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# A preliminary checklist of the species of non-marine Molluscs from the Alburni Mountains, Campania, Southern Italy (Mollusca Gastropoda Bivalvia)

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**ABSTRACT** An annotated checklist of the species of non-marine molluscs from the Alburni Mountains (Salerno Province, Campania, Southern Italy) is reported. The research was carried out from 2010 to 2013 inside a Site of Community Importance (SCI) and a Special Protection Area (SPA), of the Cilento, Vallo di Diano and Alburni National Park. The non-marine molluscs sampled on the field were compared with data available from the literature and malacological collections. Up to now, only 12 non-marine Mollusc species were known from the Alburni Mountains through bibliographical data. In all, the malacofauna of Alburni Mountains is composed by 83 non-marine Mollusc species (73 species of land snails, and 10 species of freshwater molluscs). The presence of nine species (six species of land snails and three species of freshwater snails) was confirmed by our field investigation, four species (3 species of land snails and 1 species of allochthonous freshwater snails) were recorded only by bibliographical data and were not yet found. Our analysis identifies 70 species of non-marine Molluscs (64 species of land snails, 6 species of freshwater molluscs) recorded on the basis of field data which were not previously recorded from the study area. At least 11 species are new records for the Campania Region. Extremely interesting is the record of *Vertigo angustior* Jeffreys, 1830 a species protected in European Union by the Annex II of the "Habitats Directive" and listed as "Vulnerable" at the European level. A Red List of Threatened Species is proposed and the species were classified with the code of I.U.C.N. (Version 2014.3). Five allochthonous species were surveyed for the first time in the study area: 3 land snails: *Lucilla scintilla* (Lowe, 1852), *Lucilla singleyana* (Pilsbry, 1829) and *Paralaoma servilis* (Shuttleworth, 1852), and 2 freshwater snails: *Potamopyrgus antipodarum* (J.E. Gray, 1843) and *Ferrissia fragilis* (Tryon, 1863). Four species are known exclusively from the literature: *Vertigo* (*Vertigo*) *moulinsiana* (Dupuy, 1849), *Macrogastra* (*Pyrostoma*) *plicatula* (Draparnaud, 1801), *Cernuella virgata* (Da Costa, 1778), and *Haitia acuta* (Draparnaud, 1805).

**KEY WORDS** Non-marine Molluscs; Alburni Mountains, Campania; faunistics; conservation.

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## INTRODUCTION

The knowledge of the malacofauna of Campania (about 150 species, personal data; 13,595 sq Km) is far below than that of other regions. This is even more evident when we consider the protect areas of this territory as those of the Alburni Mountains whose malacofauna is virtually unknown (Fig. 1).

In all Campania Region, only papers on checklist of Capri Island and Vesuvius National Park are known in the last 10 years (Petraccioli et al., 2005a, 2005b, 2006a, 2006b, 2007; Picariello et al., 2011); moreover there are only historical reports, nearly 100 years old, concerning the most common species and quoted with obsolete names. The purpose of this paper is, therefore, to help bridge this gap by increasing the malacofauna knowledge of this group in an important area of the Campania Region as the Alburni Mountains, with particular reference to the species listed in the Annex of the Habitats Directive, in the Index of the protected fauna of Italy and in the various red lists (Manganelli et al., 2000a; Cerfolli et al., 2002; I.U.C.N., 2014).

## MATERIAL AND METHODS

The Alburni Mountains are a calcareous massif in the Salerno Province (Campania Region) belonging to the Lucan Sub Apennines chain, located in the Eastern area of Cilento, near the borders between Campania and Basilicata. In North-East the range degrades into the plain of Vallo di Diano between the valleys of the Calore Lucano, Tanagro and Sele rivers. The massif extends for about 250 km$^2$. The study area (SCI IT8050033 named: "Monti Alburni", and SPA IT8050055 named: "Alburni") is included in Cilento, Vallo di Diano and Alburni National Park and covers 14 administrative municipalities (Aquara, Auletta, Castelcivita, Controne, Corleto Monforte, Ottati, Petina, Polla, Postiglione, San Pietro al Tanagro, San Rufo, Sant'Angelo a Fasanella, Sant'Arsenio, and Sicignano degli Alburni) (see TEMI, 2010).

A detailed investigation on the historical and current literature and a comprehensive study of Neapolitan public and private molluscan collections were preliminarly performed. We also inspected the original sites reached by Costa (1874) 140 years ago.

From 2010 to 2013 the field surveys were conducted in 127 sampling points (stations or plots) between 100 and 1742 meters above sea level (summit of Monte Alburno/Panormo) in all suitable habitats present on the territory of the Alburni Mountains in accordance with the vegetation types reported in the land use map (1: 25.000) available by the "Ente Parco". Adult specimens and shells of non-marine molluscs were hand-collected through visual search, leaf litter and soil collecting and sorting. Samples were then air dried and sieved down to 0.5 mm mesh. Samples of sediment were screened with calibrated sieves. The cleaned up material was examined under lens and/or stereo microscope to sort the smallest fraction, namely. Fractions above 1 cm were searched by a Leica EZ4 stereo microscope (Leica Microsystems GmbH, Wetzlar, Germany), both incident and transmitted, and then photographed with a digital camera.The specimens for anatomical exams were drowned in water and fixed in 75% ethanol. The reproductive apparatus was extracted by means of scalpel, scissors and forceps. The illustrations of genitalia were sketched using a camera lucida mounted on the above stereomicroscope.

