

New observations on the taxonomy, biology and distribution of *Tricolia landinii* Bogi et Campani, 2007 (Gastropoda Vetigastropoda)

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ABSTRACT

Tricolia landinii Bogi et Campani, 2007, is here reviewed on the basis of both shell morphology and observations of the living animals. This taxon, is here ascertained, it was described on the basis of only shell characters of young specimens, without the study of external soft parts. New data about adult shell morphology, living animal and distribution of this minute species are here furnished, together with a detailed iconography. On the basis of these characters *T. landinii* appears more similar to the *T. tingitana* group, rather than to *T. nordsiecki*, as underlined in the original description. In the light of the adult shell morphology here reported and of the living animal's features, a complete analysis of the entire group of this "small *Tricolia*", with comparisons to the close resembling species, is here furnished.

KEY WORDS

Tricolia landinii; Phasianellidae; juveniles; Mediterranean; re-description; adult shell.

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INTRODUCTION

The dichotomic key of classification of species of *Tricolia* Risso, 1826 made by Gofas (1986) was based on shell and radular characters while a second contribution (Gofas, 1993) was based on both shell and external soft parts characters of species.

According to these papers European species of *Tricolia* are generally arranged in two different groups: one comprises larger species,

T. miniata (Monterosato, 1884),
T. petiti (Craven, 1882),
T. pullus (Linnaeus, 1758),
T. speciosa (Muhlfeldt, 1824)
T. tenuis (Michaud, 1829)

This first group is taxonomically rather stable, being constituted by well-known species almost easily to recognise, even if some more accurate studies should better define the taxonomical status of

some taxa as *T. pullus azorica* (Dautzenberg, 1889), *T. pullus canarica* Nordsieck, 1973, *T. pullus picta* (da Costa, 1778), or some morphs of *T. tenuis*.

A second group instead is constituted by seven species all of small dimensions:

T. algoidea (Pallary, 1920)
T. deschampsii Gofas, 1993
T. entomocheila Gofas, 1993
T. landinii Bogi et Campani 2007
T. nordsiecki (Talavera, 1978)
T. punctura Gofas, 1993
T. tingitana Gofas, 1982.

A part the small dimensions, all these species share a similar globose shape of the shell, a similar creamy colour with darker strips and stains and a rocky shallow water habitat. *T. tingitana*, endemic to S-Spain, was recently cited from eastern Mediterranean, on the basis of abundant both living and fossil materials collected in several localities of the

eastern coast of Sicily and Calabria (Scuderi & Russo, 2003). After few years *T. landinii* Bogi et Campani 2007 was described as a new species endemic from E-Sicily and compared with *T. nordsiecki* as the most similar species, because of its sharp outline, flat protoconch and first teleoconch whorl and umbilicus without keel.

More recently, further studies on the growth of the shell and the living of species of *Tricolia* here conducted ascertained the identity of the Sicilian population of *T. tingitana* (sensu Scuderi & Russo, 2003) with *T. landinii*. The description of this latter species, in fact, was based on young specimens, as could be argued by the characters showed in the original description compared to those of the materials here studied. The description given by Bogi & Campani (2007) based on young specimens renders an image of *T. landinii* as more similar to flattened shell *Tricolia*, i.e. *T. nordsiecki*, rather than to the *T. tingitana* group, which share the presence of a more high spired shell. This caused misidentifications and taxonomical problems linked to the correct identification of this species.

In the present paper a more accurate study on abundant material of *T. landinii*, recent to fossil shells and living collected specimens, allowed a more precise definition of this species and a re-description, which comprises the growing stages of the species, detailed informations on shell as well as external soft body parts, a more appropriate comparison to the closest similar species and a complete distribution of the species, which seem not to be peculiar of Sicily.

ACRONYMS AND ABBREVIATIONS. The materials used for this study are deposited in the following private collections: Agatino Reitano collection, Italy, Catania (ARC); Danilo Scuderi collection, Italy, Catania (DSC); live = live collected specimen; dry = dry shell.

