of the year, the weather is much more variable, and the prevailing winds are the dry cold north-easterly, the bora, and there is also the rain-laden sirocco attended by clouds. In spring and autumn a dry sirocco is the prevailing wind, and in summer, when the weather is at its most stable, the south-westerly called the maestral blows.

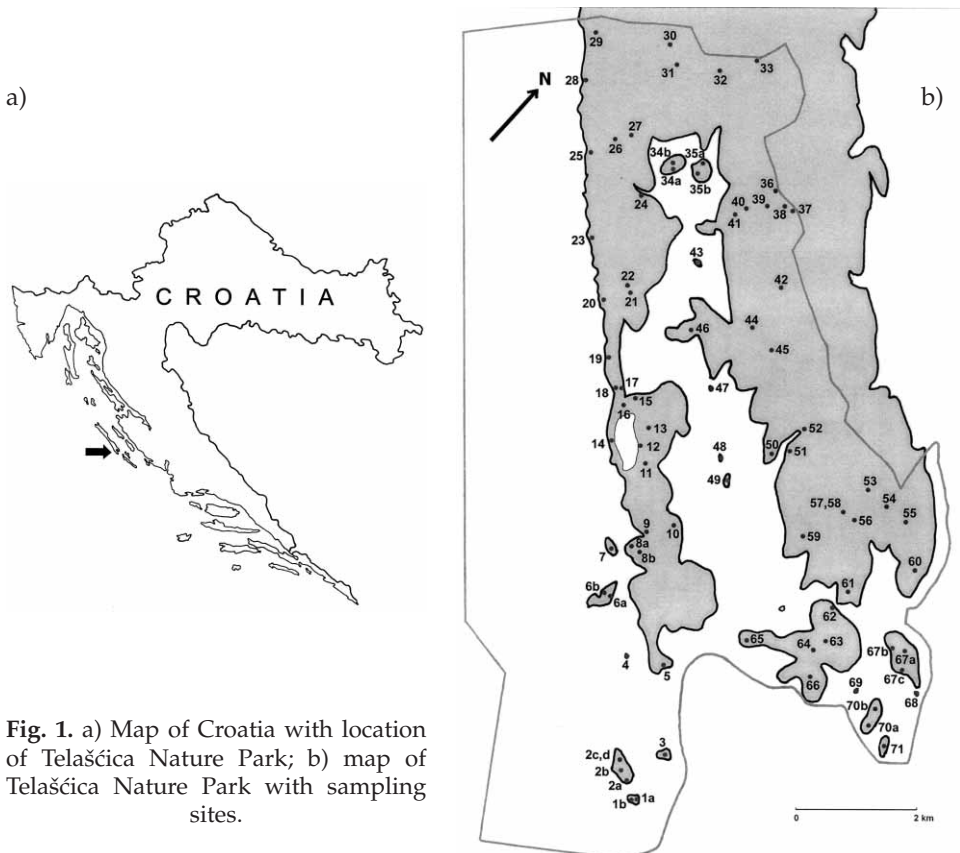


Fig. 1. a) Map of Croatia with location of Telašćica Nature Park; b) map of Telašćica Nature Park with sampling sites.

Telašćica was proclaimed a Nature Park in 1988, up to which time it had been part of the Kornati National Park, which dates from 1980. The detachment of Telašćica from the Kornati National Park was a result of the political and geographical organisation of the Republic of Croatia, for Kornati NP belongs to the Šibenik and Knin County, while Telašćica Nature Park is part of the more northerly positioned Zadar County.

The Park covers an area of 67.06 square kilometres, only 41% of which is accounted for by land. The area is dominated by Telašćica Bay, from which it took its name, which extends for 8.2 km in the NW-SE direction. Nineteen islets and rocks fall within the park, six of them being inside Telašćica Bay, seven between Dugi otok and Kornat Island, and six more on the outer side of the island of Dugi otok. The best known, most impressive and most attractive features for the tourist are the cliffs that rear practically vertically up to 200 m along the outer coast of the island, facing the open sea, and the salt Lake Mir, which has a permanent connection with the sea. The highest peak is Mrzlovica (201 m a.s.l.). Rocky grassland predominates in the park, and there are garrigue and pine forest, as well as cultivable areas devoted to olive groves, vineyards and, in the karst fields (polje), to horticultural products that are being increasingly abandoned, their place being taken by scrub.

### **A historical review of research into the terrestrial molluscs of Telašćica Nature Park**

Some very meagre and sporadic research into terrestrial snails has previously been carried out on Dugi otok. The only fairly systematic natural history investigation was that carried out by the Yugoslav Academy in 1925–1927, the results of which were published in 1930. It covered the area of Dugi otok, Kornat island and the surrounding islets. On this occasion the terrestrial malacofauna of the Telašćica area was, according to the number of sites investigated and the species identified, processed somewhat superficially (KUŠČER, 1930). Only three of the sites then covered are certainly within the confines of today's Park (»close to Lake Mir«, »Čuh polje« and the »Gvozdenjak« [=?islet or bay Gozdenjak – author's note]) while the following two sites (»Brčastac« and »Kruševac«) are not entirely within the borders of the Park. At all five of these localities, 13 species were recorded, and for the whole of Dugi otok, 21 species of terrestrial snails with shell. Initial biological investigation into submarine caves and the terrestrial flora and fauna of the outer cliffs of Telašćica Nature Park was undertaken in 1989 by the Croatian Natural History Museum of Zagreb. At that time, terrestrial snails were collected in two sites, and this spurred further research into malacofauna at 14 sites in the park in 1995 and 1996. The only work published of these investigations to date is a paper about a new species and subgenus of a snail from the family Clausiliidae (ŠTAMOL & SLAPNIK, 2002). Thus to day 14 species of terrestrial snails were known from this park, which shows that the terrestrial malacofauna of the area was previously but poorly explored; it is actually very distinctive because of its endemic and narrowly endemic species. This was a spur to new field research into terrestrial snails in 2003 at 71 localities, at heights of 0.5 to 198 m a.s.l., which enabled the creation of a much more complete picture of the composition of the terrestrial malacofauna and its distribution in the Park.