The sampled specimens were collected with permission of the "Ente Parco Nazionale del Cilento e Vallo di Diano" (Permit no. 16341/ 19.10.2010). Two sampled specimens for species were deposited in the Museo Naturalistico of Corleto Monforte (Salerno Province), a museum acknowledged as an "institution of regional interest" (Decreto dalla Giunta Regionale Campania n. 2010 del 29/12/2008). In addition, when other specimen/species were collected, we preserved them in the private collection of the authors. The species identification was based on qualified dichotomickeys (Giusti & Pezzoli, 1980; Girod et al., 1980; Bech, 1990; Giusti et al., 1995; Kerney & Cameron, 1999). The taxonomic order and nomenclatural arrangement of the list follow: Bodon et al. (1995), Manganelli et al. (1995, 1998, 2000b), Castagnolo (1995), Ponder & Lindberg (1996), Nordsieck (2002) and Bank (2011); the common names were based on Janus (1982) and on the web site: http://media.eol.org.

For each species a brief note on the abundance in the study area is reported according to the following classification: Very rare (sampled in 1–5 stations), Rare (sampled in 6–10 stations), Uncommon (sampled in 11–19 stations), Common ( sampled in 20–35 stations), Widespread (sampled in over 35 stations). The bibliographical and museological data were then reported. If present in the I.U.C.N. Red List, each species is classified

with the code of Red List of Threatened Species (I.U.C.N., 2014) and Cuttelod et al. (2011).

## RESULTS

### *Species surveyed on the field*

Phylum MOLLUSCA Cuvier, 1795
Classis GASTROPODA Cuvier, 1795
Subclassis ORTHOGASTROPODA Ponder et Lindberg, 1996

Ordo ARCHITAENIOGLOSSA Haller, 1890

Familia COCHLOSTOMATIDAE Kobelt, 1902

***Cochlostoma montanum*** (Issel, 1866)
*Cochlostoma montanum cassiniacum* (Saint-Simon, 1878)

Common, 34 plots, locally abundant. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014).

Familia ACICULIDAE J.E. Gray, 1850

***Platyla talentii*** Bodon et Cianfanelli, 2008

Rare, 10 plots, locally abundant (Figs. 2, 3). Endemic of Southern Apennine. Bodon & Cianfanelli, 2008. Classified as "NT" by Cuttelod et al. (2011) and "NT" by I.U.C.N. (2014).

Ordo NEOTAENIOGLOSSA Haller, 1892

Familia POMATIIDAE Newton, 1891 (1828)

***Pomatias elegans*** (O.F. Müller, 1774)
Round-mounted Snail

Common, 28 plots. Museal data from 1986.

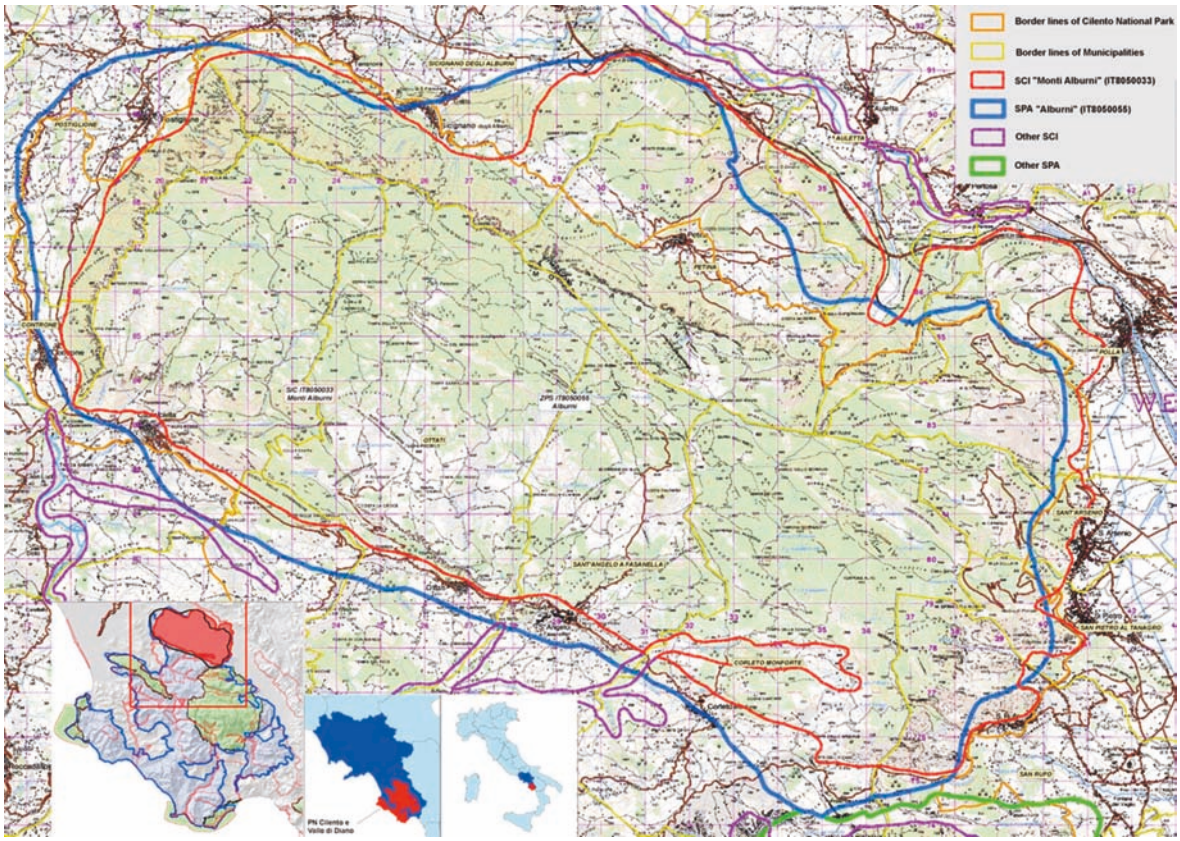



Figure 1. The study area: Alburni Mountains, S-Italy.