MATERIALS AND METHODS

This study was based on both dry shells and living specimens collected by the authors mainly in the Ionian Sea (E-Sicily) 1984 to 2012 and housed in their private collections. Further materials from Messina Strait and Tyrrhenian Sea are here considered conspecific with those of Sicily on the basis of shell characters only.

Living collected materials were stored in aquarium, observed while crawling and drown. Photographs were obtained at the stereoscope with a Nikon Coolpix 4500. Images were adjusted with a common Image editing software. Systematics in the present paper follow Clemam (2012).

RESULTS

Observations at the stereoscope allowed to study the shell characters of *T. landinii* and its growth stages. Living animals furnished further important characters which give us the certainty that a species different from others S-Spain close similar species is involved.

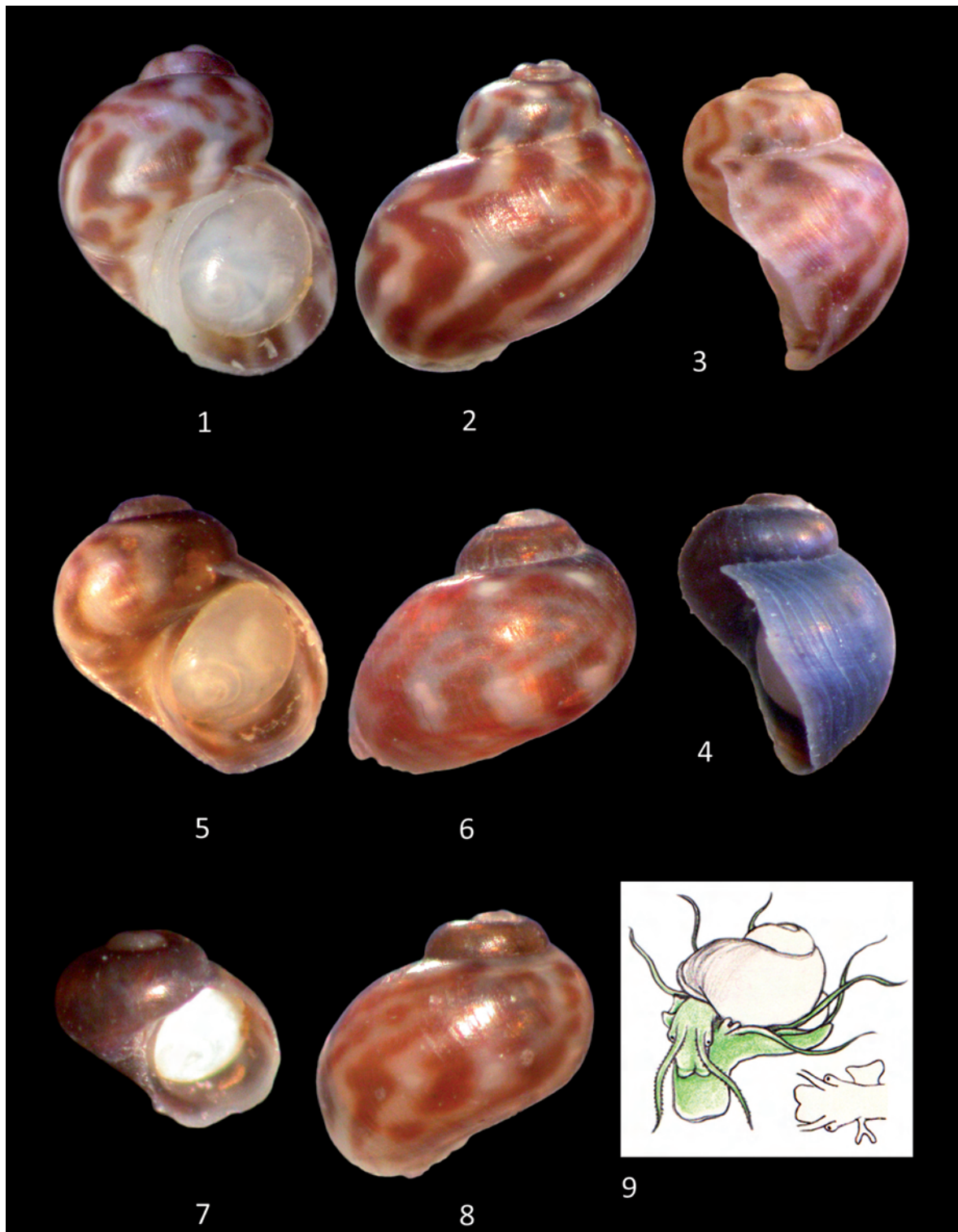
Here follows a re-description of the adult shell characters based on newly collected materials and on living animal, which adjust as for some morphological characters and complete the previous description of this taxon, lacking the soft body features as discriminating character.