## MATERIALS AND METHODS

The terrestrial snails were collected by individual collection of larger specimens and the taking of soil samples, volume  $\sim 2 \text{ dm}^3$ , from which, after drying of the soil sample and selective sieving through a number of sieves of declining mesh size from 15 mm to 1 mm, snails were separated. Because of the great drought of 2003 and the other methods necessary for the collection and proper presentation of the fauna of slugs, the latter were not covered in this investigation. The samples were organised in such a way as to cover all the typical macro- and micro-habitats in a very representative vertical and horizontal grid of sites in the Park.

The material is stored in the General Collection of Recent Molluscs in the Croatian Natural History Museum in Zagreb.

## RESULTS

### A list of the sites investigated

The list gives all the sites investigated by the author and her associates in 1995 and 1996 (14 localities) and all the sites investigated in 2003 (71 localities), that is, a total of 85 localities. Their positions have been fixed according to topographical maps of 1:25000. The list of the sites includes the name of the site, in parentheses the type of site (e.g., islet, field, hamlet), the position of the locality with reference to Sali (the only largish settlement close to the Park) or some major bay, the UTM reference, the height above mean sea level, and the type of habitat. The collectors and the date of collection are also given. The names of the sites are taken from the 1:25000 map produced by Telašćica Nature Park. If this name differs from that given on the topographic maps produced by the Military Geography Institute in 1981, then this latter name is cited in parentheses. The position of the localities is shown in Fig. 1. The last site in the list, marked X, could not be shown in Fig. 1, because it covers a broad area from site number 8 (Obručan) alongside the external reefs of the Park to site no. 23 (Grapšćak).

1. *Sestrica mala* (islet), WJ15;  
A: northern part of islet; 10–20 m a.s.l.; rocky grassland; leg. V. Štamol, 07.05.2003;  
B: southern part of islet; 15–25 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, 07.05.2003;
2. *Sestrica vela* (islet), WJ15;  
A: southern part of islet; 15 m a.s.l.; rocks, rocky grassland; leg. V. Štamol, 07.05.2003;  
B: 50–55 m a.s.l.; rocks; leg. E. Kletečki, 07.05.2003;  
C: 30 m a.s.l.; pine grove; leg. V. Štamol, 07.05.2003;  
D: north-western part of islet; 20–30 m a.s.l.; garden; leg. V. Štamol, 07.05.2003;
3. *Abica* (islet), WJ15; 10–29 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 07.05.2003;

4. Taljurić (Tanjurić) (rock), WJ15; ~3 m n. m.; rocks, halophile vegetation; leg. E. Kletečki, 07.05.2003;
5. Vidilica (cape), Sali-8,3 km SE, WJ15; 10–15 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 07.05.2003;
6. Veli Garmenjak (Gamernjak veli) (islet), WJ15;  
A: eastern part of islet; 5–20 m a.s.l.; rocky grassland, rocks; leg. V. Štamol, 07.05.2003;  
B: western part of islet; 20–25 m a.s.l.; rocks; leg. E. Kletečki, 07.05.2003;
7. Mali Garmenjak (Gamernjak mali) (islet), WJ15; 5–24 m a.s.l.; rocky grassland, rocks; leg. E. Kletečki, V. Štamol, 07.05.2003;
8. Obručan (hill), Sali-6,8 km SSE, WJ15;  
A: ~40 m a.s.l.; rocks, garrigue, grassland; leg. E. Kletečki, V. Štamol, 17.09.2003;  
B: 50–80 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 17.09.2003;
9. Lojišće (bay), Obručan (hill), Sali-6,5 km SSE, WJ15; 0,5–5 m a.s.l.; garrigue, grassland; leg. E. Kletečki, V. Štamol, 09.05.2003;
10. Pećina (hamlet), Sali-6,25 km SSE, WJ15; ~30 m a.s.l.; dry stone wall, rocks; leg. E. Kletečki, V. Štamol, 09.05.2003;
11. Lake Mir, eastern bank, WJ15; 20 m a.s.l.; dry stone wall; leg. E. Kletečki, V. Štamol, 06.05.2003;
12. Lake Mir, north-eastern bank, WJ15; 2–5 m a.s.l.; pine grove, rocky grassland; leg. E. Kletečki, V. Štamol, 06.05.2003;
13. Muravjak (Veli vrh) (hill), Lake Mir, WJ15; 95–100 m a.s.l.; leg. E. Kletečki, V. Štamol, 06.05.2003;
14. Mala Prisika (region), Lake Mir-0,13 km W, WJ15; ~60 m a.s.l.; cliffs: rocks, garrigue; leg. E. Kletečki, V. Štamol, 16.09.2003;
15. Poljice (region), Mir (bay), WJ16; ~48 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 16.09.2003;
16. Bay Mir – Lake Mir, WJ15; ~10 m a.s.l.; dry stone wall; leg. E. Kletečki, V. Štamol, 16.09.2003;
17. Bay Mir, WJ16; ~5 m a.s.l.; pine grove; leg. E. Kletečki, V. Štamol, 21.05.1995;
18. Prisika (Priseka) (region), Sali-5 km S, WJ15; 30 m a.s.l.; rocks; leg. E. Kletečki, V. Štamol, 21.05.1995;
19. Prisika (Priseka) (region), Sali-4,5 km S, WJ15; 50 m a.s.l.; rocks; leg. E. Kletečki, V. Štamol, 21.05.1995;
20. Prisika (Priseka) (region), Sali-4 km SW, WJ15; 80 m a.s.l.; rocks; leg. E. Kletečki, V. Štamol, 21.05.1995;
21. Gmajno polje (field), Sali-4,2 km SW, WJ16; 40–45 m a.s.l.; rocky grassland, stone house; leg. E. Kletečki, 21.06.2003;

