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TERRESTRIAL SNAILS (MOLLUSCA: GASTROPODA TERRESTRIA) OF DUGI OTOK (CROATIA)

VESNA ŠTAMOL & EDUARD KLETEČKI

Department of Zoology, Croatian Natural History Museum, Demetrova 1, 10000 Zagreb, Croatia

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In field research into Dugi otok outside the confines of Telašćica Nature Park, and two northern islets (Mali Lagan, Veli Lagan) we found 35 species of terrestrial snails with shells. Of these, 33 species had been recorded in the literature with reference to Dugi otok, including the surrounding southern islets that form part of Telašćica Nature Park. *Cepaea vindobonensis* and *Hygromia cinctella* are species that have been newly found. Our investigations did not reveal 10 species that are cited in the literature. We considered that two taxa (*Delima blanda conspurcata*, *Cepaea nemoralis*) do not live on the island and the islets stated, while the remaining eight taxa (*Vallonia costata*, *Granopupa granum*, *Truncatellina claustralis*, *Agathylla lamellosa*, *Delima edmibrani*, *Testacella scutulum*, *Cochlicella acuta*, *Chilostoma setosa*) are held to be certain denizens of Dugi otok, which we did not find because our investigations were not systematic enough or because they do not live outside the area in which they were recorded (Telašćica Nature Park). Among the species that attract particular attention are: *Delima edmibrani*, which is narrowly endemic to Dugi otok; *Agathylla lamellosa*, of which this is the northernmost finding site; *Chondrina spelta ventilatoris*, because it is the westernmost finding site; and *Testacella scutulum* and *Paralaoma servilis*, because they are found so seldom in Croatian malacofauna. Dugi otok, with the surrounding islets and rocks mentioned, has a total of 43 species, which constitutes, in comparison with other islands of the eastern Adriatic, a relatively rich terrestrial malacofauna.

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

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Terenskim istraživanjima Dugog otoka izvan granica PP »Telašćica« i dva sjevernije položena otočića (Mali i Veli Lagan) našli smo 35 vrsta kopnenih puževa s kućicom. Od toga su 33 vrste bile u literaturi zabilježene za Dugi otok uključujući i okolne južne otočiće koji ulaze u sastav PP »Telašćica«. Novonađene su *Cepaea vindobonensis* i *Hygromia cinctella*. Našim istraživanjima nismo našli 10 vrsta zabilježenih u literaturi. Za dvije svojte (*Delima blanda conspurcata*, *Cepaea nemoralis*) smatramo da ne obitavaju na otoku i navedenim otočićima, a preostalih 8 (*Vallonia costata*, *Granopupa granum*, *Truncatellina claustralis*, *Agathylla lamellosa*, *Delima edmibrani*, *Testacella scutulum*, *Cochlicella acuta*, *Chilostoma setosa*) smatramo sigurnim stanovnicima Dugog otoka koje ili zbog nedovoljne sustavnosti istraživanja ili zbog toga što svojte ne obitavaju područja izvan PP »Telašćica«

nismo našli. Među vrstama treba istaknuti *Delima edmibrani* kao stenoendem Dugog otoka, *Agathylla lamellosa* zbog najsjevernijeg nalazišta, *Chondrina spelta ventilatoris* zbog najzapadnijeg nalazišta, te *Testacella scutulum* i *Paralaoma servilis* zbog rijetke pojavnosti u hrvatskoj malakofauni. Dugi otok s navedenim okolnim otočićima i hridima broji ukupno 43 vrste što predstavlja, u usporedbi s drugim istočnojadranskim otocima, relativno bogatu kopnenu malakofaunu.

Ključne riječi: kopneni puževi, Dugi otok, Hrvatska

INTRODUCTION

Dugi otok is an outer island of North Dalmatia (Croatia), in the eastern Adriatic (Fig. 1). It runs in the same direction as the Dinaric mountains, from NW to SE. It is 46 km long, at its narrowest is hardly more than 1 km wide, and is at most 5 km wide; it occupies an area of 114 square kilometres (BOROVAC, 2002: 308). The highest peak is Vela straža, at 338 m a.s.l. Along the lie of the island stretches a sequence of peaks mainly between 200 and 300 m. Between these are karstic poljes, some of which are inundated during the winter (for example, Velo jezero, Malo jezero, Dobro polje). The island is mainly of limestone construction, Cretaceous in age, and the cultivable areas are limited to the Dolomite zones, mainly on the eastern side of

Fig. 1. Position of Dugi otok.

the island, which has a gentler and more indented coastline, along which are the settlements. The climate is typically Mediterranean, with a mild and rainy winter and a warm, dry summer; mean annual air temperature is 16 °C, and precipitation comes to 791 mm a year. In such conditions, typically Mediterranean vegetation has developed: the degradation phases of evergreen oak (*Orno-Quercetum ilicis*). There is macchia and garrigue, which dominates in the northern part of the island, and stony pastures which predominate in the southern part. There are also plantations of Aleppo pines, and areas devoted to the cultivation of olive trees, the grapevine and horticultural crops. The most attractive natural feature of interest is in the southern part of Dugi otok, inside the Telašćica Nature Park, so proclaimed in 1988. Here there are steep outward-facing cliffs up to 200 m high, the saltwater Mir Lake, and Telašćica Bay itself, from which the park took its name.

The history of the research

The first information concerning the existence of terrestrial snails on Dugi otok is to be found in the paper of BIELZ (1865), where just one species is adduced for the area investigated. Then came another 17 papers, 15 of which cite a small number of species (most frequently just one, sometimes up to four species), while in two papers there are over 20 taxa. The first group of papers in which a small number of taxa are cited for Dugi otok consists of papers in which unsystematic investigation of the terrestrial malacofauna is reported, because they are:

- lists of species of a wider area, in which Dugi otok is mentioned incidentally (BIELZ, 1865; BRUSINA, 1907);
- works that treat systematic groups that are represented on Dugi otok with just one or just a few species (WAGNER, 1897; HIRC, 1910; WAGNER, 1924, 1925; NORDSIECK, 1969, 2002; ILIJANIĆ & STOŠIĆ, 1972; RIEDEL, 1979; MAASSEN, 1985; ŠTAMOL & SLAPNIK, 2002);
- works that give the results of field research or lists of collections in which Dugi otok is not encompassed, or in which it is stated only in passing (STURANY, 1915), often through citations of previous papers (FRANK, 1991, 2000);
- papers that are the result of more systematic investigation of Dugi otok (KUŠČER, 1930a), but which take the form of an extended abstract, the depiction of the fauna thus being somewhat terse.

The remaining two publications (KUŠČER, 1930; ŠTAMOL, 2004) are from a second group of papers, which do deal more systematically with the malacofauna of Dugi otok. The first publication (KUŠČER, 1930) is the result of the natural history research undertaken by the Yugoslav Academy of Science and Art of Zagreb during 1925–1927. On this occasion, the malacofauna of Dugi otok was investigated at 14 sites, and 21 taxa of terrestrial snails with shell were found. The second more systematic work (ŠTAMOL, 2004) was prompted by interesting finds of terrestrial snails collected during initial field research into the flora and fauna of the outer cliffs of the southern part of Dugi otok, started in 1989 by the Croatian Natural History Museum, Zagreb. Malacological investigations, now extended to the whole of Dugi

otok, were continued in 1995 and 1996, and in 2003, when they were stepped up in the southern part of the island within the confines of Telašćica Nature Park. The result of this research was the finding of a new species and a new subgenus *Delima* (*Dugiana*) *edmibrani* Štamol et Slapnik, 2002 (ŠTAMOL & SLAPNIK, 2002) and a review of the terrestrial snails of Telašćica Nature Park (ŠTAMOL, 2004), in which 38 taxa from 85 sites in the Park are given. Nevertheless, even these papers were not complete enough to give a full account of the terrestrial malacofauna of the whole of Dugi otok; the first (KUŠČER, 1930) because it did not cover sufficient sites, and in particular because it did not cover the small species of terrestrial snails; and the second (ŠTAMOL, 2004) because it was restricted to the southern part of the island.

The recent publication concerning the terrestrial malacofauna of the Telašćica Nature Park (ŠTAMOL, 2004) prompted us to give an account of the field investigations of 49 sites in the remaining part of Dugi otok so that, in conjunction with data from the literature, a more complete image of the terrestrial malacofauna of the whole of the island would be available.

MATERIALS AND METHODS

Field research carried out during 1995, 1996 and 2003 took in Dugi otok beyond the confines of Telašćica NP, and two rather more northerly positioned islets as well (Mali Lagan, Veli Lagan). Authors considered the data from the literature that take in the whole of Dugi otok, as well as the 19 islets and rocks that together comprise Telašćica Nature Park; these are the following: Gamernjak veli, Gamernjak mali, Taljurić, Sestrica vela, Sestrica mala, Abica, Školjić, Katina, Katinica, Buč veli, Buč mali, Mala Aba, Gornja Aba, Korotan, Galijola, Gozdenjak, Farfarikulac, Burni školj, Donji školj.

Terrestrial snails were collected by individual taking of larger specimens, and by taking soil samples, from which, after drying and sieving through a number of sieves of declining mesh sizes, snails were isolated. Samples were taken from all existing altitudes (0–338 m a.s.l.) and from all typical macrohabitats, in which we chose microhabitats with expected rich fauna. Because of the particular methods of collection, slugs were not systematically collected, and hence we supply no information concerning them. The material is deposited in the General Collection of Recent Malacofauna in the Croatian Natural History Museum in Zagreb.