SYSTEMATICS

class GASTROPODA Cuvier, 1795
 ordo VETIGASTROPODA Salvini-Plawen & Haszprunar, 1987
 Family PHASIANELLIDAE Swainson, 1840
 Genus *Tricolia* Risso, 1826

Tricolia landinii Bogi et Campani, 2007

EXAMINED MATERIAL. Italy, Sicily: Cajto, Catania, -2/3m, samples obtained after *Gobius* cfr. *paganellus* Linnaeus, 1758 stomach contents (DSC, 4 live); Ognina, Catania, tide pools, -0.2m, samples obtained after washing algae and shell grit (ARC and DSC, 220 live; 450 dry); Cannizzaro, Catania, -0.1/45m, samples obtained after washing algae and shell grit (ARC 25 live; 150 dry), Acicastello, Catania, tide pools, -0.1m, samples obtained after washing algae (ARC 25 live); Acitrezza, Catania, -0.2/2m, samples obtained after scraping of the rocky substrate on surfaces of 20x20 cm (DSC, 156 live, 138 dry); Capo Mulini, Catania, tide pools, -0.1m, samples obtained after washing algae (ARC 25 live) and shell grit (DSC 200 dry); S. Giovanni Li Cuti, Catania, -1/2m, samples obtained after wa-



Figures 1-9. *T. landinii*. Figs. 1, 2. Adult shell from Acitrezza (2.2 x 2.0 mm). Fig. 3. Adult specimen seen from aside showing external lip (height 1.8 mm). Fig. 4. Not fully grown entirely blackish specimen seen from aside showing external lip (height 1.3 mm). Figs. 5-6. Not fully grown specimens corresponding to the original description (Fig. 5 height 1.1 mm; Fig. 6 height 1.2 mm). Fig. 7. Juvenile stage (height 0.7 mm). Fig. 8. Specimen from Calafuria, Tuscany (height 1.1 mm). Fig. 9. Drawing of living animal with detail of right and left neck lobes (height 1.8 mm).

shing algae and shell grit (DSC 25 live, 120 dry); Ganzirri, Messina, -50m, samples obtained after residuals of fishing nets and shell grit (DSC, 2 live; 4 dry). Italy, Calabria: Scilla, Reggio Calabria, tide pools, -0.2m, samples obtained after washing algae and shell grit (ARC and DSC, 15 live; 46 dry); Lazzaro, Reggio Calabria, shell grit (DSC, 13 dry). Ravagnese, Reggio Calabria, fossil (DSC, 1). Italy, Tuscany: Calafuria, Pisa, -2m, samples obtained after scraping of the rocky substrate on surfaces of 20x20 cm (DSC, 2 live).

DESCRIPTION. Shell. Teleoconch of adult specimens (Figs. 1-3) reaching 2.4 x 2.0 mm constituted by 3.5 whorls, the last very ample. Sculpture of dense growth lines, of which some more relevant are evident on the first tele-whorl as thin axial ribs riblets (Figs. 4, 6, 8); surface of shell covered by faint spiral microsculpture, detectable only at high magnification of the stereoscope, but almost smooth on the body whorl, with exception of the umbilical area which bears a narrow but deep umbilicus surrounded by a marked umbilical keel. Protoconch flat, constituted approximately by one whorl 200 μ m in diameter, covered by subtle spiral treads.

