New data on the genus *Albinaria* Vest, 1867 (Pulmonata Clausiliidae) from the Astypalea Island and neighboring islets (Dodecanese Archipelago, Greece)

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ABSTRACT

In this work, the authors investigated the genus *Albinaria* Vest, 1867 (Pulmonata Clausiliidae) from the Astypalea Island and the nearby islets of Ofidoussa and Kounoupi (Dodecanese Archipelago, Greece). The two endemic subspecies known, *Albinaria* (*Albinaria*) *brevicollis* *astropalia* (O. Boettger, 1883) and *A. (A.) brevicollis* *maltezana* Nordsieck, 2015 are redescribed and illustrated for shell and genital morphology. Furthermore *A. (A.) brevicollis* cf. *sica* Fuchs et Käufel, 1936 is reported for the first time from the north-east Astypalea, and two new subspecies, *A. (A.) brevicollis* *granoi* n. ssp. and *A. (A.) brevicollis* *cristinae* n. ssp. are here described from North-West Astypalea and Ofidoussa Islet, respectively.

KEY WORDS

Taxonomy; morphology; new subspecies; distribution.

INTRODUCTION

The highly diverse genus *Albinaria* Vest, 1867 (Pulmonata Clausiliidae) is present in the Dodecanese Archipelago (South-East Aegean region) with 12 species and 34 subspecies (Bank, 2017, 2019). The species identification is almost exclusively based on shell morphology and recent molecular studies have mainly confirmed species classification based on shell morphology (Douris et al., 2007).

In the Dodecanese Archipelago, *A. (Albinaria) brevicollis* (L. Pfeiffer, 1850) is the most diversified species with 17 subspecies.

In the Astypalea Island, two endemic subspecies of *A. (A.) brevicollis* are known: *Albinaria brevicollis* astropalia (O. Boettger, 1883) from the western part of the island (Kora and Livadhi nearby) and *A. brevicollis maltezana* (Nordsieck, 2015) known only from the type locality, mountain ridge North-East Maltezana = Analipsi (Fuchs & Käufel, 1936; K.L. Pfeiffer, 1955; Nordsieck, 2015).

In 2015, Mauro Grano and Cristina Cattaneo (Rome, Italy), during a naturalistic trip, have sampled fifteen populations of *Albinaria* on the Astypalea Island and on the nearby islets of Ofidoussa and Kounoupi.

The examination of this material revealed the presence of five different populations of *A. (A.) brevicollis*; two correspond to the known endemic subspecies *A. (A.) brevicollis* astropalia and *A. (A.) brevicollis* maltezana respectively, the other three...
are new to the island group of Astypalea and are discussed below.

MATERIAL AND METHODS

Study area

The island group of Astypalea (Dodecanese Archipelago, Greece) lies in the South-East Aegean Sea, representing a transition zone between the Kiklades islands and the eastern Aegean (Fig. 1). Astypalea is the largest island of the group, with an area of 96 km². It consists of two parts: a western half (Exo Nisi) and an eastern one (Mesa Nisi), joined by a narrow isthmus (Steno), 105 m wide, derived from the collapse of the neighboring territories. The two extreme parts of the island consist mainly of limestone, while the central part is flysch and alluvium (Fig. 2). The highest relief is Vardhia (482 m). Maquis and phrygana constitute the dominant vegetation types with different endemic or rare animal and plant taxa. Astypalea is surrounded by numerous smaller uninhabited off-shore islets, the largest of which are Kounoupi to the southeast and Ofidoussa to the west. Both consist mainly of limestone (Fig. 3).

Sampling methods

All samples examined for this paper were collected by M. Grano and C. Cattaneo, from 2nd August to 18th August 2015 and from 24th April 2016 to 26th April 2016. The names of local places mentioned in the text and in the map (Fig. 1) follow the map of Astypalea produced by Terrain Cartography Group (2009). Specimens were collected chronologically from the following localities:

Astypalea, Livadhi, 36°32’58’’N – 26°19’59’’E, 51 m, 02.VIII.2015
Astypalea, Vardhia, 36°31’29’’N – 26°19’11’’E, 375 m, 03.VIII.2015
Astypalea, Vatses, 36°30’53’’N – 26°19’13’’E, 80 m, 04.VIII.2015
Astypalea, Aghios Konstantinos, 36°31’39’’N – 26°21’15’’E, 10 m, 06.VIII.2015
Astypalea, Kaminakia, 36°31’19’’N – 26°18’14’’E, 42 m, 07.VIII.2015
Kounoupi Islet, 36°32’07’’N – 26°28’04’’E, 50 m, 10-11.VIII.2015