22. Gmajno polje (field), Sali-4,2 km SW, WJ16; 30 m a.s.l.; rocky grassland, stone house; leg. Z. Godec, E. Kletečki, V. Štamol, 21.06.2003;
23. Grpaščak (Grbaščak) (hill), Sali-4 km SW, WJ16; 90 m a.s.l.; rocks; leg. E. Kletečki, V. Štamol, 21.05.1995; leg. E. Kletečki, 01.07.1996;
24. Jaz (bay), Telašćica Bay, WJ16; ~5 m a.s.l.; ruined house; leg. E. Kletečki, V. Štamol, 21.05.1995;
25. Stivanjska gora (hill), Sali-4,3 km SW, WJ06; 50 m a.s.l.;  
A: ruined walls; leg. Z. Godec, E. Kletečki, V. Štamol, 19.06.2003;  
B: cliffs, rocks; leg. E. Kletečki, 19.06.2003;
26. Sv. Ivan (chapel), Stivanje polje (field), Sali-3,3 km SW, WJ06; 40 m a.s.l.; leg. E. Kletečki, V. Štamol, 10.05.2003;
27. Orlić (hamlet), Stivanje polje (field), Sali-3,2 km SW, WJ06; 50–60 m a.s.l.; leg. E. Kletečki, V. Štamol, 19.09.2003;
28. Stivanjska gora (hill), Sali-3,8 km SW, WJ05; 20 m a.s.l.; rocks; leg. B. Jalžić, 28.06.1989;
29. Mrzlovica (hill), Sali-4,3 km W, 195 m a.s.l.; rocks; leg. E. Kletečki, V. Štamol, 10.05.2003;
30. Dugo polje (field), Sali-3,2 km W, WJ06; 30 m a.s.l.; chapel; leg. S. Muštra, V. Štamol, 01.07.1996;
31. Dugo polje (field), Sali-3 km W, WJ06; 30 m a.s.l.; dry stone wall; leg. S. Muštra, V. Štamol, 01.07.1996;
32. Bučjak (peak)-Žmirci (peak), Sali-2,5 km W, WJ16; ~50 m a.s.l.; olive grove, dry stone wall; leg. Z. Godec, V. Štamol, 20.06.2003;
33. Čelinjak (hill), Sali-2,3 km W, WJ16; 190–198 m a.s.l.; rocks; leg. Z. Godec, E. Kletečki, V. Štamol, 20.06.2003;
34. Donji školj (islet), Telašćica Bay, WJ16;  
A: eastern part of islet; 10–50 m a.s.l.; rocks, rocky grassland, garrigue; leg. V. Štamol, 10.05.2003;  
B: western part of islet; 50–63 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, 10.05.2003;
35. Burni školj (islet), Telašćica Bay, WJ16;  
A: northern part of islet; 2–15 m a.s.l.; olive grove, pine grove; leg. E. Kletečki, V. Štamol, 10.05.2003;  
B: southern part of islet; 40–50 m a.s.l.; rocks; leg. E. Kletečki, 10.05.2003;
36. Veli Berčastac (peak), Sali-1 km SSW, WJ16;  
A: 180 m a.s.l.; rocks in pinewood and maquis; leg. E. Kletečki, V. Štamol, 17.06.2003;  
B: 190–199 m a.s.l.; rocks; leg. Z. Godec, 17.06.2003;
37. Mali Berčastac (peak), Sali-1 km S, WJ16; 150–155 m a.s.l.; rocks; leg. E. Kletečki, 17.06.2003;

38. Veli Berčastac (peak)-Mali Berčastac (peak), Sali-1,1 km S, WJ16; ~110 m a.s.l.; olive grove, dry stone wall; leg. V. Štamol, 17.06.2003;
39. Veli Berčastac (peak) – Debela grba (peak), Sali-1,25 km SSW, WJ16; 95 m a.s.l.; dry stone wall; leg. Z. Godec, E. Kletečki, V. Štamol, 17.06.2003;
40. Debela grba (peak), Sali-1,5 km SSW, WJ16; ~70 m a.s.l.; dry stone wall; leg. Z. Godec, E. Kletečki, 17.06.2003;
41. Debela grba (peak), Sali-1,6 km SSW, WJ16; 105–109 m a.s.l.; rocks; leg. Z. Godec, E. Kletečki, V. Štamol, 17.06.2003;
42. Kruševo polje (region), Sali-2,2 km SSE, WJ16; 40 m a.s.l.; dry stone wall, old house; leg. Z. Godec, E. Kletečki, V. Štamol, 17.06.2003;
43. Fafarikulac (Farfarikulac) (islet), Telašćica Bay, WJ16; 1–15 m a.s.l.; rocks, pine grove; leg. E. Kletečki, V. Štamol, 09.05.2003;
44. Gozdenjačke grbe (region), Sali-3 km SSE, WJ16; 90–104 m a.s.l.; rocky grassland, rocks; leg. Z. Godec, V. Štamol, 19.06.2003;
45. Gozdenjačke grbe (region), Sali-3,2 km SSE, WJ16; 100 m a.s.l.; stone desert, dry stone wall; leg. E. Kletečki, 19.06.2003;
46. Vošćenica (Raknić) (bay), Telašćica Bay, WJ16; 3–29 m a.s.l.; garrigue, rocks; leg. E. Kletečki, V. Štamol, 09.05.2003;
47. Gozdenjak (rock), Telašćica Bay, WJ16; 0,5–3,5 m a.s.l.; stone, halophile vegetation; leg. E. Kletečki, V. Štamol, 09.05.2003;
48. Galijola (islet), Telašćica Bay, WJ16; 0,5–3 m a.s.l.; rocks, halophile vegetation; leg. E. Kletečki, V. Štamol, 09.05.2003;
49. Korotan (islet), Telašćica Bay, WJ15+WJ16; 2–14 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 07.05.2003;
50. Čuška dumboka (bay), Telašćica Bay, WJ16; 20 m a.s.l.; rocks; leg. E. Kletečki, 09.05.2003;
51. Čuška dumboka (bay), Telašćica Bay, WJ16; 3–10 m a.s.l.; rocks; leg. V. Štamol, 09.05.2003;
52. Čuška dumboka (bay), Telašćica Bay, WJ16;  
A: 0,5 m a.s.l.; marine deposit, rocks; leg. V. Štamol, 09.05.2003;  
B: 3–30 m a.s.l.; garrigue, rocks; leg. E. Kletečki, V. Štamol, 09.05.2003;
53. Čuh polje (region), Sali-5 km SE, WJ16; ~50 m a.s.l.; dry stone wall; leg. Z. Godec, E. Kletečki, V. Štamol, 18.06.2003;
54. Rudići (hamlet), Čuh polje (region), Sali-5,5 km SE, WJ16;  
A: 65 m a.s.l.; old house, dry stone wall; leg. Z. Godec, V. Štamol, 18.06.2003;  
B: ~80 m a.s.l.; rocks; leg. E. Kletečki, 18.06.2003;
55. Mavar (region), Sali-5,8 km SE, WJ16; 60 m a.s.l.; dry stone wall, olive grove; leg. Z. Godec, E. Kletečki, V. Štamol, 19.06.2003;