RESULTS AND DISCUSSION

A list of sites

A) Field sites

After the name of the site, the type of the site is stated in brackets (for example, islet, point, polje, settlement), its position vis-à-vis a larger topographical item – most frequently the closest populated settlement, the UTM coordinate; height abo-

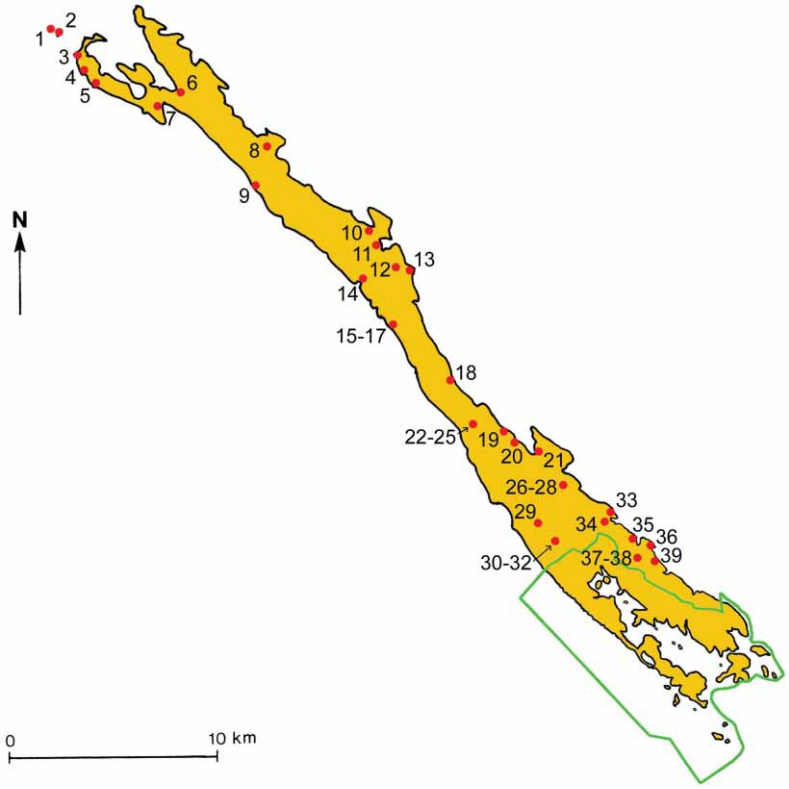

Fig. 2. Positions of explored field sites.

ve sea level; habitat; date of collection. The names of the places are taken from the 1981 1:25000 maps of the Military Geography Institute. The distribution of the sites is shown in Fig. 2.

1. Mali Lagan (islet), 1,5 km NW from Dugi otok, VJ89; 1 m a.s.l.; 04.07.1996;
2. Veli Lagan (islet), 1,3 km NW from Dugi otok, VJ88; 1 m a.s.l.; 04.07.1996;
3. Veli rat (point), Veli Rat (settlement)-2,7 km NW, VJ88; 2 m a.s.l.; rocks, garrigue; 20.05.1995;
4. Turnara (point), Veli Rat (settlement)-2,2 km NW, VJ88; 10 m a.s.l.; rocks, garrigue; macchia; 20.05.1995;
5. Zagarine (point), Veli Rat (settlement)–1,75 km W, VJ88; 10 m a.s.l.; rocks; 20.05.1995;
6. Soline (settlement), VJ98; 2 m a.s.l.; rocky grassland; 03.07.1996;
7. Sakarun (bay), Soline (settlement)-500 m S, VJ88; 5–10 m a.s.l.; 03.07.1996;
   A: beach;
   B: sandy grassland;
   C: pine grove;

8. Dragove (settlement), VJ98; 140 m a.s.l.; dry stone wall, grassland; 04.07.1996;
9. Guvnine (bay), Dragove (settlement)-2 km S, VJ98; 1–5 m a.s.l.; garrigue; 03.07.1996;
10. Lučina (bay)-Jaz (bay), Brbinj (settlement), WJ08; 3–5 m a.s.l.; dry stone wall in the field and by the pool; 03.07.1996;
11. Jaz (bay), Brbinj (settlement), rocks, pine grove, dry stone wall; 03.07.1996;
    A: WJ07; 2–5 m a.s.l.;
    B: WJ08; 5–10 m a.s.l.;
12. Savar (settlement), WJ07; 110 m a.s.l.; old house; 03.07.1996;
13. Pelegrin (point), Savar (settlement), WJ07; 03.07.1996;
    A: 2 m a.s.l.; cemetery wall;
    B: 8 m a.s.l.; rocks, pine grove;
14. Brbišćica (bay), Brbinj (settlement)-2,6 km SSW, VJ97; 2–5 m a.s.l.; 03.07.1996;
15. Ripišće (bay), Savar (settlement)-3 km S, WJ07; 50 m a.s.l.; 03.07.1996;
16. Ripišće (bay), Savar (settlement)-3 km S, WJ07; 3 m a.s.l.; macchia; 03.07.1996;
17. Ripišće (bay), Savar (settlement)-3 km S, WJ07; 3–5 m a.s.l.; 03.07.1996;
    A: pine grove;
    B: rocks;
18. Zali draga (gorge), Savar (settlement)-6 km SSE, WJ07; macchia; 02.07.1996;
    A: Oštravica (hill)-500 m ESE; 50 m a.s.l.;
    B: Oštravica (hill)-400 m SE; 130 m a.s.l.;
    C: Oštravica (hill)-300 m SSE; 200 m a.s.l.;
19. Pećina (bay), Luka (settlement), WJ07; 30 m a.s.l.; cave; 02.07.1996;
20. Barbenica (region), Luka (settlement), WJ07; 10 m a.s.l.; rocky grassland; 02.07.1996;
21. Luka (settlement), WJ07; 2–10 m a.s.l.; 02.07.1996;
    A: dry stone wall;
    B: cemetery; garden;
    C: garden;
22. Vela straža (peak), Žman (settlement)-3,5 km NW, WJ07; 337 m a.s.l.; rocky grassland; 02.07.1996;
23. Vela straža (peak), Žman (settlement)-3,5 km NW, WJ07; 330 m a.s.l.; rocks; 02.07.1996;
24. Vela straža (peak), Žman (settlement)-3,5 km NW, WJ07; 320–337 m a.s.l.; rocks; 02.07.1996;
25. Vela straža (peak), Žman (settlement)-3,5 km NW, WJ07; 290 m a.s.l.; rocks; 02.07.1996;
26. Žman (settlement), WJ06; 2–5 m a.s.l.; dry stone wall, garden; 01.07.1996;
27. Žman (settlement), WJ06; 2–5 m a.s.l.; dry stone wall, garden; 01.07.1996;
28. Žman (settlement), WJ06; 2–5 m a.s.l.; dry stone wall with cypresses; 01.07.1996;
29. Malo jezero (region), Žman (settlement), WJ06; ~10 m a.s.l.; dry stone wall, old house; 19.09.2003;
30. Velo jezero (region), Žman (settlement) – 3 km SW; WJ06; 3 m a.s.l.; polje; 01.07.1996;

31. Velo jezero (region), Žman (settlement) – 3 km SW, WJ06; 4 m a.s.l.; spring; 01.07.1996;
32. Velo jezero (region), Žman (settlement) – 3 km SW, WJ06; 8–10 m a.s.l.; old house; 01.07.1996;
33. Zaglav (settlement), WJ16; 10 m a.s.l.; grassland; 03.07.1996;
34. Zaglav (settlement), WJ16; 70 m a.s.l.; 03.07.1996;
    A: dry stone wall in olive grove;
    B: rocks, garrigue;
35. Sali (settlement), WJ16; leg. Goran Jagić, 19.09.2003;
36. Blud (point), Sali (settlement), WJ16; 5–10 m a.s.l.; rocks, pine grove, ruderal vegetation; 19.06.2003
37. Sali (settlement)-0,7 km SW, WJ16; 60 m a.s.l.; rocks; 21.05.1995;
38. Sali (settlement)-0,7 km SW, WJ16; 40 m a.s.l.; old house; 21.05.1995;
39. Lokavdenjak (region), Sali (settlement), WJ16; 40 m a.s.l.; rocks; 21.05.1995;

B) Sites from the literature

After the valid name of the place, the type of site and the UTM designation (if possible to determine), the source is stated, and in brackets the toposynonym from the work. Sites from the literature are shown in Fig. 3. In most cases it was very difficult to identify the site precisely. It was either impossible to locate the sites from the data cited, which is the case for most of the papers, or else, because of the abundance of data and the recentness of the paper (85 sites in ŠTAMOL, 2004) it is, in our opinion, not necessary. Thus in this list the sites from the work last mentioned are not given in detail, but just indicated as Telašćica Nature Park.