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RESULTS

Systematics

Classis GASTROPODA Cuvier, 1795
Ordo STYLOMATOPHORA Schmidt, 1855
Familia CLAUSILIIDAE Gray, 1855
Subfamily ALOPIINAE A.J. Wagner, 1913
Tribe MEDORINI H. Nordsieck, 1997
Genus Albinaria Vest, 1867
Subgenus Albinaria Vest, 1867

Albinaria (Albinaria) brevicollis astropalia
(O. Boettger, 1883)

EXAMINED MATERIAL. Greece, Southwest Astypalea Island, Livadhi, 36°32'58.11''N 26°19'59.64''E, 51 m, 02.VIII.2015, 2 exx, 4 shs (CL 158–163; Figs. 14–15 genitalia CL 158); idem, Ftera, 36°32'10.95''N 26°18'36.79''E, 337 m, 18.VIII.2015, 5 exx, 3 shs (CL 164–169); idem, Vardhia, 36°31'29.48''N 26°19'11.50''E, 375 m, 03.VIII.2015, 6 exx, 2 shs, (CL 171–175; Fig. 6 parietum CL 173); idem, Aghios Konstantinos, 36°31'39.53''N 26°21'15.53''E, 10 m, 06.VIII.2015, 4 shs (CL 178–183; Fig. 5 shell CL 195); idem, Kounoupi Islet, south-east Astypalea Island, Greece, 36°32'58.58''N 26°19'59.66''E, 50 m, 10–11.VIII.2015, 10 exx, 4 shs (CL 316–331; Figs. 16–17 shells CL 326–327; Figs. 18–19 parietum CL 318–319; Figs. 20–21 palatum CL 330–331; Figs. 22, 23 clausilium Cl 330, 320; Figs. 24–27 genitalia CL 316–317; idem 2 exx (CS).

DESCRIPTION. Fusiform shell more or less slender, white bluish in color, with smooth whorls, some ribs are present only on the last half of the last whorl, almost absent dorsal keel (Figs. 4, 5); principal plica well developed, posterior upper palatal plica fused with lunella apex; lunella dorsolateral, in part with basalis rudiment (Figs. 6, 7); superior lamella reaching spiral lamella.

Genitalia typical of A. (A.) brevicollis with a well developed cylindrical or conical penial caecum (1–2.6 mm, mean 1.6 mm) a V-shaped crest inside the penis (Figs. 11–15).

Measurements of the shell: H: 13.7–19.7 mm, (mean: 16 mm), D: 3–4.16 mm (mean: 3.6 mm), whorls: 9–11.75 (mean: 10.5).

DISTRIIBUTION. The type of A. (A.) brevicollis astropalia comes from Kora (West Astypalea). Nordsieck (2015) ascribes also the population from Livadhi locality. Based on our sampling A. (A.) brevicollis astropalia is also present in Ftera, Vardhia, Koutela, Vatses and Aghios Konstantinos locality (South-West Astypalea).

REMARKS. The populations of Konstantinos, with H: 14.46, D: 3.2 and 10 whors, is the smallest population of A. (A.) brevicollis astropalia.

Albinaria (Albinaria) brevicollis maltezana
Nordsieck, 2015

EXAMINED MATERIAL. Kounoupi Islet, south-east Astypalea Island, Greece, 36°32'07.48''N 26°28'04.88''E, 50 m, 10–11.VII.2015, 10 exx, 4 shs (CL 316–331; Figs. 16–17 shells CL 326–327; Figs. 18–19 parietum CL 318–319; Figs. 20–21 palatum CL 330–331; Figs. 22, 23 clausilium Cl 330, 320; Figs. 24–27 genitalia CL 316–317; idem 2 exx (CS).

DESCRIPTION. Shell distinctly ribbed, dorsal keel mostly prominent; superior lamella often reaching or surpassing spiral lamella, means dimensions H: 16.3 mm, D: 3.4 mm, R2 (n = 11): 8–12 (mean 9.9).

Dimension of genitalia (means of two specimens examined): P: 2.6 mm, E: 3.9 mm, PC: 2.25 mm; vagina: 4.6 mm, CD 1.4 mm, DBC+BC 3.3 mm, BCD: 7 mm.