56. Veli vrh (peak), Dugonjive (region), Sali-5,5 km SE, WJ16; ~110 m a.s.l.; rocks; leg. E. Kletečki, 01.07.1996;
57. Smričevica (region), Sali-5,5 km SE, WJ16; 30 m a.s.l.;  
A: old house; leg. S. Muštra, V. Štamol, 01.07.1996;  
B: dry stone wall; leg. S. Muštra, V. Štamol, 01.07.1996;
58. Smričevica (region), Sali-5,5 km SE, WJ16; 50 m a.s.l.; rocks; leg. S. Muštra, V. Štamol, 01.07.1996;
59. Orljak (peak), Sali-5,7 km SE, WJ16; 90–115 m a.s.l.; rocks; leg. Z. Godec, E. Kletečki, V. Štamol, 18.06.2003;
60. Čuška (region), Sali-6,7 km SE, WJ16; 40–50 m a.s.l.; rocky grassland, rocks; leg. Z. Godec, E. Kletečki, V. Štamol, 19.06.2003;
61. Mrkotin (region), Sali-6,7 km SE, WJ15; 5–52 m a.s.l.; rocky grassland, rocks; leg. Z. Godec, E. Kletečki, V. Štamol, 18.06.2003;
62. Ramov stan (hamlet), Katina (islet), WJ15; 5–10 m a.s.l.; dry stone wall; leg. V. Štamol, 08.05.2003;
63. Veli vrh (peak), Katina (islet), WJ15; 90–116 m a.s.l.; rocks; leg. E. Kletečki, 08.05.2003;
64. Šešeljin stan (region) – Veli vrh (peak), Katina (islet), WJ15; 35–40 m a.s.l.; dry stone wall, rocks; leg. V. Štamol, 08.05.2003;
65. Punta Kadena (cape), Katina (islet), WJ15; 5–49 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 08.05.2003;
66. Kod Mare (region), Katina (islet), WJ15; ~20 m a.s.l.; rocky grassland; leg. E. Kletečki, V. Štamol, 08.05.2003;
67. Gornja Aba (islet), WJ15;  
A: 30–50 m a.s.l.; rocks; leg. V. Štamol, 08.05.2003;  
B: 3–5 m a.s.l.; dry stone wall in olive grove; leg. V. Štamol, 08.05.2003;  
C: 10–20 m a.s.l.; rocks; leg. E. Kletečki, 08.05.2003;
68. Mala Aba (rock), WJ15; 1–2 m a.s.l.; rocks; leg. E. Kletečki, 08.05.2003;
69. Katinica (rock), WJ15; 1–2 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, 08.05.2003;
70. Buč veli (islet), WJ15;  
A: southern part of islet; 5–30 m a.s.l.; rocks, rocky grassland; leg. V. Štamol, 08.05.2003;  
B: northern part of islet; 30–42 m a.s.l.; rocks; leg. E. Kletečki, 08.05.2003;
71. Buč mali (islet), WJ15; 2–20 m a.s.l.; rocks, rocky grassland; leg. E. Kletečki, V. Štamol, 08.05.2003;
- X. Grpaščak (Grbaščak) (hill)–Obručan (hill), Sali-3,7 km SW-6,8 km SEE, WJ16–WJ15; 50–60 m a.s.l.; rocks; leg. E. Kletečki, N. Tvrtković, M. Vrbek, 28.06.1989;



## List of terrestrial snails with finding sites

This list includes species and subspecies of terrestrial snails that we found during our field research or that were recorded in the literature for the area investigated. Taxa placed in square brackets are those that do not inhabit the park but were found only with respect to their shells in the sea deposit on the shore. After the names of the taxa the finding sites from our field research are given marked with numbers from the list of localities. A site given in square parentheses shows that the taxon at this site was found only in sea deposit. A question mark alongside the symbol for a locality indicates an uncertainty in the identification resulting most frequently from poorly preserved adult specimens or the existence of only juvenile specimens. In cases when the species could not be determined to species level, the genus with the relevant localities is noticed.

If there are any literature data, they are cited after this with the symbol L.

### 1. *Cochlostoma scalarinum scalarinum* (Villa, 1841)

1A, 1B, 2A, 2B, 2C, 2D, 3, 5, 6A, 6B, 7, 8A, 8B, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25A, 25B, 26, 27, 28, 29, 30, 31, 32, 33, 34A, 34B, 35A, 35B, 36A, 36B, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52A, 52 B, 54A, 54B, 55, 56, 57A, 57B, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67A, 67 B, 67C, 68, 70A, 70B, 71, X.

L: KUŠČER 1930: 33 (*Cochlostoma scalarinum* Villa: »Gvozdenjak« [=? Gozdenjak islet or bay ]; »close to Lake by Mir«; »Kruševac«)

### 2. *Pomatias elegans* (O. F. Müller, 1774)

1A, 1B, 2B, 3, 6A, 6B, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 25A, 25B, 26, 29, 30, 31, 32, 33, 34B, 35A, 35B, 37, 38, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52A, 52 B, 53, 54A, 54B, 56, 57A, 57B, 58, 59, 60, 61, 62, 64, 65, 67A, 67C, 69, 70A, 70B, 71.

L: KUŠČER 1930: 33/34 (*Pomatias elegans* Müll.: »close to Lake by Mir«)

### 3. *Hypnophila pupaeformis* (Cantraine, 1836)

1B, 2B, 2C, 3, 5, 6A, 6B, 7, 8A, 8B, 10, 13, 14, 15, 18, 20, 21, 22, 23, 25A, 25B, 26, 27, 28, 29, 31, 32, 33, 34A, 34B, 35A, 35B, 36B, 37, 38, 39, 41, 42, 43, 45, 49, 50, 51, 52A, 52 B, 53, 54A, 55, 56, 58, 59, 60, 61, 62, 63, 65, 67A, 67 B, 67C, 68, 70A, 70B, 71, X.

### 4. *Lauria cylindracea* (Da Costa, 1778)

1B, 2A, 2B, 2C, 2D, 3, 6B, 10, 13, 16, 17, 21, 22, 23, 24, 25B, 26, 27, 28, 29, 30, 31, 35A, 36A, 42, 43, 52A, 53, 54A, 55, 57A, 57B, 62, 71.

### 5. *Vallonia costata* (O. F. Müller, 1774)

10, 26, [52A].