Familia HYDROBIIDAE Stimpson, 1865
Mud snails

***Pseudamnicola*** (***P.***) cfr. ***moussonii*** (Calcara, 1841)

Very rare, 1 plot. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Belgrandia minuscula*** (Paulucci, 1881)

Very rare, 2 plots. Bodon et al. (2005). Classified as "DD" and Endemic species in Europe by Cuttelod et al. (2011) and "DD" by I.U.C.N. (2014).

***Potamopyrgus antipodarum*** (J.E. Gray, 1843)
New Zealand mud snail, Jenkins' Spire Snail

Very rare, 2 plots (Fig. 4). Allochthonous species, introduced from New Zealand (Lori et al., 2005; Lori & Cianfanelli, 2007; Cianfanelli, 2009; Cuttelod et al., 2011). Classified as "LC" by I.U.C.N. (2014).

***Bythinella opaca*** (M. von Gallenstein, 1848)
*Bythinella schmidtii* (Küster, 1852)

Very rare, 4 plots. Bodon et al. (1999) in an adjacent locality; Bodon et al., 2005. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Familia ELLOBIIDAE Pfeiffer, 1854

***Carychium tridentatum*** (Risso, 1826)
Long-toothed Herald Snail

Uncommon, 14 plots, locally abundant.

Familia LYMNAEIDAE Rafinesque, 1815

***Galba truncatula*** (O.F. Müller, 1774)
Dwarf Pond Snail

Very rare, 2 plots. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014).

***Radix labiata*** (Rossmässler, 1835)
*Lymnaea* (*Radix*) *peregra* (O.F. Müller, 1774)
*Radix peregra* (O. F. Müller, 1774)
Wandering Snail

Very rare, 3 plots. Costa (1874): sub *Limnaeus Gibilmannicus* (see O. G. Costa, 1839). Museal data from 1986. *Radix peregra* is classified by I.U.C.N. (2014) as synonym of *Radix balthica* (Linnaeus, 1758). *Radix labiata* is classified as "LC" by Cuttelod et al. (2011).

Ordo PULMONATA Cuvier in Blainville, 1814
Subordo BASOMMATOPHORA Keferstein, 1864
Familia ANCYLIDAE

***Ancylus fluviatilis*** O.F. Müller, 1774
River Limpet

Rare, 7 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014).

***Ferrissia fragilis*** (Tryon, 1863)
*Ferrissia wautieri* (Mirolli, 1960)
Fragile Ancylid

Very rare, 1 plot (Fig. 5). Classified as "LC" by I.U.C.N. (2014). Cryptic invader of Italian freshwater ecosystems from North America (Cianfanelli et al., 2007; Lori & Cianfanelli, 2007).

Subordo STYLOMMATOPHORA A. Schmidt, 1855
Familia PYRAMIDULIDAE Kennard et B.B. Woodward, 1914

***Pyramidula pusilla*** (Vallot, 1801)
Rock Snail

Common, 24 plots, locally abundant.

***Pyramidula rupestris*** (Draparnaud, 1801)
Rock Snail

Very rare, 1 plot. Costa (1874).

Familia VERTIGINIDAE Fitzinger, 1833

***Vertigo* (*Vertigo*) *pygmaea*** (Draparnaud, 1801)
Common Whorl Snail, Crested vertigo

Very rare, 1 plot. Classified as "LC" by Cuttelod et al. (2011)

***Vertigo* (*Vertilla*) *angustior*** Jeffreys, 1830
Vertigo sinistrorso minore, Narrow-mounthed Whorl Snail

Very rare, 1 plot (Fig. 6). Species protected in European Union by the Annex II of the "Habitats Directive", and in Italy by the D.P.R. n. 357/1997 than modified by D.P.R. n. 120/2003. In Europe, this species is listed as Vulnerable (VU) (criteria: A2ac+3c) at the European level and at the level of the 27 member States of the European Union (Cuttelod et al., 2011). The species is regionally protected in Tuscany, Umbria and Emilia-Romagna. The species has been regarded in Italy as "NT" by Manganelli et al. (2000a). Classified as "LR" by Cerfolli et al. (2002), and "NT" by I.U.C.N. (2014).

***Columella edentula*** (Draparnaud, 1805)
Toothless Chrysalis Snail

Very rare, 2 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

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

Rare, 10 plots. Endemic species in Europe classified as "LC" by Cuttelod et al. (2011).

Familia ORCULIDAE Pilsbry, 1918

***Sphyradium doliolum*** (Bruguière, 1792)

Uncommon, 12 plots. Classified as "LC" by Cuttelod et al. (2011).

***Pagodulina pagodula*** (des Moulins, 1830)

Very rare, 1 plot. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Familia CHONDRINIDAE Steenberg, 1925

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

Very rare, 4 plots. Classified as "LC" by Cuttelod et al. (2011).

***Chondrina avenacea*** (Bruguière, 1792)

Widespread, 36 plots. Museal data from 1874. (Costa, 1874). Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Familia LAURIIDAE Steenberg, 1925

***Lauria sempronii*** (Charpentier, 1837)

Rare, 8 plots.

Familia ARGNIDAE Hudec, 1965

***Argna biplicata*** (Michaud, 1831)

Very rare, 4 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Familia VALLONIIDAE Morse, 1864

***Acanthinula aculeata*** (O.F. Müller, 1774)
Pricly Snail

Common, 21 plots. Classified as "LC" by Cuttelod et al. (2011).

***Gittenbergia sororcula*** (Benoit, 1859)

Rare, 9 plots. Locally very abundant. Classified as "LC" by Cuttelod et al. (2011).