I. Božava (settlement), VJ98
   BIELZ, 1865 (Boxava) …[the accuracy of this assumption concerning toposynonyms is dubious – authors];
II. Brbinj (settlement)
   KUŠČER, 1930 (Birbinj);
   KUŠČER, 1930a (Birbinj);
III. Savar (settlement), WJ07
   KUŠČER, 1930 (Savar);
IV. Strašna peć (cave), WJ07
   KUŠČER, 1930 (Strašna peć);
   RIEDEL, 1979 (Strašna peć);
V. eastern Draga by Strašna peć (valley), WJ07
   KUŠČER, 1930 (istočna Draga pri Strašnoj peći);
VI. Žman (settlement) – Malo jezero (region), WJ06
   KUŠČER, 1930 (Žman-Malo jezero);
VII. Velo jezero (region), WJ06
   KUŠČER, 1930 (Velo jezero);
VIII. Žman (settlement) – Sali (settlement)
   KUŠČER, 1930 (Žman-Sali);
IX. Dugo polje (polje) – Zaglav (settlement);
   KUŠČER, 1930 (Dugo polje-Zaglav);

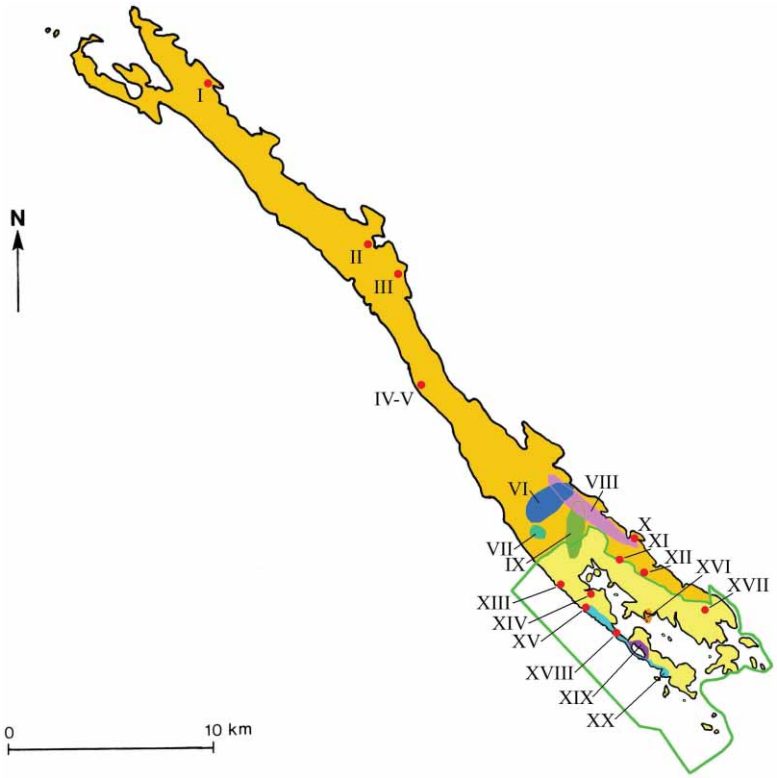

Fig. 3. Positions of sites from the literature.

X. Sali (settlement), WJ16
WAGNER, 1897 (Sali);
BRUSINA, 1907 (Sali);
STURANY, 1915 (Sale);
KUŠČER, 1930 (Krnjac /Sali/; Sali; Sale, Orto Fortis);
ILIJANIĆ & STOŠIĆ, 1972 (Sali);

XI. Berčastac (hill), WJ16
KUŠČER, 1930 (Brčastac);

XII. Kruševac (hill), WJ16
KUŠČER, 1930 (Kruševac);

XIII. Stivanjska gora (hill), WJ06
ŠTAMOL & SLAPNIK, 2002 (Stivanjska gora);

XIV. Jaz (bay), Luka Telaščica (bay), WJ16
ŠTAMOL & SLAPNIK, 2002 (Jaz, Luka Telašćica);
NORDSIECK, 2002 (Luka Telašćica);

XV. Grbašćak (hill), WJ16
ŠTAMOL & SLAPNIK, 2002 (Grbašćak)

XVI. Gozdenjak (islet or bay), WJ16
KUŠČER, 1930 (Gvozdenjak);
XVII. Čuh polje (polje), WJ16
KUŠČER, 1930 (Čuh polje);
XVIII. Priseka (hill), WJ15
ŠTAMOL & SLAPNIK, 2002;
XIX. Blizu Jezera pri Miru, WJ15
KUŠČER, 1930 (Blizu »Jezera« pri Miru; Blizu Slanog Jezera pri Miru);
XX. Grbašćak (hill)-Obručan (hill)
ŠTAMOL & SLAPNIK, 2002 (Grbašćak-Obručan);
Telašćica Nature Park, WJ06, WJ16, WJ15
ŠTAMOL, 2004
Dugi otok (island)
KUŠČER, 1930 (Dugi otok);
KUŠČER, 1930 a (Dugi otok);
STURANY, 1915 (Insel Grossa /Lunga/);
WAGNER, 1897 (Insel Lunga);
WAGNER,1924 (Insel Sale);
WAGNER, 1925 (Insel Sale);
NORDSIECK, 1969 (Dugi Otok);
MAASSEN, 1985 (Dugi Otok);
NORDSIECK, 2002 (Dugi Otok);

List of taxa with finding sites

The list of taxa is systematic, the names being taken from FAUNA EUROPAEA (BANK, 2004). Taxa cited in square brackets are those that do not actually live on Dugi otok, rather appear on the shores as sea deposit. The following are given for every taxon:

1. quotations of previous authors with the synonyms for the taxa from the said works

2. sites from the literature (after the letter **L**) and from field research (after the letter **F**) arranged according to UTM designations. A question mark alongside the designation of the locality means that the taxa in this site could not be determined with any certainty. The literature sites the UTM of which could not be determined are quoted separately. Alongside the site from the literature, the quoted work is cited, with the help of a number in square brackets, according to the following key:

[1] BIELZ, 1865
[2] WAGNER, 1897
[3] BRUSINA, 1907
[4] HIRC, 1910
[5] STURANY, 1915
[6] WAGNER,1924
[7] WAGNER, 1925
[8] KUŠČER, 1930
[9] KUŠČER, 1930a
[10] NORDSIECK, 1969
[11] ILIJANIĆ & STOŠIĆ, 1972
[12] RIEDEL, 1979
[13] MAASSEN, 1985
[14] FRANK, 1991
[15] FRANK, 2000
[16] ŠTAMOL & SLAPNIK, 2002
[17] NORDSIECK, 2002
[18] ŠTAMOL, 2004

Toposynonyms from the works quoted are given in the list of literature sites.

The abbreviation NP (Nature Park) is used to indicate any locality from ŠTAMOL, 2004, all of them within the confines of the Telašćica Nature Park located in the southern part of Dugi otok. In the same paper (ŠTAMOL, 2004: 100) the UTM designation for the site Stivanjska gora (hill) is incorrect, and for the site Mrzlovica it was omitted. Both sites have the UTM designation WJ06, and this is now taken into account in determining the UTM of the taxa.

1. *Cochlostoma scalarinum scalarinum* (A. & J. B. Villa, 1841)

[2] WAGNER, 1897: 578, 580 *Pomatias* (*Eupomatias*) *scalarinus* Villa
[3] BRUSINA, 1907: 161 *Cochlostoma scalarinum* (Villa)
[4] HIRC, 1910: 57 *Pomatias scalarinus* Villa
[8] KUŠČER, 1930: 33 *Cochlostoma scalarinum* Villa
[11] ILIJANIĆ & STOŠIĆ, 1972: 13 *Pomatias scalarinus* Villa
[18] ŠTAMOL, 2004: 103 *Cochlostoma scalarinum scalarinum* (Villa, 1841)

VJ88: **F:** 5, 7A, 7C
VJ97: **F:** 14
WJ07: **F:** 11A, 13A, 13B, 15, 17B, 18A, 18B, 18C, 22, 23, 24, 25
WJ06: **L:** NP: [18]; **F:** 28, 29, 32
WJ16: **L:** Sali: [2], [3], [8], [11]; Kruševac: [8]; Gozdenjak: [8]; NP: [18]; **F:** 34A, 34B, 36, 37
WJ15: **L:** close to Lake by Mir: [8]; NP: [18]
L: Žman-Sali: [8]; Dugi otok: [2], [4]

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

[8] KUŠČER, 1930: 33,34 *Pomatias elegans* Müll.
[18] ŠTAMOL, 2004: 103 *Pomatias elegans* (O. F. Müller, 1774)

VJ88: **F:** 7B
VJ98: **F:** 8
WJ08: **F:** 11B
WJ07: **F:** 11A, 12, 18A, 18B, 18C, 21A, 21B, 21C, 23, 24, 25
WJ06: **L:** NP: [18]; **F:** 26, 28, 29, 32
WJ16: **L:** Sali: [8]; NP: [18]; **F:** 33, 34A, 34B, 35, 36, 38
WJ15: **L:** close to Lake by Mir: [8]; NP: [18]
L: Brbinj: [8]; Žman-Sali: [8]

3. *Hypnophila pupaeformis* (Cantraine, 1835)

[8] KUŠČER, 1930: 34 *Azeca pupaeformis* Cantr.
[18] ŠTAMOL, 2004: 103 *Hypnophila pupaeformis* (Cantraine, 1836)

VJ88: **F:** 5
VJ97: **F:** 14
WJ08: **F:** 10
WJ07: **F:** 11A, 13A, 13B, 18A, 18C, 21B, 22, 23, 24, 25
WJ06: **L:** NP: [18]; **F:** 26, 28, 29

WJ16: **L:** Sali: [8]; NP: [18]; **F:** 34A, 34B, 36, 37, 38
WJ15: **L:** NP: [18]

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

[18] ŠTAMOL, 2004: 103 *Lauria cylindracea* (Da Costa, 1778)

VJ98: **F:** 6
VJ97: **F:** 14
WJ07: **F:** 13A, 13B, 18A, 18B, 18C, 21B, 23, 24, 25
WJ06: **L:** NP: [18]; **F:** 26, 27, 28, 29, 32
WJ16: **L:** NP: [18]; **F:** 34A, 34B, 37, 38
WJ15: **L:** NP: [18]

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

[18] ŠTAMOL, 2004: 103 *Vallonia costata* (O. F. Müller, 1774)

WJ06: **L:** NP: [18]
WJ15: **L:** NP: [18]

Remark: Species previously found on Dugi otok only at two sites (ŠTAMOL, 2004).