DISTRIIBUTION. Albinaria (A.) brevicollis maltezana is known only for the type locality: mountain ridge North East Maltezana = Analipsi (Nordsieck, 2015).
REMARKS. We ascribe to this subspecies the population of the small islet of Kounoupi (8 km South-East of Maltezana), which shows the same mean dimensions and the same distinctive characters in the shell (Figs. 16–23). We observed some specimens with the lower part of the lunella bent inwards = rudiment subclaustralis (Fig. 19). We examined the genitalia of two specimens. They show a very long vagina of 6 mm and 4.35 mm respectively, and diverticulum of the bursa copulatrix of 9 mm and 7 mm, respectively. However, this may be due to a recent mating, as evidenced by the presence of the spermathophora inside the diverticulum (Figs. 24–27). We have also sampled on the small islet of Koutsomiti, but here we have not found Albinaria.

Albinaria (Albinaria) brevicollis cf. sica Fuchs et Käufel, 1936

EXAMINED MATERIAL. Astypalea, Dhracospilia, near the cave Dhracospilia, Northeast Astypalea, Greece, 36°38'21.56''N 26°22'50.25''E, 54 m, 13.VIII.2015, 8 exx., 6 sh (CL 214–224; Figs. 28–29 shells CL 214, 215; Figs. 30–31 palatum CL 215–216; Figs. 32–33 clausilium CL 225; Figs. 34–38 genitalia CL 216); idem 2 exx (CS).

DESCRIPTION. Slender conical shell; 1.5–2 apical whorls convex and brown; the other whorls convex, uniformly ribbed, brown in colour with white ribs; irregular ribs on the last part of the last whorl; dorsal keel low or moderately high; peristome oval detached (Figs. 28–29); lower part of lunella with a rudiment basalis or bent inwards = rudiment subclaustralis (Figs. 30–31), upper lamella rarely reaches the spiral lamella (Figs. 32–33, 35–38).

Dimensions of the shell: H: 13.7–16.5 mm, (mean 15.5 mm), D: 2.8–3.3 mm (mean 3.2 mm), whorls: 10–12.5 (mean 11.3), R2 (n = 9): 9–15 (mean 11.5).

Dimensions of the genitalia (two specimens examined): P: 1.5–2.4 mm, E: 2–3.15 mm, PA: 0.7–2 mm; V: 1.5–3.4 mm, CD 1–1.1 mm, DBC+BC 1–2 mm, BCD: 2.9–4.7 mm

REMARKS. The Albinaria population of Dhracospilia is very similar to A. (A.) brevicollis sica described for the island of Megali Zafora, the largest and northernmost of the Zafora islands (about 50 km southeast of Astypalea). We attribute the Dhracospilia population to this subspecies, but further sampling and examination are desirable to clarify the philogenetic relations both with A. (A.) brevicollis sica from the type locality both with A. (A.) brevicollis maltezana.

Albinaria (Albinaria) brevicollis granoi n. ssp.

TYPE LOCALITY. Pachia Ammos, North-West Astypalea Island, Dodecanese Archipelago, Greece.

TYPE MATERIAL. Holotype (Fig. 39): Pachia Ammos, on the rocks close to the sea, North-West Astypalea Island, 36°35'31.15''N 26°17'30.12''E, 41 m, M. Grano and C. Cattaneo legit, 15.VIII.2015, (MCZR-M-TYPE 00250/H). Paratypes: idem 8 exx., 11 shs, (CL 240–258; Fig. 40 shells CL 249; Figs. 41–42 palatum CL 241, 251; Figs. 43–44 clausilium CL 242, 251; Figs. 45–48 genitalia CL 240; Figs. 49–50 genitalia CL 241); idem 2 shs (CS); idem 2 shs (CG); Panormos, on the rocks close to the sea, North-West Astypalea Island, 36°35'10.26''N 26°16'37.62''E, 16 m, 14.VIII.2015, 1 ex, 5 shs (CL 230–235); idem 2 shs (CP).

DIAGNOSIS. Spindle-shaped, medium-small shell H: 13.9, D: 2.9, with 10.5 whorls (mean of 15 shells), characterized by rounded apical and subapical whorls, spire ribbed, basal keel and dorsal keel distinct, upper lamella reaches or does not reach spiral lamella.

DESCRIPTION OF THE HOLOTYPE (Fig. 39). Spindle-shaped shell, H: 12.9 mm, D: 2.9 mm; with 10 ½ whorls (mean of 15 shells), characterized by rounded apical and subapical whorls, the apical and subapical whorls are more convex than the subsequent ones, the two apical whorls are dark brown, the following white with ample brown spots and points and with uniformly white ribs, R2: 14; on the last part of the last whorl the ribs are irregular; suture bulge present, basal keel distinct, dorsal keel about as high as basal keel and shorter, detached oval peristome; upper lamella reaching the spiral lamella; inferior lamella low within, ending on columellar edge in front; lower part of lunella with a rudiment of basalis.
Figure 4. Shell of *Albinaria (Albinaria) brevicollis astropalia* Fiera, Astypalea Island, Greece, H: 15.1 mm, D: 3.6 mm.