Colour. Protoconch almost whitish; first tele-whorl blackish, becoming creamy in subsequent whorls, with dark black or purplish axial flames irregularly arranged and white dots arranged in two spiral rows, the first abapically and the latter adapically. Uniformly red-brown and blackish specimens (Fig. 4) are known, some others are lacking the white dots.

Animal (Fig. 9). Entirely green, with three pairs of epipodial tentacles almost of the same length; right neck lobe broad, with edge not notched and left neck lobe double fingered. Operculum round, white, relatively thick and paucispiral, with nucleus externally visible (Figs. 1, 5, 7).

BIOLOGY AND DISTRIBUTION. Type locality: Porticello, Villa San Giovanni (Reggio Calabria), Strait of Messina, Italy.

The species is present along the Ionian coast of Sicily, excluding the calcareous rocky shore of the Southern part of the Island. Further material from Messina Strait and Tuscany seems to demonstrate the not endemic status of the species, though the identification of this material needs confirmation with the observation of the living animal features. The species commonly lives in shallow rocky shores, 0,10/4-6 m depth, on the red algae of the spe-

cies *Pterocradiella capillacea* (S.G. Gmelin) Santelices & Hommersand, 1997.

PALEONTOLOGY. The fossil material ascribable to this species, found at Ravagnese, Reggio Calabria, which belongs to Tyrrhenian Stage suggests the presence of this species in the Messina Strait area since middle/late Pleistocene.

CONCLUSIONS

According to the original description (Bogi & Campani, 2007) *T. landinii* is characterised by: general outline remarkable low, protoconch and first tele-whorl flattened, prosocline and sinuous outline of external lip, faint umbilicus without any keels.

The examination of a large quantity of topotypic, both complete and not full grown specimens of *T. landinii* allowed us to ascertain the juvenile specimens on which the original description of this species was made and thus to re-describe it. Juvenile specimens, in fact, are characterised by the always whitish protoconch whorls which become almost black with the construction of the first teleoconch whorl and show a faint umbilicus, without any keel and in an almost black basal area (Fig. 7). The second tele-whorl assumes the colour of adult specimens, becoming yellowish with red-brownish longitudinal strips and white dots. The feature and colour of this stage, slightly more than 1 mm high, perfectly corresponds to the original description of holotype of *T. landinii*.

The adult shell is bigger, exhibits a general not flattened form, form, with a narrow umbilicus bordered by a sharp keel in a white area and the coloration above described for the second tele-whorl, which could be rather variable considering hundreds specimens of an entire population.

The whole shell assumes therefore a form markedly different from that described in the original description, being more closely to the *T. tingitana* group of species, which comprises *T. tingitana*, *T. deschampsii*, *T. entomocheila* and *T. punctura*, rather than to *T. nordsiecki* (Fig. 10) or juvenile stages of *T. miniata*, to which was originally compared. In particular the shell of *T. landinii* differs from that of *T. entomocheila* for the absence of the deep notch in the subsutural part of the outer lip. The shell of *T. landinii* also differs from that of *T. punctura*,