Familia ENIDAE B.B. Woodward, 1903 (1880)

***Chondrula tridens*** (O.F. Müller, 1774)

Very rare, 2 plots. Classified as "NT" by Cuttelod et al. (2011).

***Jaminia quadridens*** (O.F. Müller, 1774)

Uncommon, 17 plots. Locally very abundant. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014).

***Merdigera obscura*** (O.F. Müller, 1774)
*Ena obscura* (O.F. Müller, 1774)
Lesser Bulin

Uncommon, 11 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Familia PUNCTIDAE Morse, 1864

***Punctum pygmaeum*** (Draparnaud, 1801)
Dwarf Snail

Common, 33 plots.

***Paralaoma servilis*** (Shuttleworth, 1852)
*Paralaoma caputspinulae* (Reeve, 1852)
Pinhead Spot

Very rare, 2 plots. Allochthonous species, introduced from New Zealand (Lori et al., 2005; Lori & Cianfanelli, 2007; Cianfanelli, 2009; Christensen, 2012).

Familia DISCIDAE Thiele, 1931 (1866)

***Discus rotundatus*** (Müller, 1774)
Discus Snail, Rounded Snail

Rare, 7 plots.

Familia HELICODISCIDAE H.B. Baker, 1927

***Lucilla scintilla*** (Lowe, 1852)
Oldfield Coil

Very rare, 1 plot (Fig. 7). Allochthonous species. The indigenous distribution for this species includes North America (Lori et al., 2005; Lori & Cianfanelli, 2007; Cianfanelli, 2009).

***Lucilla singleyana*** (Pilsbry, 1889)
Smooth Coil

Very rare, 1 plot (Fig. 8). Allochthonous species. Originally probably from North America, introduced to Europe (Lori et al., 2005; Lori & Cianfanelli, 2007; Cianfanelli, 2009).

Familia VITRINIDAE Fitzinger, 1833

***Vitrina*** cfr. ***pellucida*** (O.F. Müller, 1774)
Pellucid Glass Snail

Uncommon, 11 plots. Classified as "LC" by Cuttelod et al. (2011).

Familia PRISTILOMATIDAE T. Cockerell, 1891

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

Common, 26 plots.

***Vitrea etrusca*** (Paulucci, 1878)

Very rare, 4 plots.

***Vitrea contracta*** (Westerlund, 1871)
Milky Crystal Snail

Common, 26 plots.

Familia ZONITIDAE Mörch, 1864

***Aegopis verticillus*** (Fèrussac, 1822)

Very rare, 1 plot (Fig. 9).

Familia OXYCHILIDAE P. Hesse, 1927 (1879)

***Retinella olivetorum*** (Gmelin, 1791)
*Retinella olivetorum olivetorum* (Gmelin, 1791)

Common, 33 plots. Museal data from 1986.

***Oxychilus*** (***Oxychilus***) cfr. ***draparnaudi*** (Beck, 1837)
Draparnaud's Glass Snail, Dark-bodied Glass snail

Uncommon, 16 plots. Museal data from 1986.

***Mediterranea hydatina*** (Rossmässler, 1838)

Very rare, 1 plot.

***Daudebardia rufa*** (Draparnaud, 1805)

Widespread, 42 plots. Locally very abundant (Figs. 10, 11, 12, 13).

Familia MILACIDAE Ellis, 1926

***Tandonia sowerbyi*** (A. Férussac, 1823)
Keeled Slug, Sowerby's Slug

Uncommon, 11 plots.

Familia LIMACIDAE Lamarck, 1801

***Limax maximus*** Linnaeus, 1758
Leopard Slug, Great Grey Slug, Giant Garde Slug

Rare, 6 plots.

***Lehmannia marginata*** (O. F. Müller, 1774)
Tree slug

Very rare, 1 plot.

***Limacus flavus*** (Linnaeus, 1758)
Yellow Slug, Tawny Garden Slug

Very rare, 2 plots.

Familia AGRIOLIMACIDAE H. Wagner, 1935

***Deroceras reticulatum*** (O.F. Müller, 1774)
Netted Slug, Gray Fieldslug

Rare, 6 plots.

***Deroceras invadens*** Reise, Hutchinson, Schunach et Schlitt, 2011
Chestnut Slug, Brown Field Slug, Longneck Fieldslug, Widespread Pest Slug

Very rare, 4 plots.

Familia EUCONULIDAE Baker, 1928

***Euconulus fulvus*** (O.F. Müller, 1774)
Tawny Glass Snail, Brown Hive

Rare, 8 plots.

Familia FERUSSACIIDAE Bourguignat, 1883

***Cecilioides acicula*** (O.F. Müller, 1774)
Blind Snail

Very rare, 5 plots.

***Cecilioides*** (***Cecilioides***) ***veneta*** (Strobel, 1855)
*Cecilioides janii* (De Betta et Martinati, 1855)

Very rare, 5 plots.

Familia SUBULINIDAE P. Fischer et Crosse, 1877

***Rumina decollata*** (Linnaeus, 1758)
Decollate Snail

Very rare, 4 plots.

Familia OLEACINIDAE H. Adams et A. Adams, 1855

***Poiretia dilatata*** (Philippi, 1836)
Common, 31 plots. Museal data from 1986.

Familia TESTACELLIDAE J.E. Gray, 1840

***Testacella scutulum*** G.B. Sowerby I, 1821
Shield Shelled Slug

Very rare, 4 plots.

Familia CLAUSILIIDAE J.E. Gray, 1855
Door Snails
***Medora*** sp.

Very rare, 3 plots.

***Cochlodina* (*Cochlodina*) *laminata*** (Montagu, 1803)
Plaited Door Snail

Rare, 6 plots. (Costa, 1874).