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

[18] ŠTAMOL, 2004: 103 *Acanthinula aculeata* (O. F. Müller, 1774)

VJ97: **F:** 14
WJ07: **F:** 11A, 18A, 18B, 18C, 20, 24
WJ06: **L:** NP: [18]; **F:** 26, 28, 29, 32
WJ16: **L:** NP: [18]; **F:** 34A, 34B

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

[18] ŠTAMOL, 2004: 103 *Pyramidula rupestris* (Draparnaud, 1801)

WJ16: **L:** NP: [18]; **F:** 38
WJ15: **L:** NP: [18]

Remark: GITTENBERGER & BANK, 1996 define several species within what was previously defined in the literature as *Pyramidula rupestris.* Of these, the following come to Croatia, or might come: the Mediterranean *P. rupestris* recorded in Dalmatia (GITTENBERGER & BANK, 1996: 76), the Mediterranean and West-Central European *P. pusilla* (Vallot, 1801), recorded in Croatia in the island of Korčula (REISCHÜTZ *et al.*, 2002: 54), and *P. cephalonica* (Westerlund, 1898), the range of which stretches from N. Dalmatia southwards to Greece and Turkey (GITTENBERGER & BANK, 1996: 72), and has recently been found on the island of Pag (FISCHER *et al.*, 2000: 55).

8. *Granopupa granum* (Draparnaud, 1801)

[18] ŠTAMOL, 2004: 104 *Granopupa granum* (Draparnaud, 1801)
WJ06: **L:** NP: [18]

WJ16: **L:** NP: [18]
WJ15: **L:** NP: [18]

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

[8] KUŠČER, 1930: 34 *Abida frumentum illyrica* R.
[18] ŠTAMOL, 2004: 104 *Granaria illyrica illyrica* (Rossmässler, 1835)

VJ88: **F:** 3, 4, 5
VJ97: **F:** 14
WJ08: **F:** 11B
WJ07: **F:** 15, 16, 18A, 18C, 20, 22, 24
WJ06: **L:** NP: [18]; **F:** 29
WJ16: **L:** Sali: [8]; Čuh polje: [8]; NP: [18]; **F:** 34A, 37
WJ15: **L:** »close to Lake by Mir«: [8]; NP: [18]
L: Žman-Sali: [8]

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

[8] KUŠČER, 1930: 34 *Chondrina mühlfeldti* Brug.
[18] ŠTAMOL, 2004: 104 *Chondrina spelta ventilatoris* (Westerlund, 1875)

WJ07: **F:** 18A, 18B, 18C, 22, 24, 25
WJ06: **L:** NP: [18]
WJ16: **L:** Berčastac: [8]; Sali: [8]; NP: [18]
WJ15: **L:** NP: [18]

Remark: In research into Telašćica Nature Park (ŠTAMOL, 2004: 109) it turned out that this subspecies lives, with rare exceptions, on cliffs over 100 m a.s.l. Our research into the second part of the island confirms this observation. Dugi otok is the westernmost finding site for the range of this taxon.

11. *Rupestrella rhodia* (Roth, 1839)

[8] KUŠČER, 1930: 34 *Chondrina rhodia* Roth.
[18] ŠTAMOL, 2004: 104 *Rupestrella rhodia* (Roth, 1839)

WJ07: **F:** 18B, 23
WJ16: **L:** Berčastac: [8]; NP: [18]; **F:** 37
WJ15: **L:** NP: [18]

12. *Rupestrella philippii philippii* (Cantraine, 1841)

[8] KUŠČER, 1930: 34 *Chondrina philippi* Cantr.
[18] ŠTAMOL, 2004: 104 *Rupestrella philippii* (Cantraine, 1840)

WJ07: **F:** 11A
WJ06: **L:** NP: [18]
WJ16: **L:** Berčastac: [8]; NP: [18]; **F:** 37
WJ15: **L:** NP: [18]

13. *Truncatellina callicratis* (Scacchi, 1833)

[18] ŠTAMOL, 2004: 104 *Truncatellina callicratis* (Scacchi, 1833)

VJ88: **F:** 2, 3, 4, 7A, 7B, 7C
VJ98: **F:** 6
VJ97: **F:** 14
WJ08: **F:** 11B
WJ07: **F:** 11A, 13A, 13B, 18A, 18B, 18C, 21B, 21C, 22, 23, 24
WJ06: **L:** NP: [18]; **F:** 26, 27, 28, 32
WJ16: **L:** NP: [18]; **F:** 34B, 36, 38, 39
WJ15: **L:** NP: [18]

14. *Truncatellina claustralis* (Gredler, 1856)

[18] ŠTAMOL, 2004: 104 *Truncatellina claustralis* (Gredler, 1856)

WJ16: **L:** NP: [18]
WJ15: **L:** NP? [18]

Remark: *T. claustralis* is found only in the southern part of Dugi otok, inside Telašćica NP, at no more than two sites, there being only a few specimens. The precision of the determination at one of the said sites is, according to the author, dubious (ŠTAMOL, 2004: 104).

***Chondrula* sp.**

[18] ŠTAMOL, 2004: 104 *Chondrula* sp.

WJ16: **L:** NP: [18]

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

[18] ŠTAMOL, 2004: 104 *Chondrula tridens eximia* (Rossmässler, 1835)

VJ88: **F:** 4, 7B, 7C
WJ16: **L:** NP: [18]
WJ15: **L:** NP: [18]

16. *Agathylla lamellosa* (J. A. Wagner, 1829)

[18] ŠTAMOL, 2004: 104 *Agathylla lamellosa* (Schubert et Wagner, 1829)

WJ06: **L:** NP: [18]
WJ16: **L:** NP: [18]
WJ15: **L:** NP: [18]

Remark: A species that was until quite recently known only from the area of the southern Adriatic from Dubrovnik in Croatia in the north to Petrovac in Montenegro in the south (FECHTER & FALKNER, 1990: 154). It was recorded the first time ever outside this area in the southern part of Dugi otok, at a distance of 170 km from the northernmost point of the range of the genus *Agathylla* (ŠTAMOL, 2004:

108), or 270 km distant from the northernmost point of the range of the species *A. lamellosa*. The species was found only on the rocky outer coastal reefs within the confines of Telašćica Nature Park. It is possible that it might extend further towards the north along the coastal cliffs of the western part of Dugi otok, not taken in by our investigations. Investigation of the differences between these specimens and those from southern Dalmatia are under way.

17. *Delima blanda conspurcata* (Rossmässler, 1836)

[6] WAGNER, 1924: 105/106 *Delima* (*Delima*) *conspurcata* Rssm.
[10] NORDSIECK, 1969: 271 *Delima* (*Delima*) *conspurcata* (Rossmässler)
[14] FRANK, 1991: 361 *Delima conspurcata* (Rossmaessler 1836)
[15] FRANK, 2000: 93 *Delima* (*Delima*) *conspurcata* (Rossmaessler 1836)
Dugi otok: [6]; »nach A. J. Wagner (1924)« [10]; »nach A. W. [!] Wagner (1924)« [14]; »nach A. J. Wagner 1924, zit. ex H. Nordsieck 1969« [15]

Remark: A subspecies that is recorded only by WAGNER (1924) for Dugi otok, all further references being just quotations of the Wagner data. The research of KUŠČER (1930) and ŠTAMOL (2004), which are at the same time the only systematic investigations with results that have been published, and our field research, have not confirmed the existence of this taxon on Dugi otok.

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

[6] WAGNER, 1924: 109 *Delima* (*Delima*) *albocincta* Pfr.
[8] KUŠČER, 1930: 34,35 *Delima albocincta* Pfr.
[9] KUŠČER, 1930a: 14 *Delima albocincta* Pfr.
[10] NORDSIECK, 1969: 272 *Delima* (*Delima*) *albocincta albocincta* (L. Pfeiffer)
[18] ŠTAMOL, 2004: 104 *Delima albocincta albocincta* (L. Pfeiffer, 1841)

WJ07: **F:** 18A, 18C, 19
WJ06: **L:** NP: [18]
WJ16: **L:** Sali: [8]; Kruševac: [8]; NP: [18]; **F:** 37, 38
WJ15: **L:**NP: [18]
L: Žman-Sali: [8]; Dugi otok: [6] »Die Fundortsangaben: Insel Sale,… welche in meiner Samlung durch typische Exemplare vertreten sind, halte ich für ungenügend verbürgt.«; [8], [9], [10]

Remark: WAGNER (1924: 109) considered the information about the existence of the species *Delima albocincta* on Dugi otok incorrect. The research of KUŠČER (1930: 34/35, 1930a: 14) and ŠTAMOL (2004: 104) as well as our field research has supported the existence of the species on Dugi otok.

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

[5] STURANY, 1915: 401 *Clausilia* (*Delima*) *alschingeri* Küst.
[6] WAGNER,1924: 112 *Delima* (*Delima*) *alschingeri* K.
[8] KUŠČER, 1930: 35, 36 *Delima alschingeri* Charp.

[9] KUŠČER, 1930a: 15 *Delima alschingeri* Charp.
[18] ŠTAMOL, 2004: 105 *Delima bilabiata alschingeri* (Charpentier, 1852)

VJ89: **F:** 1
VJ88: **F:** 2, 3, 4, 5
VJ98: **F:** 6, 8, 9
WJ08: **F:** 10, 11B
WJ07: **L:** Savar: [8]; eastern Draga by Strašna peć: [8]; **F:** 11A, 12, 13A, 13B, 15, 16, 17B, 20, 21B, 21C
WJ06: **L:** Sali: [5], [8]; NP: [18]; **F:** 26, 27, 28, 29, 32
WJ16: **L:** Kruševac: [8]; Gozdenjak: [8]; NP: [18]; **F:** 34A, 34B, 36, 37, 39
WJ15: **L:** »close to Lake by Mir«: [8]; NP: [18]
L: Brbinj: [8], [9]; Žman-Sali: [8]; Dugi otok: [6].