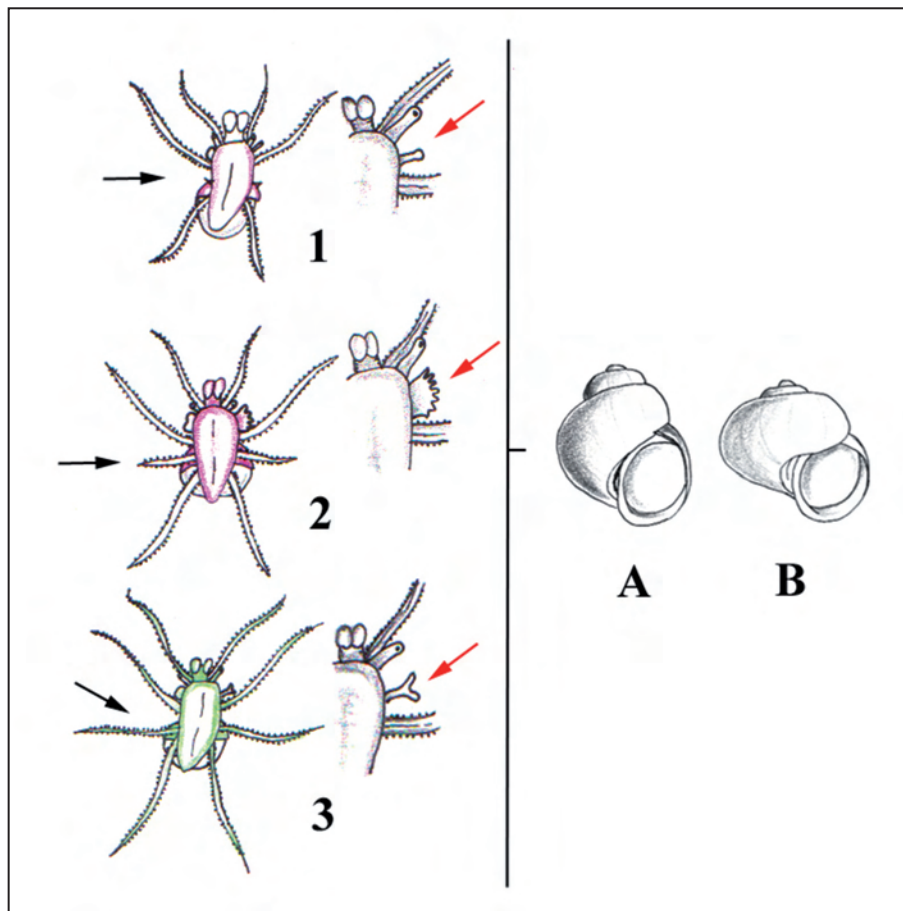


Figure 10. Schematic drawing of the types of shell in *Tricolia tingitana* (A) and *T. nordsiecki* (B) species and of the living animals of the *T. tingitana* group: *T. deschampsii* (1), *T. tingitana* (2) and *T. landinii* (3). Black arrows indicate the second epipodial tentacles (absent in the former species); red arrows indicate the left neck lobe.

which lives in the Strait of Messina too, because of its smaller dimensions, in having well rounded whorls, less laterally compressed; *T. punctura* has a different colour pattern, being almost unique among species of this group of small *Tricolia* (Gofas, 1993).

The adult shell of *T. landinii* resembles more that of *T. tingitana* and *T. deschampsii*. The former of this two species is reported as endemic to the S-Spain (Gofas, 1982). More recently *T. tingitana* was erroneously cited for E-Sicily (Scuderi & Russo, 2003) on the basis of the close resemblance of the shell, which is almost indistinguishable from that of *T. landinii*. Studies here conducted allowed us to ascertain the identity of material of *T. tingitana* sensu Scuderi & Russo (2003) with *T. landinii*, mainly on the basis of the features of the living animal (Fig. 9).

Moreover, the presence of 6-7 spiral cords on the first teleoconch whorl and of three shallow sinuities on the outer lip allow the distinction of shells of *T. deschampsii* from those of *T. tingitana* and *T. landinii*.

Here, the examination and comparison of the living animals allowed a better separation among these species according to the following differences (Fig. 10): *T. deschampsii* has only two pairs of epipodial tentacles, while *T. landinii* and *T. tingitana* have three pairs of epipodial tentacles. The colour of the main parts of the body soft parts of *T. tingitana* is almost purplish while in *T. landinii* is entirely green. Moreover in the former species the left neck lobe brings 5-7 long digitations, while in *T. landinii* is only double fingered.

Further not Sicilian material, here attributed to *T. landinii* on the basis of shell characters only, ex-

tends the distribution of this species to the entire western coasts of Italy.

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