***Charpentieria* (*Stigmatica*) *paestana*** (Philippi, 1836)
*Siciliaria paestana* (Philippi, 1836)

Widespread, 42 plots. Locally abundant.

***Charpentieria* (*Stigmatica*)** cfr. ***ernae*** (Fauer, 1978)

Very rare, 2 plots. Museal data from 1970. Endemic of Southern Appennine. (Fauer, 1978; Welter-Schultes, 2012; Nordsieck, 2013).

***Macrogastra* (*Pyrostoma*) *attenuata*** (Rossmässler, 1835)
*Macrogastra* (*Pyrostoma*) *attenuata iriana* (Pollonera, 1885)
Lined door snail

Very rare, 2 plots.

***Clausilia cruciata*** (S. Studer, 1820)
*Clausilia cruciata bonellii* E. Von Martens, 1873

Very rare, 3 plots. Museal data before 1950.

Familia HYGROMIIDAE Tryon, 1866

***Xerotricha conspurcata*** (Draparnaud, 1801)

Very rare, 2 plots. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011).

***Hygromia cinctella*** (Draparnaud, 1801)
Girdled Snail

Rare, 8 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Cernuella* (*Cernuella*) *cisalpina*** (Rossmässler, 1837)

Common, 21 plots. Locally abundant. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Cernuella* (*Xerocincta*) *neglecta*** (Draparnaud, 1805)
Luddesdown Snail, Neglected dune snail

Very rare, 3 plots. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Cernuellopsis ghisottii*** Manganelli et Giusti, 1988

Very rare, 3 plots. Hallgas, com. pers., 2013. This species is endemic to Italy. Classified as "VU" by Cuttelod et al. (2011) and by I.U.C.N. (2014) (IUCN Criteria (Europe) (version 3.1): B1ab(iii)+2ab(iii). Endemic species in Europe (Cuttelod et al., 2011).

***Trochoidea* (*Trochoidea*) *pyramidata*** (Draparnaud, 1805)

Very rare, 2 plots. Classified as "LC" by Cuttelod et al. (2011).

***Trochoidea* (*Trochoidea*) *trochoides*** (Poiret, 1789)

Very rare, 2 plots. Museal data from 1985. Classified as "LC" by Cuttelod et al. (2011).

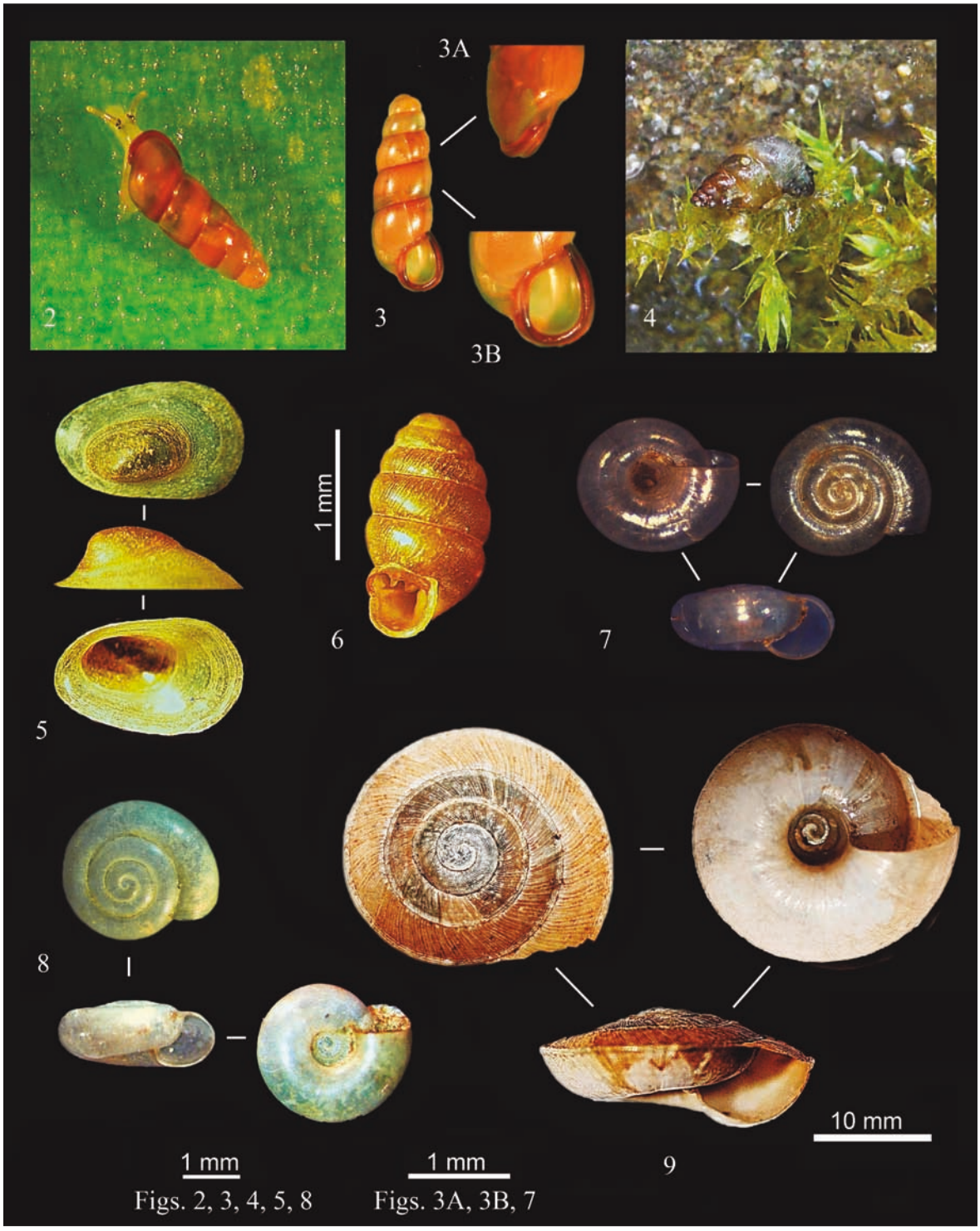
***Monacha* (*Monacha*)** cfr. ***cartusiana*** (O.F. Müller, 1774)
Chartreuse Snail, Carthusian Snail

Common, 35 plots. Museal data from 1986. Classified as "LC"by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011). Regarded as "Edible species" in Tuscany and Umbria Region.