20. *Delima edmibrani* Štamol & Slapnik, 2002

[16] ŠTAMOL & SLAPNIK, 2002: 239, 241, 244 *Delima* (*Dugiana* n.subgen.) *edmibrani* n. sp.
[17] NORDSIECK, 2002: 27,32 *Delima* (*Dugiana*) *edmibrani* Štamol & Slapnik
[18] ŠTAMOL, 2004: 105 *Delima edmibrani* Štamol et Slapnik, 2002

WJ06: **L:** Stivanjska gora: [16]; NP: [18]
WJ16: **L:** Jaz, Luka Telaščica: [16]; Luka Telašćica: [17]; Grbašćak: [16]; Grbašćak-Obručan: [16]; Priseka: [16]; NP: [18]
WJ15: **L:** Grbašćak-Obručan: [16]; Priseka: [16]; NP: [18]
L: Dugi otok: [17]

Remark: A species of the southern part of Dugi otok that primarily inhabits the rocky outer coastal reefs and secondarily old stone houses and boundary walls. So far it has been found only inside the confines of Telašćica Nature Park, which is perhaps the consequence of the unsystematic investigation of the continuation of the outer reefs towards the north. So far this is a species endemic to Dugi otok.

21. *Charpentieria gibbula gibbula* (Rossmässler, 1836)

[6] WAGNER, 1924: 121 *Delima* (*Siciliaria*) *gibbula* Rssm.
[7] WAGNER, 1925: 56 *Delima* (*Siciliaria*) *gibbula* Rssm.
[8] KUŠČER, 1930: 36 *Delima gibbula* R.

VJ88: **F:** 2
WJ07: **F:** 12, 13A, 13B, 21B, 21C
WJ06: **F:** 27
WJ16: **L:** Sali: [8]; **F:** 36
L: Brbinj: [8]; Dugi otok: [6], [7]

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

[18] ŠTAMOL, 2004: 105 *Charpentieria stigmatica stigmatica* (Rossmässler, 1836)

WJ16: **L:** NP: [18]

Remark: Found only in sea deposit on the shore in Čuška dumboka Cove inside Telašćica Bay.

***Cecilioides* sp.**

[18] ŠTAMOL, 2004: 105 *Cecilioides* sp.

VJ89: **F:** 1
VJ88: **F:** 3
VJ98: **F:** 8
WJ07: **F:** 13A, 15, 16
WJ06: **L:** NP: [18]; **F:** 27, 28, 29
WJ16: **L:**NP: [18]; **F:** 34A
WJ15: **L:** NP: [18]

22. *Cecilioides acicula* (O. F. Müller 1774)

[18] ŠTAMOL, 2004: 105 *Cecilioides acicula* (O. F. Müller, 1774)

VJ88: **F:** 4
VJ98: **F:** 6
VJ97: **F:** 14
WJ07: **F:** 13A, 17B
WJ06: **L:** NP: [18]; **F:** 26
WJ16: **L:** NP: [18]; **F:** 38?
WJ15: **L:** NP: [18]

23. *Cecilioides veneta* (Strobel, 1855)

[18] ŠTAMOL, 2004: 105 *Cecilioides veneta* (Strobel, 1855)

VJ97: **F:** 14
WJ06: **L:** NP: [18]
WJ16: **F:** 36
WJ15: **L:** NP? [18]

24. *Rumina decollata* (Linnaeus, 1758)

[18] ŠTAMOL, 2004: 105 *Rumina decollata* (Linnaeus, 1758)

VJ89: **F:** 1
VJ88: **F:** 2
WJ15: **L:** NP: [18]

25. *Poiretia cornea* (Brumati, 1838)

[8] KUŠČER, 1930: 36 *Poiretia algira* L.
[18] ŠTAMOL, 2004: 105 *Poiretia cornea* (Brumati, 1838)

VJ98: **F:** 8
VJ97: **F:** 14
WJ08: **F:** 10, 11B

WJ07: **L:** Savar: [8]; **F:** 11A, 12, 18A, 18B, 21A, 21B, 21C, 22, 23
WJ06: **L:** NP: [18]; **F:** 28, 29, 32
WJ16: **L:** Sali: [8]; NP: [18]; **F:** 36, 37, 38
WJ15: **L:** »close to Salt Lake by Mir«: [8]; NP: [18]

26. *Testacella scutulum* G. B. Sowerby I, 1820

[18] ŠTAMOL, 2004: 105 *Testacella scutulum* G. B. Sowerby I, 1820

WJ06: **L:** NP: [18]

Remark: A species that is seldom cited for the area of Croatia. WAGNER, H. (1952: 207, 208) cited it for Istria and Dalmatia, with the rider that, alongside the sites listed in Istria, the city of Rijeka is the only Croatian locality defined outside Istria. DE MATTIA (2003: 162) mentions it for the island of Lošinj. In connection with this, then, the find on Dugi otok, albeit at only a single site (ŠTAMOL, 2004), should be the southernmost defined site in Croatia.

27. *Punctum pygmaeum* (Draparnaud, 1801)

[18] ŠTAMOL, 2004: 105 *Punctum pygmaeum* (Draparnaud, 1801)

VJ88: **F:** 3
VJ98: **F:** 6, 8, 9
VJ97: **F:** 14
WJ08: **F:** 11B
WJ07: **F:** 11A, 13B, 18B, 20, 23, 24, 25
WJ06: **L:** NP: [18]; **F:** 26, 28
WJ16: **L:** NP: [18]; **F:** 34A, 34B
WJ15: **L:** NP: [18]

28. *Paralaoma servilis* (Shuttleworth, 1852)

[18] ŠTAMOL, 2004: 105 *Paralaoma servilis* (Schuttleworth, 1852)

WJ07: **F:** 21B
WJ06: **L:** NP: [18]

Remark: This species has to date only two finding sites on Dugi otok. Actually, the species is rarely recorded in Croatia, although on the long coastal area from Istria to the north (MAASSEN, 1993: 88) via Crikvenica and Novi (MAASSEN, 1984: 160) to Konavle in the south (REISCHÜTZ, A. & REISCHÜTZ, P. L., 2002: 50). Of the islands, it has been recorded on Lošinj (ŠTAMOL & VELKOVRH, 1995: 227, 230).

***Vitrea* sp.**

[18] ŠTAMOL, 2004: 105 *Vitrea* sp.

WJ15: **L:** NP: [18]

29. *Vitrea subrimata* (Reinhardt, 1871)

[18] ŠTAMOL, 2004: 106 *Vitrea subrimata* (Reinhardt, 1871)

VJ88: **F:** 7C
VJ98: **F:** 8
VJ97: **F:** 14
WJ08: **F:** 11B
WJ07: **F:** 13A, 13B, 15, 16, 18A, 21B, 21C, 22, 23
WJ06: **L:** NP: [18]; **F:** 28, 29, 32
WJ16: **L:** NP: [18]; **F:** 34A, 34B
WJ15: **L:** NP: [18]

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

[18] ŠTAMOL, 2004: 106 *Vitrea botterii* (L. Pfeiffer, 1853)

VJ88: **F:** 3
VJ97: **F:** 14
WJ06: **L:** NP: [18]; **F:** 29
WJ16: **L:** NP: [18]; **F:** 34A, 34B, 36
WJ15: **L:** NP: [18]

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

[18] ŠTAMOL, 2004: 106 *Euconulus fulvus* (O. F. Müller, 1774)

WJ06: **F:** 26
WJ15: **L:** NP: [18]

***Oxychilus* sp.**

VJ88: **F:** 2, 3
VJ98: **F:** 8
WJ07: **F:** 18A, 18C
WJ06 **F:**: 27
WJ16: **F:** 38

32. *Oxychilus alliarius* (J. S. Miller, 1822)

[8] KUŠČER, 1930: 36 *Oxychilus cellarius austriacus* A. J. Wagn.
[12] RIEDEL, 1979: 116 *Oxychilus* (*Ortizius*) *alliarius* (Miller, 1822)
[13] MAASSEN, 1985: 140–141 *Oxychilus alliarius* (Miller, 1822)
[18] ŠTAMOL, 2004: 106 *Oxychilus alliarius* (Miller, 1822)

VJ98: **F:** 9
VJ87: **F:** 14
WJ08: **F:** 11B
WJ07: **L:** Strašna peć: [8], [12]; **F:** 11A, 13A, 13B, 20, 24
WJ06: **L:** NP: [18]; **F:** 26, 28, 29
WJ16: **L:** Sali: [8]; Kruševac: [8]; NP: [18]; **F:** 34A, 34B, 39

WJ15: **L:** NP: [18]
L: Dugi otok: [13]

Remark: According to RIEDEL (2005, pers. comm.) it is probable that all data regarding *Oxychilus alliarius* are in fact related to the dwarf form of *Oxychilus draparnaudi* (H. Beck, 1837), but it was impossible to be certain because of the lack of wet material.

33. *Aegopis acies* (A. Férussac, 1819)

[8] KUŠČER, 1930: 36 *Aegopis acies* R.
[18] ŠTAMOL, 2004: 106 *Aegopis acies* (A. Férussac, 1832)

WJ06: **L:** NP: [18]; **F:** 31
WJ16: **L:** Sali: [8]; NP: [18]; **F:** 35, 38

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

[18] ŠTAMOL, 2004: 106 *Lindholmiola girva corcyrensis* (Rossmässler, 1838)

WJ16: **L:** NP: [18]

Remark: Found only in sea deposit on the shore in Čuška dumboka Cove inside Telašćica Bay.