Figure 5. Idem, Aghios Konstantinos, Astypalea Island, Greece, H: 15.2 mm, D: 3.3 mm.
Figures 6–10. Parietum, palatum and clausilum of Albinaria (Albinaria) brevicollis astropalia, Astypalea Island, Greece. Fig. 6. Parietum: Astypalea, Livadhia; Fig. 7. Parietum: Astypalea, Vardhia; Fig. 8. Palatum: Astypalea, Konstantinos; Fig. 9. Palatum: Astypalea, Koutella; Fig. 10. Clausilium: Astypalea, Ftera.
Figures 11–15. Genialia of *Albinaria (Albinaria) brevicollis astropalia*, Astypalea Island, Greece. Fig. 11. Genitalia: Ftera. Fig. 12. Internal structure of penis, same specimen of figure 11. Fig. 13. Genitalia: Konstantinos. Fig. 14. Genitalia: Livadhia. Fig. 15. Internal structure of penis, same specimen of figure 14.
Fig. 16. Shell of *Albinaria* (*Albinaria*) *brevicollis maltezana*, Kounoupi Islet, islands group of Astypalea, Greece, H: 18.1 mm, D: 3.6 mm. Fig. 17. idem, H: 14.9 mm, D: 3.3 mm.
Figures 18-23. Parietum, palatum and clausilium of *Albinaria (Albinaria) brevicollis maltezana*, Kounoupi Islet, island group of Astypalea, Greece. Fig. 18. Parietum. Fig. 19. Parietum. Fig. 20. Palatum. Fig. 21. Palatum. Fig. 22. Clausilium, same specimen of figure 20. Fig. 23. Clausilium.
Figures 24–27. Genitalia of *Albinaria* (*Albinaria*) *brevicollis maltezana*, Konoupi Islet, islands group of Astypalea, Greece. Fig. 24. Genitalia. Fig. 25. Internal structure of penis, same specimen of figure 24. Fig. 26. Genitalia. Fig. 27. Internal structure of penis, same specimen of figure 26.
Fig. 28. Shell of *Albinaria (Albinaria) brevicollis* cf. *sica*, Dhragospilia, Astypalea Island, Greece, H: 15.2 mm, D: 3.2 mm. Fig. 29. idem, H: 16.45 mm, D: 3.15 mm.
Figures 30–34. Parietum, Palatum and Clausilium of *Albinaria (Albinaria) brevicollis* cf. *sica*, Dhragospilia, Astypalea Island, Greece. Fig. 30. Parietum. Fig. 31. Parietum. Fig. 32. Palatum. Fig. 33. Palatum. Fig. 34. Clausilium, same specimen of figure 32.
Figures 35–38. Genitalia of *Albinaria (Albinaria) brevicollis* cf. *sica*, Dragospilia, Astypalea Island, Greece. Fig. 35. Genitalia. Fig. 36. Internal structure of penis, same specimen of figure 35. Fig. 37. Genitalia. Fig. 38. Internal structure of penis, same specimen of figure 37.
Fig. 39. Holotype of *Albinaria* (*Albinaria*) *brevicollis granoi* n. ssp., Pachia Ammos, Astypalea Island, Greece, H: 12.9 mm, D: 2.9 mm. Fig. 40. Paratype *A.* (*A.*) *brevicollis granoi* n. spp., idem, H: 12.7 mm, D: 3 mm.
Figures 41–46. Parietum, palatum and clausilium of *Albinaria* (*Albinaria*) *brevicollis granoi* n. ssp., Pachia Ammos, Astypalea Island, Greece. Fig. 41. Parietum. Fig. 42. Parietum. Fig. 43. Palatum. Fig. 44. Palatum, same specimen of figure 42. Fig. 45. Clausilium. Fig. 46. Clausilium, same specimen of figure 44.
Figures 47–50. Genitalia of *Albinaria* (*Albinaria*) *brevicollis granoi* n. ssp., Pachia Ammos, Astypalea Island, Greece. Fig. 47. Genitalia. Fig. 48. Internal structure of penis, same specimen of figure 47. Fig. 49. Genitalia. Fig. 50. Internal structure of penis, same specimen of figure 49.
Figure 51. Holotype of *Albinaria (Albinaria) brevicollis cristinae* n. ssp., Ofidoussa Islet, islands group of Astypalea, Greece, H: 14.5 mm, D: 3.1 mm. Fig. 52. Paratype, *A. (A.) brevicollis cristinae* n. spp., idem, H: 14.7 mm, D: 3.1 mm.
VARIABILITY. Height: 12.7–15 mm (mean 13.9 mm), D: 2.8–3.1 mm (mean 2.9 mm), whorls: 10–11.75 (mean 10.5), R2 (n = 15): 9–17 (mean 14). Dorsal keel about as high as basal keel or slightly stronger; upper lamella reaches or does not reach the spiral lamella; lower part of lunella with a rudiment of basalis (Figs. 40–44).