***Monacha* (*Eutheba*)** cfr. ***parumcincta*** (Menke, 1828)

Common, 26 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).
Familia HELICODONTIDAE Kobelt, 1904

***Helicodonta obvoluta*** (O.F. Müller, 1774)
*Helicodonta obvoluta obvoluta* (O.F. Müller, 1774)
Cheese Snail




Figures 2-9. Non-marine Molluscs from the Alburni Mountains, Campania, Southern Italy. Figure 2. *Platyla talentii* alive (Photo by N. Maio). Figure 3. Shell of *Platyla talentii*: view. 3A. Particular of dorsal view. 3B. Particular of the mouth (Photos by N. Maio). Figure 4. *Potamopyrgus antipodarum* alive (Photo by N. Maio). Figure 5. Shell of *Ferrissia fragilis*: dorsal, lateral and ventral view (Photo by I. Niero). Figure 6. Shell of *Vertigo* (*Vertilla*) *angustior*: apertural view (Photo by I. Niero). Figure 7. Shell of *Lucilla scintilla*: umbilical, dorsal and apertural view (Photo by N. Maio). Figure 8. Shell of *Lucilla singleyana*: dorsal, apertural and umbilical view (Photo by N. Maio). Figure 9. Shell of *Aegopis verticillus* dorsal, umbilical and apertural view (Photo by N. Maio).

Rare, 7 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Familia HELICIDAE Rafinesque, 1815

***Chilostoma*** (***Campylea***) cfr. ***planospira*** (Lamarck, 1822)

Uncommon, 18 plots. Museal data from 1986. Classified as "DD" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Marmorana*** (***Ambigua***) ***fuscolabiata fuscolabiata*** (Rossmässler, 1842)

Widespread, 27 plots. Costa (1874), Degner (1927). Museal data from 1874. Classified as "DD" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Marmorana*** (***Ambigua***) cfr. ***fuscolabiata wullei*** Kobelt, 1903

Common, 25 plots. Kobelt (1903a; 1903b), Degner (1927), Bacci (1951), Alzona (1971). Museal data from 1903.

***Eobania vermiculata*** (O.F. Müller, 1774)
Chocolate-band snail

Very rare, 3 plots. Museal data from 2006. Regarded as "Edible species" in Tuscany and Umbria Region.

***Cantareus apertus*** (von Born, 1778)
Green Garden Snail

Very rare, 2 plots. Museal data from 1986. Regarded as "Edible species" in Tuscany and Umbria Region.

***Cornu aspersum*** (O.F. Müller, 1774)
*Cantareus aspersus* (O.F. Müller, 1774)
Garden Snail, Common Snail, Brown Garden Snail

Very rare, 4 plots. Museal data from 1986. Regarded as "Edible species" in Tuscany and Umbria Region.

***Helix*** (***Helix***) cfr. ***delpretiana*** Paulucci, 1878

Rare, 9 plots. Museal data from 1986. This species is endemic to the Central Appenines in Italy. Classified as "DD" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

***Helix*** (***Helix***) cfr. ***ligata*** O.F. Müller, 1774
Ligate Snail

Uncommon, 11 plots. Museal data from 1986. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014). Endemic species in Europe (Cuttelod et al., 2011).

Classis BIVALVIA Linnaeus, 1758

Ordo VENEROIDA H. et A. Adams, 1857
Familia SPHAERIIDAE Deshayes, 1855 (1820)

***Pisidium casertanum*** (Poli, 1791)
Caserta Pea Mussel

Very rare, 5 plots. Classified as "LC" by Cuttelod et al. (2011) and by I.U.C.N. (2014).

***Species exclusively known from the literature***

Familia VERTIGINIDAE Fitzinger, 1833

***Vertigo*** (***Vertigo***) ***moulinsiana*** (Dupuy, 1849)
Vertigo of Demoulins, Demoulins' Whorl Snail

Manganelli et al. (2001), Bodon et al. (2005). Find only in debris of Fiume Calore, near Grotta di Castelcivita, Salerno Province, by S. Cianfanelli and E. Talenti on 1994. Species protect in European Union by the Annex II of the "Habitats Directive" and in Italy by the D.P.R. n. 357/1997 than modified by D.P.R. n. 120/2003. The species is regionally protect in Tuscany, Umbria and Emilia-Romagna. The species has been initially classified as "LRcd"(= Lower risk, conservation dependant) by Bouchet et al. (1999), then the species has been regarded in Italy as "VU"(criteria: B2a, B2b) by Manganelli et al. (2000b, 2001). Classified as "LR" by Cerfolli et al. (2002), "VU" (criteria: A2ac) by Cuttelod et al. (2011) and by I.U.C.N. (2014).