34. *Cochlicella acuta* (O. F. Müller, 1774)

[8] KUŠČER, 1930: 37 *Cochlicella acuta* Drap.

WJ16: **L:** Sali: [8]

***Monacha* sp.**

[18] ŠTAMOL, 2004: 106 *Monacha* sp.

VJ88: **F:** 2, 7C
WJ07: **F:** 13B, 17B, 18B, 20, 21A, 21B
WJ06: **F:** 29
WJ16: **L:** NP: [18]; **F:** 36
WJ15: **L:** NP: [18]

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

[8] KUŠČER, 1930: 36 *Theba carthusiana* Müll.
[18] ŠTAMOL, 2004: 106 *Monacha cartusiana* (O. F. Müller, 1774)

VJ89: **F:** 1
VJ88: **F:** 7B, 7C
VJ98: **F:** 8
WJ08: **F:** 10, 11B
WJ07: **L:** Savar: [8]; **F:** 12, 13A, 20, 21B, 21C
WJ06: **L:** NP: [18]; **F:** 26, 28, 29, 30, 31, 32
WJ16: **L:** Sali: [8]; NP: [18]; **F:** 34A, 34B, 38, 39

WJ15: **L:** »close to Salt Lake by Mir«: [8]; NP: [18]
L: Brbinj: [8]; Žman-Sali: [8]

36. *Monacha parumcincta* (Menke, 1828)

[8] KUŠČER, 1930: 36 *Theba olivieri* Roth.
[18] ŠTAMOL, 2004: 106 *Monacha parumcincta* (Menke, 1828)

VJ88: **F:** 3, 4, 5, 7A
VJ98: **F:** 9
VJ97: **F:** 14
WJ08: **F:** 11B
WJ07: **L:** Savar: [8]; **F:** 11A, 13A, 15, 16, 17A, 18A, 18C, 20, 25
WJ06: **L:** Velo jezero: [8]; NP: [18]; **F:** 27, 29
WJ16: **L:** Sali: [8]; Berčastac: [8]; NP: [18]; **F:** 37
WJ15: **L:** »close to Salt Lake by Mir«: [8]; NP: [18]
L: Žman-Sali: [8].

37. *Hygromia cinctella* (Draparnaud, 1801)

WJ07: **F:** 21B

38. *Cernuella virgata* (Da Costa, 1778)

[8] KUŠČER, 1930: 37 *Helicella variabilis*

VJ98: **F:** 6
WJ07: **F:** 21B, 21C
WJ06 **F:**: 28
WJ16: **F:** 33
L: Dugo polje-Zaglav [8]

39. *Cernuella cisalpina* (Rossmässler, 1837)

[8] KUŠČER, 1930: 37 *Candidula profuga* A. S.
[18] ŠTAMOL, 2004: 106 *Cernuella cisalpina meridionalis* (Mousson, 1854)

WJ07: **F:** 13A, 21A, 21B
WJ06: **L:** NP: [18]
WJ16: **L:** Sali: [8]; **F:** 36, 38

40. *Chilostoma setosa* (A. Férussac, 1832)

[18] ŠTAMOL, 2004: 106 *Helicigona setosa* (Férussac, 1832)

WJ15: **L:** NP: [18]

41. *Cepaea nemoralis* (Linnaeus, 1758)

[1] BIELZ, 1865: 228 *Helix* (*Tachea*) *nemoralis* L.

VJ98: **L:** Božava: [1]

Remark: In connection with the existence of this snail on Dugi otok, there are two questions. The first is connected with our determination of toposynonyms, that is, whether the »Boxava« in Dalmatia given by BIELZ (1865) is really Božava, on Dugi otok, which we drew attention to in the quotation of toposynonyms. The second is connected with the accuracy of the determination of the species, or in connection with the accuracy of the information about the site. Previous more systematic research (KUŠČER, 1930, 1930a; ŠTAMOL, 2004) and our field research did not confirm this item from the literature.

42. *Cepaea vindobonensis* (C. Pfeiffer, 1828)

VJ98: **F:** 9

Remark: This snail was found only at one site on the whole of Dugi otok, just one specimen of it in garrigue at a relatively low height above sea level. Although an empty shell was found, it was well preserved and fresh, fairly distant from the coast, which means that we can rule out the possibility of it having been washed up.

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

[5] STURANY, 1915: 399 *Eobania vermiculata* Müll.
[8] KUŠČER, 1930: 37 *Eobania vermiculata* Müll.
[18] ŠTAMOL, 2004: 106 *Eobania vermiculata vermiculata* (O. F. Müller, 1774)

VJ88: **F:** 2
VJ98: **F:** 6, 8
WJ07: **F:** 13A
WJ06: **L:** Žman-Malo jezero: [8]; NP: [18]; **F:** 26, 27, 28
WJ16: **L:** Sali: [5], [8]; Berčastac: [8]; NP: [18]; **F:** 33, 35, 36, 38, 39
WJ15: **L:** NP: [18]

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

[5] STURANY, 1915: 398 *Helix* (*Cryptomphalus*) *aspersa* Müll.
[8] KUŠČER, 1930: 37 *Helix aspersa* Müll.
[18] ŠTAMOL, 2004: 106 *Cornu aspersum aspersum* (O. F. Müller, 1774)

VJ98: **F:** 6, 8
WJ08: **F:** 10, 11B
WJ07: **F:** 12, 13A, 21A, 21B, 21C
WJ06: **F:** 26, 27, 28
WJ16: **L:** Sali: [5], [8]; NP: [18]; **F:** 35, 36, 38, 39
WJ15: **L:** NP: [18]

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

[8] KUŠČER, 1930: 37 *Helix cincta* Brum.
[18] ŠTAMOL, 2004: 107 *Helix cincta cincta* O. F. Müller, 1774

VJ89: **F:** 1

VJ88: **F:** 2, 7B, 7C
VJ98: **F:** 8
WJ08: **F:** 11B
WJ07: **F:** 12, 13A, 13B, 21A, 21C
WJ06: **L:** NP: [18]; **F:** 26, 28, 29
WJ16: **L:** Sali: [8]; NP: [18]; **F:** 35
WJ15: **L:** NP: [18]

By a review of the available literature and field research, it was established that 45 species of snails with shell might inhabit Dugi otok and its 21 surrounding islets and rocks. In the literature, 43 taxa were registered for the area. Of these, our field research, which, we must point out, did not cover the southern part of the island within the confines of Telašćica Nature Park, was unable to confirm the existence of 10 taxa that were recorded in the literature, while two taxa were entirely new for Dugi otok. The failure to confirm the literature data might be the consequence of:

1. the taxa really not existing on Dugi otok. We hypothesise that this is the case with the species *Delima blanda conspurcata* and *Cepaea nemoralis*, because the report, published only once, has never been backed up by subsequent field research;

2. the taxa do inhabit Dugi otok, but do not live outside the confines of Telašćica Nature Park, where they were recently recorded (*Vallonia costata*, *Granopupa granum*, *Truncatellina claustralis*, *Agathylla lamellosa*, *Delima edmibrani*, *Testacella scutulum*, *Cochlicella acuta*, *Chilostoma setosa*); or

3. the taxa do exist on Dugi otok even outside Telašćica Nature Park, but were not found in our research because our field research was not sufficiently systematic. This might be the case with respect to taxa that have particular habitat requirements (*Agathylla lamellosa*, *Delima edmibrani*, *Granopupa granum*, *Cochlicella acuta*) or appear very rarely on Dugi otok (*Vallonia costata*, *Testacella scutulum*, *Chilostoma setosa*, *Truncatellina claustralis*).

The two taxa previously unrecorded in the literature with respect to Dugi otok are *Hygromia cinctella* and *Cepaea vindobonensis*, both of them found only on one locality.

We might sum up that, according to the data in the literature, to our field research, and the assumption that the literature information concerning the existence of *Delima blanda conspurcata* and *Cepaea nemoralis* is erroneous, 43 species of terrestrial snails with shells live on Dugi otok. Of particular interest in this fauna are the species endemic to Dugi otok *Delima edmibrani*, to date found only in the southern part of the island, within the confines of Telašćica Nature Park; the species *Agathylla lamellosa*, because it is the northernmost site of this species, a full 270 km distant from the range of the species known so far, *Chondrina spelta ventilatoris* which here reaches the western border of its range; and *Testacella scutulum* and *Paralaoma servilis* because they are such rarities in the fauna of Croatia (ŠTAMOL, 2004).

By a comparison of the results of field research carried out inside Telašćica Nature Park located on the southern part of the island (ŠTAMOL, 2004) and the results of the field research described in this paper, covering the northern, central and southern part of the island, outside the confines of Telašćica Nature Park, it can be

seen that Telašćica Nature Park has a larger number of species than the rest of the island, although it occupies about one quarter of the area of the island (see Table 1). This is probably a result of the greater habitat diversity and also of the more systematic research in the Nature Park, which is evident in the number of the investigated sites.