### 6. *Acanthinula aculeata* (O. F. Müller, 1774)

17, 21, 22, 23, 24, 30, 31, 42, 50.

### 7. *Pyramidula rupestris* (Draparnaud, 1801)

16, 40, 42, 53, 54A, 55, 57A, 57B.

**8. *Granopupa granum* (Draparnaud, 1801)**

19, 20, 28, 39, [52A], 55.

**9. *Granaria illyrica illyrica* (Rossmässler, 1835)**

1A, 1B, 2A, 2B, 2C, 3, 5, 6A, 6B, 7, 8A, 8B, 10, 12, 14, 15, 16, 18, 19, 20, 21, 23, 25A, 25B, 28, 29, 32, 34A, 35B, 36A, 36B, 37, 39, 40, 41, 43, 46, 47, 48, 50, 51, 52A, 52 B, 53, 54A, 55, 56, 60, 61, 62, 63, 64, 65, 66, 67A, 67 B, 67C, 68, 69, 70A, 70B, 71, X.

L: KUŠČER 1930: 34 (*Abida frumentum illyrica* R.: »close to Lake by Mir«; »Čuh polje«)

**10. *Chondrina spelta ventilatoris* (Westerlund, 1875)**

13, 25B, 29, 33, 37, 41.

L: KUŠČER 1930: 34 (*Chondrina mühlfeldti* Brug.: »In the collection of the Zagreb Museum marked: »Brčastac, Krnjac (Sali)««)

**11. *Rupestrella rhodia* (Roth, 1839)**

2B, 2C, 8A, 8B, 10, 13, 14, 15, 16, 32, 33, 34B, 36B, 37, 39, 41, 43, 44, 45, 46, 49, 51, 52B, 53, 56, 58, 60, 61, 63, 65, 67A, 70B, 71.

L: KUŠČER 1930: 34 (*Chondrina rhodia* Roth.: »In the collection of the Zagreb Museum from the same site« [refers to Brčastac – author's note])

**12. *Rupestrella philippii* (Cantraine, 1840)**

2B, 2C, 3, 5, 8A, 8B, 10, 13, 14, 18, 20, 25B, 28, 29, 32, 34B, 35B, 36B, 37, 41, 50, 51, [52A], 52B, 56, 58, 59, 63.

L: KUŠČER 1930: 34 (*Chondrina philippi* Cantr.: »In the collection of the Zagreb Museum from the site Brčastac«)

**13. *Truncatellina callicratis* (Scacchi, 1833)**

2A, 2B, 2D, 3, 6A, 7, 8A, 9, 10, 13, 16, 18, 19, 20, 22, 23, 24, 26, 30, 33, 35A, 36A, 36B, 37, 42, 43, 48, 49, 50, 51, 52A, 53, 54A, 54B, 57A, 57B, 59, 63, 67A, 70B, 71.

**14. *Truncatellina claustralis* (Gredler, 1856)**

8A?, 50.

***Chondrula* sp.**

53.

**15. *Chondrula tridens eximia* (Rossmässler, 1835)**

3, 6B, 22, 69, 70A.

**16. *Agathylla lamellosa* (Schubert et Wagner, 1829)**

14, 18, 19, 20, 23, 28, 29, [52A], X.

**17. *Delima albocincta albocincta* (L. Pfeiffer, 1841)**

6A, 6B, 8A, 8B, 26, 27, 33, 34A, 34B, 35A, 35B, 36B, 37, 39, 40, 41, 42, 43, 54A, 56, 58, 59, 62.

L: KUŠČER 1930: 34 (*Delima albocincta* Pfr.: »Kruševac«)

**18. *Delima bilabiata alschingeri* (Charpentier, 1852)**

1B, 2A, 2B, 2D, 3, 5, 6A, 6B, 7, 8A, 8B, 9, 10, 11, 12, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25A, 25B, 26, 27, 28, 29, 31, 32, 34A, 34B, 35A, 35B, 36B, 38, 39, 42, 43, 44, 45, 46, 48, 51, 52A, 52 B, 53, 54A, 55, 56, 57B, 58, 59, 60, 61, 62, 64, 66, 67A, 67 B, 67C, 70A, 71.

L: KUŠČER 1930: 35 (*Delima alschingeri* Charp.: »Gvozdenjak« [=? Gozdenjak islet or bay]; »close to Lake by Mir«; »Kruševac«)

**19. *Delima edmibrani* Štamol et Slapnik, 2002 (Fig. 2)**

10, 14, 18, 19, 20, 21, 23, 24, 25A, 25B, 26, 28, 29, X.

L: ŠTAMOL & SLAPNIK 2002: 244 (*Delima edmibrani* sp. n.: »Locus typicus: the island of Dugi otok, Luka Telaščica, Jaz (bay), 3 m a.s.l.; UTM: WJ16; Other localities: the island of Dugi otok: 1. Stivanjska gora (hill), 20 m a.s.l., UTM: WJ06; 2. Grbaščak (hill)-Obručan (hill), 50–60 m a.s.l., UTM: WJ16, WJ15; 3. Grbaščak (hill), 90 m a.s.l., UTM: WJ16; 4. Priseka (region), 80 m a.s.l., UTM: WJ16; 5. Priseka (region), 50 m a.s.l., UTM: WJ16; 6. Priseka (region), 30 m a.s.l., UTM: WJ15«).

**[*Charpentieria stigmatica stigmatica* (Rossmässler, 1836)]**

[52A].

**20. *Cecilioides acicula* (O. F. Müller, 1774)**

1B, 2C, 7, 20, 24, 25A, 26, 35A, 43, 55, 56, 57B.

**21. *Cecilioides veneta* (Strobel, 1855)**

syn.: *C. jani* (De Betta et Martinatti, 1855)

?1A, 25A.

***Cecilioides* sp.**

1B, 8A, 8B, 10, 18, 20, 21, 22, 25B, 26, 34A, 35A, 37, 42, 53, 54A, 56, 65, 67C.

**22. *Rumina decollata* (Linnaeus, 1758)**

1B.

**23. *Poiretia cornea* (Brumati, 1838)**

1B, 2A, 2C, 2D, 3, 6A, 6B, 7, 8A, 8B, 9, 10, 12, 13, 14, 15, 16, 18, 21, 22, 23, 24, 25A, 26, 27, 29, 31, 33, 34A, 34B, 35A, 35B, 36A, 36B, 37, 41, 42, 43, 45, 49, 50, 51, 52 B, 53, 54A, 55, 56, 57B, 58, 59, 61, 62, 64, 65, 67A, 67 B, 67C, 70B, 71, X.