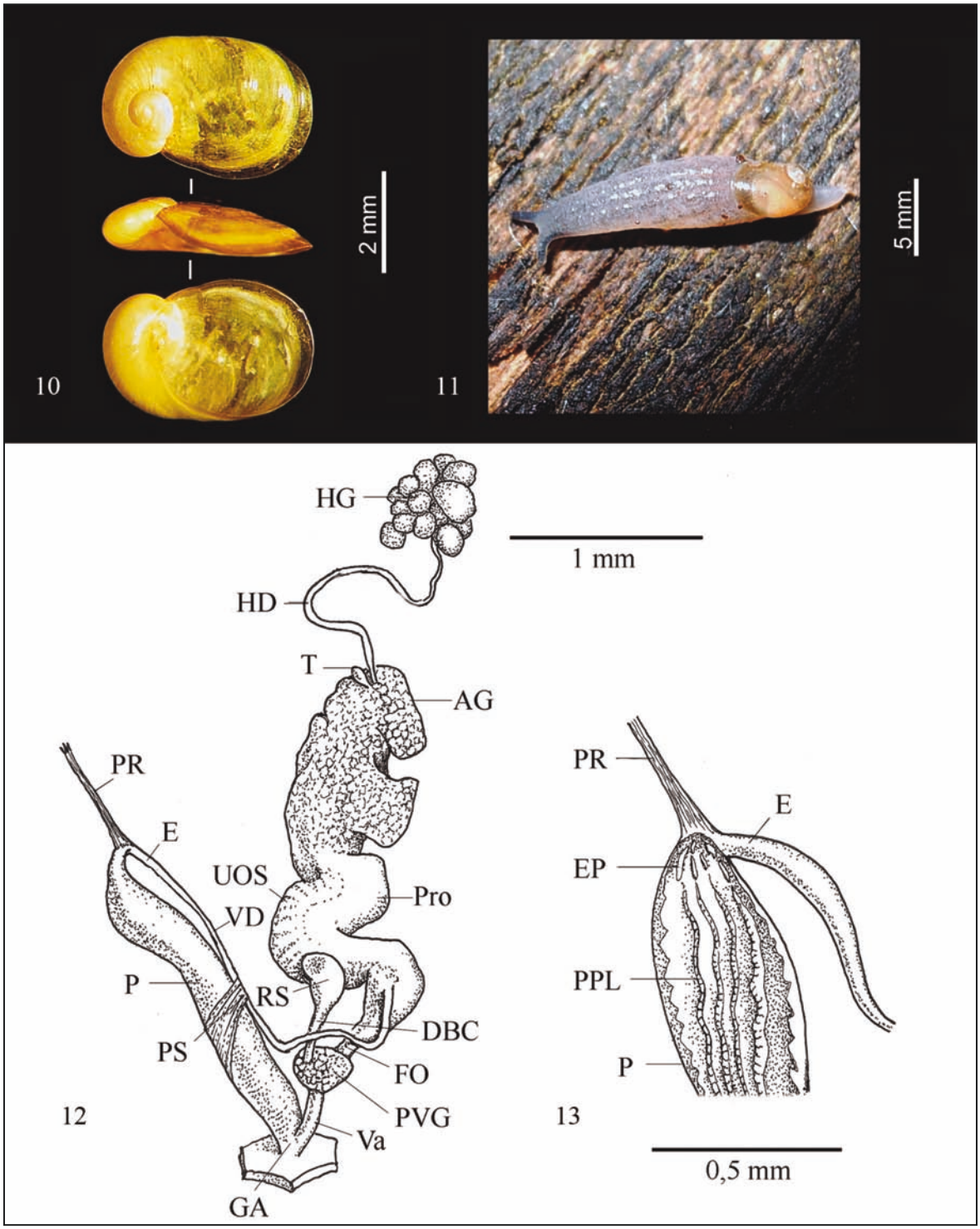



Figure 10. Shell of *Daudebardia rufa*: dorsal, apertural and umbilical view (Photo by I. Niero). Figure 11. *D. rufa* alive (Photo by N. Maio). Figure 12. Genitalia of *D. rufa* (Sant'Angelo a Fasanella (SA), 1160 m, 17.0V.2013, N. Maio, P. Crovato & I. Niero legit. Figure 13. Internal structure of the penis. Acronyms in figures: AG= albumen gland; DBC= duct of the bursa copulatrix; E= epiphallus; EP= epiphallic pore; FO= free oviduct; GA= genital atrium; HD= hermaphroditic duct; HG= hermaphroditic gland; P= penis; PPL= penis pleats; PR= penial retractor; Pro= prostate; PVG= perivaginal gland; PS = penis sheath; RS = reservoir of spermatheca; T= talon; UOS= uterine ovispermiduct; Va= vagina, VD= vas deferens. (Drawn by I. Niero).

Familia CLAUSILIIDAE J.E. Gray, 1855

***Macrogastra*** cfr. ***plicatula*** (Draparnaud, 1801)

Costa (1874: sub *Clausilia plicatula* Drap.). Museal data before 1950.

From the South of Italy are cited 3 subspecies, in addition to *M. plicatula plicatula*: *M. p. amiatensis* Nordsieck, 2006; *M. p. apennina* Gentiluomo 1868, and *M. p. aprutica* Nordsieck, 2006 (Nordsieck, 2006).

Familia HYGROMIIDAE Tryon, 1866

***Cernuella*** *cfr.* ***virgata*** (Da Costa, 1778)
Banded Snail

Kobelt (1907). Museal data from 1986. Regarded as "Edible species" in Tuscany and Umbria Region.

Familia OXYCHILIDAE P. Hesse, 1927 (1879)

***Oxychilus*** sp.

Capasso (1958), Capolongo & Cantilena (1974).