Dimensions of the genitalia (Figs. 47–50): P: 1.75 mm, E: 2.6 mm, PC: 1.7 mm; vagina: 1.85 mm, CD 1.25 mm, DBC+BC 1.46 mm, BCD: 3.2 mm.

ETYMOLOGY. Named in honour of Mauro Grano (Rome, Italy), Italian herpetologist, who together with his colleague Cristina Cattaneo collected this new subspecies.

DISTRIBUTION. Mountain ridge North-West Astypalea Island.

REMARKS. The smaller dimensions and the rounded and slender apical and subapical whorls differentiate this subspecies from the other ribbed subspecies A. (A.) brevicollis brevicollis from the Rhodes Island, A. (A.) brevicollis telensis K.L. Pfeiffer, 1955 from the Tilos island, A. brevicollis theodori K.L. Pfeiffer, 1955 from the island of San Theodoros. Finally, A. brevicollis granoi n. ssp. differs from A. brevicollis maltezana for the smaller dimensions, lower number of whorls, greater number of ribs and less developed dorsal keel and upper lamella.

**Albinaria (Albinaria) brevicollis cristinae n. ssp.**

TYPE LOCALITY. Ofidoussa Islet, west of Astypalea Island, Dodecanese Archipelago, Greece.

TYPE MATERIAL. Holotype (Fig. 51): Ofidoussa Islet, 36°33’12.38”N 26°08’23.29”E, 82 m, legit M. Grano and C. Cattaneo, 18.VIII.2015, (MCZR-M-TYPE 00251/H). Paratypes: idem, 3 shs (CL 298–300; Fig. 52 shells CL 300).

DIAGNOSIS. Albinaria brevicollis cristinae n. ssp. is characterized by: slender, white shell; whorls convex and smooth; only on the last part of the last whorl there are thin and dense striae that reach the suture; dorsal keel prominent, upper lamella does not reach or reaches the spiral lamella.

DESCRIPTION OF THE HOLOTYPE (Fig. 51). Slender conical shell, only the last whorl tapering down-wards; H: 14.5 mm, D: 3.1 mm, with 2.5 apical whorl light brown, the other 9 whorls white with few brown spots; whorls convex and smooth, only the first three subapical whorls have weak striae and the last part of the last whorl shows very thin and dense striae that reach the suture; sutural bulge marked; basal keel distinct, dorsal keel stronger and shorter, convergent with basal; peristome detached; oval mouth, inside yellowish white. The upper lamella reaches the spiral lamella, the inferior lamella low, subcolumnellar lamella not visible in oblique vision; lunella dor-sal-dorsolateral in position; principal plica and posterior upper palatal plica ending dorsolaterally.

VARIABILITY. Height: 14–16.4 mm (mean 14.9 mm), D: 2.75–3.1 mm (mean 3.0 mm), whorls: 11.25–11.5; subapical whorls without striae in the three paratypes. The upper lamella does not reach (2 shs) or reaches the spiral lamella (2 shs); inferior lamella low or moderately high (Fig. 52).

ETYMOLOGY. Named in honour of Cristina Cattaneo (Rome, Italy), Italian botanist and herpetologist, who together with her colleague Mauro Grano collected this new subspecies.

DISTRIBUTION. Known only from type locality: Ofidoussa Islet.

REMARKS. Albinaria brevicollis cristinae n. ssp. is somewhat similar to A. brevicollis heracleensis (O. Boettger, 1883) (Syn.: A. brevicollis karavica Fuchs & Käufel, 1936) from the Karavi Nisa Islet (64 km southeast of Ofidoussa). Albinaria brevicollis cristinae n. ssp. is distinguished by A. brevicollis heracleensis for: the shorter and most prominent dorsal keel; the slightly more convex whors, the thinner and more dense striae on the last part of the last whorl; more developed upper lamella (Boettger, 1883; Fuchs & Käufel, 1936; K.L. Pfeiffer, 1955; Nordsieck, 1999).

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