L: KUŠČER 1930: 36 (*Poiretia algira* L.: »close to Salt Lake by Mir«)

**24. *Testacella scutulium* G. B. Sowerby I, 1820**

31.

**25. *Punctum pygmaeum* (Draparnaud, 1801)**

2D, 7, 9, 10, 16, 18, 20, 22, 23, 24, 30, 35A, 36A, 36B, 43.

**26. *Paralaoma servilis* (Schuttleworth, 1852)**

31.

***Vitrea* sp.**

63.

**27. *Vitrea subrimata* (Reinhardt, 1871)**

1A, 2A, 2B, 2C, 2D, 3, 5, 6B, 7, 8A, 8B, 9, 10, 12, 13, 18, 20, 21, 22, 25A, 25B, 27, 28, 29, 34A, 34B, 35A, 36A, 36B, 38, 41, 43, 44, 48, 49, 51, 52A, 52 B, 53, 54A, 55, 56, 57B, 59, 61, 62, 64, 65, 66, 67A, 67 B, 67C, 70B, 71.

**28. *Vitrea botterii* (L. Pfeiffer, 1853)**

8A, 9, 10, 11, 15, 16, 17, 18, 20, 23, 24, 25B, 29, 36A, 38.

**29. *Euconulus fulvus* (O. F. Müller, 1774)**

2D.

**30. *Oxychilus alliarius* (Miller, 1822)**

17, 22, 26, 31, 42, 61.

L: KUŠČER 1930: 36 (*Oxychilus cellarius austriacus* A. J. Wagn.: »Kruševac«).

**31. *Aegopis acies* (A. Férussac, 1832)**

26, 54A.

**[*Lindholmiola girva corcyrensis* (Rossmässler, 1838)]**

[52A].

***Monacha* sp.**

17, 18, 19, 24, 35A, 44.

**32. *Monacha cartusiana* (O. F. Müller, 1774)**

9, 10, 11, 13, 16, 21, 22, 25A, 26, 27, 30, 31, 32, 34A, 34B, 38, 42, 48, 52A, 52 B, 53, 54A, 55, 57A, 57B, 58, 61, 62, 63, 64, 66, 67A, 67B.

L: KUŠČER 1930: 36 (*Theba carthusiana* Müll.: »close to Salt Lake by Mir«)

**33. *Monacha parumcincta* (Menke, 1828)**

1A, 1B, 2A, 2B, 2C, 2D, 3, 5, 6A, 6B, 7, 8A, 8B, 9, 10, 12, 13, 14, 15, 16, 20, 21, 23, 25A, 25B, 29, 31, 33, 35B, 36A, 36B, 37, 39, 41, 43, 45, 46, 47, 49, 50, 51, 52A, 52 B, 53, 54A, 54 B, 56, 58, 59, 60, 61, 62, 66, 67A, 67C, 69, 70A, 70B, 71.

L: KUŠČER 1930: 36 (*Theba olivieri* Roth.: »close to Salt Lake by Mir«; »Brčastac«)

**34. *Cerņuella cisalpina meridionalis* (Mousson, 1854)**

26, [52A].

**35. *Helicigona setosa* (Férussac, 1832)**

3.

**36. *Eobania vermiculata vermiculata* (O. F. Müller, 1774)**

2A, 2C, 7, 9, 10, 14, 18, 20, 23, 28, 35A, 38, 42, 53, 62, 66, 67A, 68, 69, X.

L: KUŠČER 1930: 37 (*Eobania vermiculata* Müll.: »Brčastac«)

**37. *Cornu aspersum aspersum* (O. F. Müller, 1774)**

2B, 2C, 2D, 3?, 42, 43, 48, 54A, 69.

**38. *Helix cincta cincta* O. F. Müller, 1774**

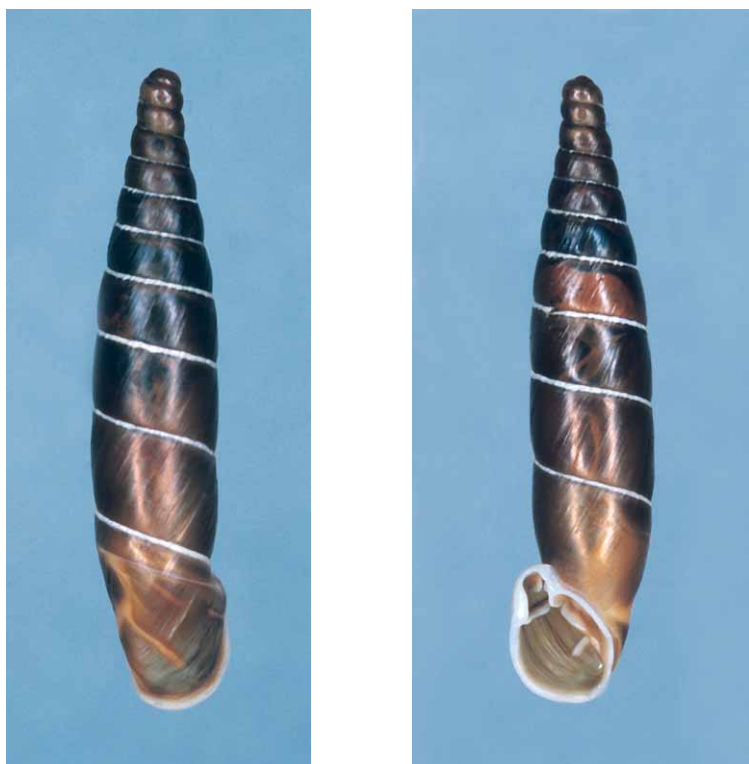
2D, 8B, 9, 10, 12, 16, 21, 22, 23, 26, 27, 28, 32, 34A, 34B, 35A, 35B, 47, 48, 49, 53, 54A, 55, 57B, 58, 60, 61, 64, 67A, 67 B, 68, 71.

In the investigations carried out in 1995, 1996 and 2003, 38 species were recorded as living in the area of Telašćica Nature Park. This has increased the number of known taxa in the Park by more than two and a half times (there were 14 of them before).