Ordo HYGROPHILA A. Férussac 1822

Familia PHYSIDAE Fitzinger, 1833

***Haitia acuta*** (Draparnaud, 1805)
Acute Bladder Snail, European physa, Tadpole Snail, Bladder Snail, Pewter physa

Sacchi (1964): sub *Physa acuta*. Allochthonous species. The oldest alien species of Italy probably native to northeastern North America (Lori et al., 2005; Lori & Cianfanelli, 2007; Cianfanelli, 2009).

## DISCUSSION

Up to now, only 13 non-marine Mollusc species were known from the Alburni Mountains through bibliographical data (nine species of land snails and four species of freshwater snails), to which we add the new species listed in this paper for the study area. The presence of nine species (six species of land snails and three species of freshwater molluscs) are confirmed by our field investigation. Only four species (the land snails *Macrogastra plicatula*, *Vertigo moulinsiana*, *Cernuella virgata* and the allochthonous freshwater snails *Haitia acuta*) were documented exclusively by bibliographical data and have not been confirmed by the field surveys yet (Fiorentino et al., 2008; Reise et al., 2011). Our analysis identifies 79 species of non-marine molluscs (69 species of land snails, ten species of freshwater molluscs) recorded on the basis of field data. In total the occurrence of 83 species of non-marine molluscs (73 species of land snails, 10 species of freshwater molluscs) was herein attested in the survey area representing approximately the 56% of the estimated fauna of Campania Region (about 150 species, personal data).

At least 11 species are new records for the Campania Region (*Aegopis verticillus*, *Cernuellopsis ghisottii*, *Lucilla scintilla*, *Argna biplicata*, *Cernuella neglecta*, *Daudebardia rufa*, *Helix delpretiana*, *Pagodulina pagodula*, *Vitrina pellucida*, *Vitrea etrusca* and *Macrogastra attenuata*). *M. attenuata* (sub *M. lineolata*) and *D. rufa* were generically recorded from Matese Mountains (probably Molise) by Giusti et al. (1985). 70 species of non-marine molluscs (64 species of land snails, six species of freshwater molluscs), recorded on the basis of field data, have not been previously recorded from the study area.

Extremely interesting is the finding of samples of *Medora* sp.: it seems to be the second record of this genus for the region. The systematics of the genus *Medora* Adams,1855 is in fact complex and, in many respects, still controversial. Regarding Italy, Nordsieck (1970) considered *M. italiana* (Küster, 1847) of the Central-Southern Apennines distinct from *M. albescens* (Menke, 1830) of the Balkan peninsula. In addition, he assigned to *M. italiana* various subspecies: only one from Campania: *M. i. italiana* (Küster, 1847) (locus typicus: Piedimonte d'Alife (= Piedimonte Matese, Caserta, Campania). Giusti et al. (1986) suggested that it was not possible to distinguish *M. italiana* from *M. albescens* with the subspecies *M. a. italiana* in the central part of Italy. The populations reported for Italy as *M. dalmatina* (Manganelli et al., 1995) were described by Nordsieck (2012) as a distinct sub-

species. Preliminary data by Colomba et al. (2012) suggest that the genus *Medora* shows a much more complex and articulate differentiation than hitherto hypothesized by morphological surveys so far. An attempt to clarify its organization and internal structure, at various taxonomic levels, a more detailed analysis including a higher number of molecular markers and additional *Medora* populations from Italy are required.

Other interesting records are: *Vertigo angustior*, a species protected in the European Union by the Annex II of the Council Directive 92/43/EEC of May 21th1992 on the conservation of natural habitats and of wild fauna and flora known as "Habitats Directive", that includes "animal and plant species of community interest whose conservation requires the designation of special areas of conservation (SPA)" and listed as "Vulnerable" at the European level and *Platyla talentii*, an endemic species of Southern Apennine, recently described by Bodon & Cianfanelli (2008), classified as "Near Threatned" by Cuttelod et al. (2011) and by I.U.C.N. (2014).

Five allochthonous species were surveyed for the first time in the study area: three land snails (*Lucilla scintilla*, *L. singleyana* and *Paralaoma servilis*) and two freshwater snails (*Potamopyrgus antipodarum* and *Ferrissia fragilis*). *L. scintilla* and *L. singleyana* are native in North America; they were probably introduced into Europe in the second half of the 20th century (Horsák et al., 2009). *L. singleyana*, *P. servilis* and *F. fragilis* are the second records for the Campania Region, the first is Bodon et al. (2004) sub *Helicodiscus singleyanus* (Pilsbry, 1890), Bodon et al. (2004) sub *P. caputspinulae* (Reeve, 1852) and D'Antonio & Bravi (1990) sub *F. wautieri* (Mirolli, 1960).

In the past, three endemic taxa had been described as new for the Alburni area: *Helix* (*Iberus*) *wullei* first described by Kobelt (1903a: 14-15, tavv. 1766-1768) from "Monte Alburno circa vicum Postiglione prov. Salernitanae" and later as *Iberus wullei* (Kobelt, 1903b: pag. 4-5, fig. without number); *Xerophila* (*Xerolauta*) *peninsularis* forma "*alburni*" described by Kobelt (1907: pp. 59-60, Tafel 357 Fig. 2221) from "Monte Postiglione, des alten Alburnus" and *Siciliaria ernae* described by Fauer (1978: 265, abb. 1) from "Passo Sentinella im SO der Monti Aburni" [municipality of Corleto Monforte], and "6 km West of San Rufo". Today *X. peninsularis* is considered a junior synonym of *Cernuella virgata* (Da Costa, 1778) but the taxonomic status of *Iberus* (= *Marmorana*) *wullei* and of *S. ernae* need to be confirmed. The Demoulins' Whorl Snail, listed in the Standard Data Form of the SCI of "Monti Alburni" is not confirmed by our field surveys.

A Red List of Threatened Species is also proposed and the species were classified with the code of I.U.C.N. (Version 2014.3).

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