Tab. 1. Area surfaces, number of investigated sites and number of species on Dugi otok and its parts.

	area	number of sites	number of species
Telašćica NP	25,95 km^2	71	38
Dugi otok outside Telašćica NP	88,49 km^2	39	35
Dugi otok	114,44 km^2	110	43

From a comparison of the number of surface species of terrestrial snails with shell of Dugi otok with the number of species in nine other east Adriatic island for which data have been published: Krk (BOLE, 1958); Cres (ŠTAMOL & VELKOVRH, 1995); Lošinj (ŠTAMOL & VELKOVRH, 1995); Susak (ŠTAMOL & POJE, 1998); Pag (FISCHER *et al.*, 2000); Brač (ŠTAMOL, 1986); Vis (REISCHÜTZ, A. & REISCHÜTZ, P. L., 1999); Korčula (REISCHÜTZ *et al.*, 2002); and Mljet (REISCHÜTZ, A. & REISCHÜTZ, P. L., 2000), it would appear that Dugi otok has the third richest malacofauna. (The halophile snails *Truncatella subcylindrica* (Linnaeus, 1767), *Myosotella* and *Ovatella* species are excepted, for they have not been covered in all the investigations compared). This is a relatively rich malacofauna, for not only does Dugi otok have more species than the smaller islands, such as Lošinj, Susak, Vis and Mljet, but it even has few more taxa (than the island of Brač, which is three times as big) or many more taxa than larger islands (from the 2.5 times larger N. Dalmatian island of Pag, and the 3.5 times as large Krk). More snail species are to be found on the island of Cres, which is 3.5 times as big, and on Korčula, which is 2.5 times as big.

CONCLUSION

Through a review of the available literature it was established that 43 species (including subspecies) of land snails have been recorded for the island of Dugi otok and the surrounding islets and rocks (Mali Lagan, Veli Lagan, Garmenjak veli, Garmenjak mali, Taljurić, Sestrica Vela, Sestrica mala, Abica, Katina, Katinica, Buč veli, Buč mali, Mala Aba, Gornja Aba, Korotan, Galijola, Gozdenjak, Farfarikulac, Burni školj, Donji školj). Of these, we would consider two taxa (*Delima blanda conspurcata* and *Cepaea nemoralis*) not actually to inhabit the area researched, because data that have been published only once have never again been confirmed by field research. In our field research, which covered Dugi otok outside the confines of

Telašćica Nature Park, and two northern islets (Mali Lagan, Veli Lagan), we found 35 taxa. Of these, two taxa have never before been recorded for Dugi otok and the islands mentioned. These are *Hygromia cinctella* and *Cepaea vindobonensis*. It might be said in summation that, according to the literature data, according to our field research, and the assumption that the literature data concerning the existence of *Delima blanda conspurcata* and *Cepaea nemoralis* are erroneous, there are in fact 43 species of terrestrial snails inhabiting Dugi otok.

In our field research we were unable to confirm 10 taxa stated in the literature, which, in the case of *Delima blanda conspurcata* and *Cepaea nemoralis* we consider to be the result of their not actually living on Dugi otok and the islets mentioned. The other 8 taxa (*Vallonia costata*, *Granopupa granum*, *Truncatellina claustralis*, *Agathylla lamellosa*, *Delima edmibrani*, *Testacella scutulum*, *Cochlicella acuta*, *Chilostoma setosa*) we hold certainly to inhabit the area stated, and explain the failure of our field research to find them either by their not existing outside the borders of Telašćica Nature Park, or by research that, outside these borders, was not systematic enough.

The narrowly endemic species *Delima edmibrani*, so far found only within Telašćica Nature Park, stands out within the Dugi otok fauna, together with *Agathylla lamellosa*, found here 270 km north of its previously known range; *Chondrina spelta ventilatoris*, here at its westernmost finding site, and the species rare in the Croatian fauna *Testacella scutulum*, of which this is the southernmost finding site, and *Paralaoma servilis*, which has its sixth and seventh finding sites in Croatia on Dugi otok.

By a comparison of the number of species and subspecies of terrestrial snails with shell of relatively recently investigated islands of the eastern Adriatic, we conclude that Dugi otok has a comparatively rich terrestrial malacofauna, because it has more taxa not only than smaller islands, but also than some of the much bigger islands (Krk, Pag and Brač, for example).

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REFERENCES

BANK, R. A. (ed.), 2004: Mollusca. Gastropoda. In: FAUNA EUROPAEA. Version 1.1. http://www.faunaeur.org

BIELZ, E. A., 1865: Systematisches Verzeichniss der Land- und Süsswasser-Mollusken des österreichischen Kaiserstaates. Verh. u. Mitt. des siebenbürg. Ver. für Naturwissenschaften in Hermannstadt 16, 132–142, 158–162, 173–186, 204–210, 223–234.

BOLE, J., 1958: Zoogeografski pregled malakofavne otoka Krka. Biol. vestn. 6, 118–123.

BOROVAC, I., 2002: Veliki atlas Hrvatske. 480 pp. Mozaik knjiga, Zagreb.

BRUSINA, S., 1907: Naravoslovne crtice sa sjevero-istočne obale Jadranskoga mora. Dio četvrti i posljednji, specijalni. Rad JAZU, 171, matem.-prir. razr. 42, 43–228.

DE MATTIA, W., 2003: I molluschi ipogei del Carso Triestino (Friuli-Venezia Giulia, Italia) (Gastropoda: Prosobranchia, Basommatophora, Stylommatophora; Bivalvia: Pterioidea). Check-list delle specie, tassonomia, sistematica, ecologia e biogeografia. Atti Mus. Civ. Stor. Nat. Trieste 50, 89–218.

FECHTER, R. & FALKNER, G., 1990: Weichtiere. 287 pp. Mosaik Verlag, München.

FISCHER, W., KITTEL, K., REISCHÜTZ, A. & REISCHÜTZ, P. L., 2000: Ein Beitrag zur Kenntnis der Molluskenfauna von Pag (Nord-Dalmatien, Kroatien). Nachrichtenbl. Ersten Vorarlberger Malak. Ges. 8, 53–59.

FRANK, C., 1991: Über Molluskenfunde aus Jugoslawien und den der Küste vorgelagerten Inseln des adriatischen Meeres. Zeitschr. angew. Zool. 78 (3), 349–380.

FRANK, C., 2000: Mollusca (Gastropoda et Bivalvia): eine historische Sammlung aus Hollabrunn (Niederösterreich). Wiss. Mitt. Niederösterr. Landesmuseum 13, 47–167.

GITTENBERGER, E. & BANK, R. A., 1996: A new start in *Pyramidula* (Gastropoda Pulmonata: Pyramidulidae). Basteria 60 (1/3), 71–78.

HIRC, D., 1910: Malakološki prilozi. Glasnik Hrvatskoga prirodoslovnoga društva **22** (2/2), 40–63.

ILIJANIĆ, V. & STOŠIĆ, M., 1972: Popis zbirke mekušaca (Mollusca) Spiridiona Brusine. Hrv. Nar. Zoološki muzej, **6**, 86 str. Zagreb.

KUŠČER, L., 1930: Mollusca. p. 33–39. In: VOUK, V.: Prirodoslovna istraživanja sjeverno-dalmatinskog otočja. I. Dugi i Kornati.p.1–171. Prirodoslovna istraživanja Kraljevine Jugoslavije **16**, 1–171.

KUŠČER, L., 1930a: Die Mollusken. Bull. int. Acad. Yougosl. sci. beaux-arts, Cl. sci.math. nat., **24**, 14–16.

MAASSEN, W. J. M., 1984: Nieuwe mollusken-soorten voor de Joegoslavische fauna. De Kreukel **20** (10), 159–164.

MAASSEN, W. J. M., 1985: Systematische lijst van joegoslavische recente mollusken. I. Familia Zonitidae. De Kreukel 21 (10), 139–143.

MAASSEN, W. J. M., 1993: *Lauria reischuetzi* Falkner, 1985 (Gastropoda Pulmonata: Pupillidae) wiedergefunden. Basteria **57**, 88.

NORDSIECK, H., 1969: Zur Anatomie und Systematik der Clausilien, VII. Dinarische Clausiliidae, I: Das Genus *Delima*. Arch. Moll. **99** (5/6), 267–284.

NORDSIECK, H., 2002: Contributions to the knowledge of the Delimini (Gastropoda: Stylommatophora: Clausiliidae). Mitt. dtsch. malakozool. Ges. 67, 27–39.

REISCHÜTZ, A. & REISCHÜTZ, P. L., 1999: Ein Beitrag zur Kenntnis der Molluskenfauna der Insel Vis (Mitteldalmatien, Kroatien). Nachrichtenbl. Ersten Vorarlberger Malak. Ges. **7**, 35–39.

REISCHÜTZ, A. & REISCHÜTZ, P. L., 2000: Ein Beitrag zur Kenntnis der Molluskenfauna der Insel Mljet (Dalmatien, Kroatien). Nachrichtenbl. Ersten Vorarlberger Malak. Ges. **8**, 60–65.

REISCHÜTZ, A. & REISCHÜTZ, P. L., 2002: Ein Beitrag zur Kenntnis der Molluskenfaunavon Konavle (Süddalmatien, Kroatien). Nachrichtenbl. Ersten Vorarlberger Malak. Ges. **10**, 47–51.

REISCHÜTZ, A., REISCHÜTZ, P. L., FISCHER, W., FRABERGER, U. & KIENNAST, H., 2002: Ein Beitrag zur Kenntnis der Molluskenfauna von Korcula (Dalmatien, Kroatien). Nachrichtenbl. Ersten Vorarlberger Malak. Ges. 10, 52–58.

RIEDEL, A., 1979: Materialien zur Kenntnis der paläarktischen Zonitidae (Gastropoda). XII–XIV. Fragm. Faunistica **25** (9), 115–125.

STURANY, R., 1915: 19. Mollusca. In: GINZBERGER, A.: Beiträge zur Naturgeschichte der Scoglien und kleineren Inseln Süddalmatiens. Ergebnisse von zwei im Mai und Juni 1911 und im Juli 1914 mit Unterstutzung aus der erbaschaft Treitl ausgeführten Reisen. I. Teil. Denkschr. Kaiserl. Akad. Wiss. Wien, math.-naturwiss. Kl. **92**, 397–404.