**DISCUSSION****Taxa of terrestrial snails**

The most interesting taxa are two endemic species from the family of door snails: *Delima edmibrani* and *Agathylla lamellosa*.

*Delima edmibrani* (Dugi otok door snail) (Fig. 2) has been found so far only inside the borders of Telašćica Nature Park and could be considered its narrowly endemic



**Fig. 2.** *Delima edmibrani* Štamol et Slapnik, 2002 – endemic snail of researched area, frontal and dorsal view 5 (photo: B. Jalžić).

species. It was found for the first time in 1989 ± incidentally during natural history research of Croatian Natural History Museum staff, and then again in 1995 and 1996. For a long time it was impossible to determine the systematic affiliation of this taxon and it was only in 2002 that it was put into a new subgenus of *Delima* (*Dugiana*) Štamol et Slapnik, 2002, with *D. edmibrani* for the moment its only member (ŠTAMOL & SLAPNIK, 2002). The taxon is found on the SW-facing rocky coastal cliffs of the island looking onto the open sea between 20 and 190 m a.s.l., which are its primary habitat. The secondary habitats are the dry stone walls and old, ruinous stone houses, and here it is found at a height of ~5 m a.s.l. and up to 50 m. It is interesting that, if we imagine the longitudinal line of Telašćica Bay from NW to SE, the species is not found on the half closer to Sali.

*Agathylla lamellosa* is a species that has shown even greater specialisation in the rocks of the outer rocks and cliffs of the Park than the Dugi otok door snail. It lives on all such habitats together with the Dugi otok door snail, but it does not exist in the localities of anthropogenic habitats in which *D. edmibrani* is found. Thus *Agathylla lamellosa* is less frequent in the Park than *D. edmibrani*. What makes its existence in the Park exceptional is that it appears at least 170 km distant from the previously known northern limit of the range of the genus *Agathylla*. This has so far been an endemic genus of the South Adriatic area from Makarska, Croatia, the northernmost possible point, to central Albania in the south, and the species *A. lamellosa* has been distributed from Dubrovnik, Croatia, in the north, to Petrovac in Montenegro in the south (FECHTER & FALKNER, 1990: 154). Research into the differences with respect to individuals of the same species from southern Dalmatia is under way.

We would also put forward as interesting species those that have a wide distribution, and live both inside and outside Croatia and yet are relatively rarely found in Croatia. These are *Paralaoma servilis*, so far found in Croatia near Motovun (MAASSEN, 1993), Crikvenica and Novi (MAASSEN, 1984), on Lošinj (ŠTAMOL & VELKOVVRH, 1995), in Konavle in Ljuta (REISCHÜTZ, A. & REISCHÜTZ, P. L., 2002) and *Testacella scutulum*, which in lists, faunas and so on is given in general for Croatia, that is, for Istria, but the only defined find of which refers to Rijeka (WAGNER, 1952). Both these species were found in our previous research at only one locality in the Park.

Also of interest are broadly distributed species, recorded in Croatia at many localities, but found in the Park in only one (*Euconulus fulvus*, *Rumina decollata*, *Cerņuella cisalpina meridionalis*, *Helicigona setosa*) or few localities (*Aegopis acies*, *Vallonia costata*, *Truncatellina claustralis*). The reason might be the small number of suitable habitats, competition from species with similar requirements in a small area, the relatively recent introduction of the species, the inadequate investigation of the area, or a combination of some of these factors stated.

A fourth group of interesting taxa are endemics of a smaller or greater area of the eastern Adriatic coast. Endemics of relatively small ranges are *Delima albocincta albocincta*, recorded on Dugi otok, Ugljan and the Kornati (NORDSIECK, 1969), *Delima bilabiata alschingeri*, recorded mainly for the area of Zadar, the Kornati islands and Dugi otok, *Chondrina spelta ventilatoris* recorded for the area of the Krka Valley as far as Brač and Hvar in the south (NORDSIECK, 1970), the find inside the Park thus representing its westernmost find. Endemics with a somewhat larger range are *Coc-*

*hlostoma scalarinum scalarinum* and *Hypnophila pupaeformis*. Most of the fourth group of interesting species are among the most frequent snails of the Park. An exception is *Chondrina spelta ventilatoris*, which is a dweller of the rocks at altitudes mainly over 100 m a.s.l.

### Habitats of terrestrial snails

The habitats richest in species of terrestrial snails are anthropogenic habitats. These are on the whole abandoned stone houses that are used little or never, or dry stone walls and churches that have not been restored (site no. 10: 20 species; site no. 54A: 17 species; sites no. 53: 16 species; sites 21, 22, 26, 35A: 14–15 species). In the immediate vicinity of these sites, as well as in different habitats, e.g. in the stone wastes with little vegetation the number of species can fall drastically (e.g. site 54B: 4 species). It has been shown that, besides the rocky islets totally exposed to the sea, which are not inhabited by terrestrial snails (i. e. site no. 4., Taljurić islet), stone wastes with little or no vegetation are the habitats with the most impoverished terrestrial malacofauna. Abundant habitats should be protected with measures to maintain the current state of human impact, i.e., the habitats should continue to be under moderate anthropogenic influence. A total exclusion of human impact or on the other hand an excessive human impact would lead to changes in the life conditions and the creation of conditions unfavourable for some of the existing species.

Habitats with the most peculiar terrestrial snail fauna are the rocks of the outer cliffs on which the narrowly endemic species *Delima edmibrani* and the endemic species *Agathylla lamellosa* live. At greater elevations a.s.l. there is also the endemic *Chondrina spelta ventilatoris* although it is also to be found in other rocky parts of the Park if the height of  $\pm 100$  m is satisfied. These habitats, which are the greatest lure to tourists and attract many visitors, should be protected by restrictions on human movements.

### CONCLUSION

During investigations of a total of 85 sites in the area of the Telašćica Nature Park, a total of 38 species of terrestrial snails were discovered. Thus the existence of all the 14 species previously recorded in the Park was confirmed, and another 24 species were discovered. The sites investigated were distributed  $\pm$  regularly around the area of the Park, with the proviso that care was taken to include all the islets, all the main macro- and microhabitats and the whole range of elevations a.s.l. of the Park.

Particularly prominent in the malacofauna are the narrowly endemic species of the Dugi Otok door snail *Delima edmibrani* that has so far not been found outside the confines of the Park, and the species *Agathylla lamellosa* which has been known so far only in the area of Southern Dalmatia and Montenegro, this being the northernmost finding site. Both species appear on the rocky habitats of the outer cliffs.



Also worth distinguishing in the fauna are the endemic taxon *Chondrina spelta ventilatoris* which here has its westernmost finding site, and the rare species of the Croatian fauna *Testacella scutulium*, the second and the southernmost site, and *Para-laoma servilis*, with the sixth record in Croatia.

There are a relatively large number of endemic taxa of a larger or smaller part of the eastern Adriatic coast (alongside the mentioned *Chondrina spelta ventilatoris*, *Agathylla lamellosa* and *Delima admibrani* there are also *Cochlostoma scalarinum scalarinum*, *Hypnophila pupaeformis*, *Delima albocincta albocincta*, *D. bilabiata alschingeri*, *Aegopis acies* and *Helicigona setosa*) which indicates the specificity of and the need to protect the fauna as a whole.

The richest in species were the anthropogenic habitats little affected by people, which should if possible be kept this way. The most peculiar were the rocky habitats of the outer cliffs, which need protecting, probably, by partial prohibition of the movements of visitors in the areas.

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## S A Ž E T A K

### Kopneni puževi (Mollusca: Gastropoda terrestria) Parka prirode »Telašćica« (Dugi otok, Hrvatska)

V. Štamol

Terenskim istraživanjima ukupno 85 lokaliteta na području Parka prirode Telašćica koji se nalazi na južnom dijelu Dugog otoka (Hrvatska) ustanovljeno 38 vrsta kopnenih puževa. Time se potvrdilo postojanje svih 14 dosada zabilježenih vrsta za Park, i otkrilo još 24 vrste u Parku.

Veliki broj istraživanih lokaliteta na dobro zastupljenoj vertikalnoj i horizontalnoj mreži u Parku kojima su obuhvaćena sva tipična makrostaništa i mikrostaništa omogućila su stvaranje relativno dobre slike sastava kopnene malakofaune i njene rasprostranjenosti u Parku. Izuzetak su puževi bez kućice koji ovim radom nisu obuhvaćeni.

Pokazalo se da se, zbog postojanja endemičnih i stenoendemičnih vrsta, kopnena malakofauna Parka prirode »Telašćica« ističe osebujnošću. Među njima najzanimljivije su stenoendemične vrste dugootočka zaklopnica *Delima edmibrani* koja nije poznata izvan granica Parka, i *Agathylla lamellosa* koja je dosada bila poznata iz područja južne Dalmacije i Crne Gore, pa joj je ovo najsjevernije nalazište. Obe vrste dolaze u Parku na stjenovitim staništima klifova uz vanjsku obalu Dugog otoka.

Iz faune izdvajamo još endemičnu svojtu *Chondrina spelta ventilatoris* koja ovdje ima najzapadnije nalazište, a rijetke vrste hrvatske faune *Testacella scutulum* najjužnije nalazište i *Paralaoma servilis* šesto nalazište za Hrvatsku.

U fauni je relativno velik broj endemičnih svojti manjeg ili većeg dijela istočno-jadranske obale (uz navedene *Chondrina spelta ventilatoris*, *Agathylla lamellosa* i *Delima edmibrani*, još *Cochlostoma scalarinum scalarinum*, *Hypnophila pupaeformis*, *Delima albocincta albocincta*, *D. bilabiata alschingeri*, *Aegopis acies*, *Helicigona setosa*), što ukazuje na osebujnost i potrebu zaštite cjelokupne kopnene malakofaune.

Kao najbogatija staništa pokazala su se antropogena staništa slabo utjecana čovjekom te bi ih trebalo pokušati održavati takvima. Najsiromašnija staništa su kamenjari s malo ili ništa vegetacije. Najosebujnija su stjenovita staništa vanjskih obalnih grebena (klifova) koja su, kao glavni turistički mamac, na udaru mnogobrojnih posjetitelja te bi ih trebalo zaštititi zabranom kretanja posjetitelja barem većim djelomom takvih površina.

## SUMMARY

**Terrestrial snails (Mollusca: Gastropoda terrestria)  
of the Telašćica Nature Park (Dugi otok, Croatia)**

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In field investigations of a total of 85 sites in the area of the Telašćica Nature Park, which is in the southern part of the island of Dugi otok, Croatia, 38 species of terrestrial snails were established. This has confirmed the existence of all the 14 species so far recorded in the Park, and established the existence of another 24 species in the area.

The large number of localities investigated, on a highly representative vertical and horizontal grid in the Park, which encompassed all the typical macro- and microhabitats enabled the creation of relatively good picture of the composition of terrestrial malacofauna and its distribution in the park. Slugs were not covered by this investigation.

It appeared that, because of the existence of endemic and narrowly endemic species, the terrestrial malacofauna of Telašćica Nature Park is remarkable for its peculiarity. Among these taxa the most interesting species are the Dugi otok door snail *Delima edmibrani* which is not known beyond the confines of the Park, and the species *Agathylla lamellosa* which was previously known in the area of Southern Dalmatia and Montenegro, this find thus marking its northernmost location. Both species appear in the Park on the rocky habitats of the cliffs alongside the outer coast of Dugi otok.

Also worth picking out from the fauna is the endemic taxon *Chondrina spelta ventilatoris* of which this is the westernmost finding site, and the southernmost finding site of a species rare in the Croatian fauna, *Testacella scutulum* and of *Paralaoma servilis*, the sixth finding site in Croatia.

There are a relatively large number of endemic taxa of a major or lesser part of the eastern coast of the Adriatic in the fauna (along with *Chondrina spelta ventilatoris*, *Agathylla lamellosa* and *Delima edmibrani* already mentioned, there are also *Cochlostoma scalarinum scalarinum*, *Hypnophila pupaeformis*, *Delima albocincta albocincta*, *D. bilabiata alschingeri*, *Aegopis acies* and *Helicigona setosa*) which shows the distinctiveness of the area and the need to protect the entirety of the terrestrial malacofauna.

The richest habitats turned out to be the anthropogenic habitats that are slightly affected by people, which if possible should be kept this way. The poorest habitats are the stone wastes with little or no vegetation. Most peculiar are the rocky habitats of the cliffs that, as a leading tourist draw, are exposed to the impact of the many visitors; they should be protected by a ban placed upon the movement of visitors upon at least a major part of such areas.