ŠTAMOL, V., 1986: Prilog poznavanju kopnenih puževa (Gastropoda) otoka Brača i ugroženost endema. Biosistematika **12** (1), 45–56.

ŠTAMOL, V., 2004: Terrestrial snails (Mollusca: Gastropoda terrestria) of the Telašćica Nature Park (Dugi otok, Croatia). Nat. Croat. **13** (2), 95–113.

ŠTAMOL, V. & POJE, M., 1998: The fossil and recent malacofauna of the island of Susak (Croatia) (Gastropoda: Prososbranchia, Basommatophora, Stylommatophora). Malak. Abh. Mus. Tierkd. Dresden **19** (1), 103–117.

ŠTAMOL, V. & SLAPNIK, R., 2002: *Delima* (*Dugiana*) *edmibrani* n. subgen. and n. sp. from Croatia (Gastropoda: Pulmonata: Clausiliidae). Arch. Moll. **130** (1/2), 239–248.

ŠTAMOL, V. & VELKOVRH, F., 1995: Contribution to the knowledge of land snail fauna of the islands of Cres and Lošinj (Croatia) (Gastropoda: Prosobranchia, Basommatophora, Stylommatophora). Malak. Abh. Mus. Tierkd. Dresden **17** (20), 219–237.

WAGNER, A. J., 1897: Monographie der Gattung *Pomatias* Studer. Denkschr. math.-nat. Cl. Kais. Akad. Wiss. **64**, 565–632, 10 Taf.

WAGNER, A. [J.], 1924: Systematisches Verzeichnis der mir heute bekannten Arten und Formen der Clausiliiden. III. Annal. Zool. Mus. Pol. Hist. Nat. **3** (3–4), 99–126.

WAGNER, A. [J.], 1925: Studien über die Systematik, Stammesgeschichte und geographische Verbreitung des Genus *Delima* (Hartmann), A. J. Wagner. Annal. Zool. Mus. Pol. Hist. Nat. **4** (1), 1–73 +17 tab.

WAGNER, H., 1952: Die Raublungenschnecken-Gattungen *Daudebardia*, *Testacella* und *Poiretia*. Akadémiai Kiadó, Budapest, 259 pp.

SAŽETAK

Kopneni puževi (Mollusca: Gastropoda terrestria) Dugog otoka (Hrvatska)

V. Štamol & E. Kletečki

U cilju spoznaje cjelokupne kopnene malakofaune Dugog otoka poduzeta su terenska istraživanja 1995., 1996. i 2003. godine, te pregledana stručna literatura. Osim samog Dugog otoka ovim radom obuhvaćeni su i neki okolni otočići i hridi: dva sjevernije položena otočića (Veli i Mali Lagan), te 19 južno smještenih otočića i hridi koji ulaze u sastav Parka prirode »Telašćica« (Gamernjak veli, Gamernjak mali, Taljurić, Sestrica vela, Sestrica mala, Abica, Školjić, Katina, Katinica, Buč veli,

Buč mali, Mala Aba, Gornja Aba, Korotan, Galijola, Gozdenjak, Farfarikulac, Burni školj, Donji školj). Rezultati terenskih istraživanja i obrada literaturnih podataka koji se odnose na južni dio otoka unutar granica Parka prirode »Telašćica« objavljeni su (ŠTAMOL, 2004). Preostalo nam je da objavimo rezultate naših terenskih istraživanja preostalog dijela Dugog otoka, znači sjevernog (uključujući i dva manja otočića Mali i Veli Lagan), srednjeg i južnog dijela otoka izvan PP, te uz literaturne podatke prikažemo terestričku malakofaunu cjelokupnog područja.

Pregledom dostupne stručne literature ustanovljeno je da su bile zabilježene 43 vrste kopnenih nadzemnih puževa s kućicom za Dugi otok uključujući navedene otočiće i hridi. Deset vrsta od toga nismo našli terenskim istraživanjima, koja, naglašavamo, nisu obuhvatila južni dio otoka unutar PP »Telašćica«, a dvije su prvi put nađene na Dugom otoku. Od deset »literaturnih« svojti nepotvrđenim našim terenskim istraživanjima, smatramo da su *Cepaea nemoralis* i *Delima blanda conspurcata* nepostojeće na otoku, jer jednom objavljeni podaci nisu kasnije terenskim radom potvrđeni. Preostalih osam vrsta (*Vallonia costata*, *Granopupa granum*, *Truncatellina claustralis*, *Agathylla lamellosa*, *Delima edmibrani*, *Testacella scutulum*, *Cochlicella acuta*, *Chilostoma setosa*) smatramo sigurnim stanovnicima Dugog otoka, jer su nedavno terenskim radom nađene (ŠTAMOL, 2004). Mi ih nismo našli na dijelu Dugog otoka izvan granica PP »Telašćica« ili zbog toga što ne žive izvan granica PP »Telašćica« ili zato što nismo proveli dovoljno sistematična terenska istraživanja za svojte specifičnih stanišnih zahtjeva (*Granopupa granum*, *Agathylla lamellosa*, *Delima edmibrani*, *Cochlicella acuta*) i rijetke pojavnosti na Dugom otoku (*Vallonia costata*, *Truncatellina claustralis*, *Testacella scutulum*, *Chilostoma setosa*). Dvije vrste koje dosada nisu bile zabilježene za Dugi otok su *Hygromia cinctella* i *Cepaea vindobonensis*. Iz svega navedenog proizlazi da 43 vrste kopnenih puževa s kućicom obitavaju na Dugom otoku, što je relativno bogata fauna jer nadmašuje i znatno veće otoke (npr. Krk, Pag, Brač). Gledajući kvalitativno, malakofauna se ističe stenoendemičnom vrstom *Delima edmibrani* dosada nađenom samo na Dugom otoku, endemičnim svojtama *Agathylla lamellosa*, koja ovdje postiže najsjevernije nalazište udaljeno 270 km od najbližeg, *Chondrina spelta ventilatoris*, koja je na zapadnoj granici areala, te rijetkim vrstama u hrvatskoj fauni (*Testacella scutulum* i *Paralaoma servilis*).

SUMMARY

Terrestrial snails (Mollusca: Gastropoda terrestria) of Dugi otok (Croatia)

V. Štamol & E. Kletečki

In order to gain an insight into the overall terrestrial malacofauna of Dugi otok, field investigations were carried out in 1995, 1996 and 2003, and the scientific literature was reviewed. This work covered not just Dugi otok itself, but several of the other surrounding islets and rocks: the two northerly placed islets (Veli Lagan, Mali Lagan) and the 19 southern islets and rocks that are part of the Telašćica Nature

Park (Gamernjak veli, Gamernjak mali, Taljurić, Sestrica vela, Sestrica mala, Abica, Školjić, Katina, Katinica, Buč veli, Buč mali, Mala Aba, Gornja Aba, Korotan, Galijola, Gozdenjak, Farfarikulac, Burni školj, Donji školj). The results of field research and the processing of the data from the literature that relate to the southern part of the island within the confines of Telašćica Nature Park were published earlier (ŠTAMOL, 2004). It remained for us to publish the results of our field research into the remaining part of Dugi otok, that is, the northern (including the two small islands of Mali Lagan and Veli Lagan), the central and the southern part of the island not included in the Telašćica Nature Park; thus, using the literature data as well, we here present the terrestrial malacofauna of the whole of Dugi otok.

A review of the available literature on the subject produced the figure that 43 species of terrestrial surface snails have been recorded for Dugi otok, including the islands and rocks mentioned. Of these, ten species were not found in our field research, which, we must point out, did not cover the southern part of the island inside Telašćica Nature Park, while two snails were found on Dugi otok for the first time in this research. As for the ten species given in the literature that were not confirmed by this field report, we consider that *Cepaea nemoralis* and *Delima blanda conspurcata* do not actually live on the island, because the data, published just once, have never been confirmed by subsequent field research. We think that the other eight species (*Vallonia costata*, *Granopupa granum*, *Truncatellina claustralis*, *Agathylla lamellosa*, *Delima edmibrani*, *Testacella scutulum*, *Cochlicella acuta*, *Chilostoma setosa*) are certain inhabitants of Dugi otok, because they were found in recent field research (ŠTAMOL, 2004). We did not find them in that part of the Dugi otok outside the confines of Telašćica Nature Park either because they do not live outside the borders of the park or because we did not carry out field research that was systematic enough for taxa with specific habitat requirements (*Granopupa granum*, *Agathylla lamellosa*, *Delima edmibrani*, *Cochlicella acuta*) or because they appear seldom in Dugi otok (*Vallonia costata*, *Truncatellina claustralis*, *Testacella scutulum*, *Chilostoma setosa*). Two species previously unrecorded for Dugi otok are *Hygromia cinctella* and *Cepaea vindobonensis*. From everything stated, it follows that 43 species of terrestrial snails inhabit Dugi otok, which is a relatively rich fauna, because the numbers surpass those of much larger islands (for example, Krk, Pag and Brač). Looked at from a qualitative point of view, of particular importance in the malacofauna are the narrowly endemic species *Delima edmibrani*, found so far only on Dugi otok; the endemic species *Agathylla lamellosa*, which is here found 270 km further to the north than the previously known northernmost finding site, *Chondrina spelta ventilatoris*, which is at the western edge of its range on Dugi otok, and the species *Testacella scutulum* and *Paralaoma servilis*, interesting because they are so rare in the Croatian fauna.