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The revival of *Thiessea pieperi* (Subai, 1996) (Gastropoda: Helicidae)

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Abstract. The helicoid genus *Thiessea* comprises 16 species, of which 15 are distributed in the Aegean and the eastern coastal part of Greek mainland and one species is present in the western coast of Turkey. Two species were known only from shells, *T. pieperi* (Kasos island, southern Aegean) and *T. valkanovi* (Thasos island, northern Aegean). The thorough survey of Kasos for land gastropods gave us the opportunity to discover live *T. pieperi*. The species was found aestivating in limestone crevices on Mount Prionas. Based on the fresh material collected, we give new description of the shell and, for the first time, we describe the species' reproductive system and compare it with its congenerics. This find reinforces the taxonomic status of the species and furthermore corroborates that there are few extinctions of land gastropods during Holocene in the Aegean archipelago.

Key words. Ariantinae, reproductive system, Aegean, Greece

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Introduction

The genus *Thiessea* Kobelt, 1904 comprises 16 species distributed in the Aegean archipelago and on the nearby mainland of Greece and Turkey. All, but two species, have been found alive. In the revision of the genus by Subai (1996) detailed descriptions of shells and anatomical characters were given for 14 species. However, two species were described solely based on shell characteristics: *T. valkanovi* (Urbański, 1960) endemic to the island of Thasos (northern Aegean, Greece), and *T. pieperi* (Subai, 1996) endemic to the island of Kasos (Dodekanisa, Greece). Notably, these two species represent the northernmost and southernmost presence of the genus, respectively. The description of *T. valkanovi* was based on many shells from various sites on Thasos, while *T. pieperi* was described by only three old shells collected in 1991 by Dr H. Pieper from a single locality on Kasos (Subai 1996).

Kasos is the southwestern island of Dodekanisa. It is a mountainous, limestone island, and its highest peak is Mount Prionas, at 600 m a.s.l. The dominant vegetation is mainly phrygana with *Sarcopoterium spinosum* (L.) Spach, *Thymbra capitata* (L.) Cav., *Genista fasselata* Dence, and *Lithodora hispidula* (Sm.) Griseb. In very few places there is maquis vegetation with *Juniperus turbinata* Guss. and few cultivated areas. There are few settlements all in the northern part of the island where the topography is milder.

During our survey on Kasos in March 2025, we found living individuals of *T. pieperi* for the first time. Based on the material collected, including fresh shells and living individuals, we provide a detailed study of the shell and for the first time we describe the reproductive system and compare it with the congeneric species. Additionally, we provide data concerning its habitat.

Materials and Methods

In March 2025, a survey for terrestrial gastropods was conducted on Kasos in the framework of a research project focusing on critically endangered species on the islands of Kasos, Karpathos and Saria funded by Hellenic Foundation for Research and Innovation. Land gastropods were collected in 20 different sites all around the island (Fig. 1), while leaf litter and topsoil were collected from most sites.

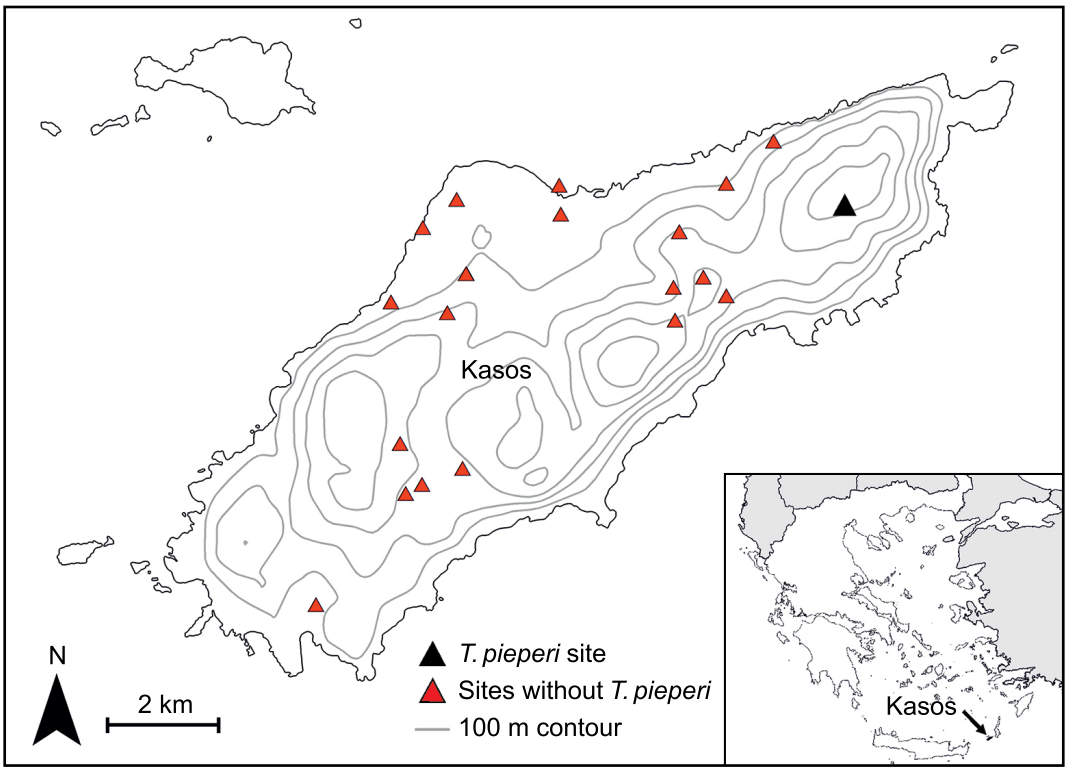

Figure 1. Map of Kasos, Dodekanisa, Greece, with the sites (triangles) surveyed in the present study. Red triangles = sites surveyed but without *Thiessea pieperi* detected; black triangle = *T. pieperi* found.

Thiessea pieperi was found in a single site (Fig. 1). Fifteen shells of adult and juvenile individuals, and only three live adult individuals were collected; two of these live were preserved in 75% ethanol and one in 96% ethanol. All material is deposited in the Invertebrate Division of the Natural History Museum of Crete (NHMC), University of Crete.

All adult and intact specimens, five individuals, were measured with electronic callipers (Table 1). The anatomy of the reproductive system was examined under a Leica Stemi 508 stereomicroscope. Whorls were measured following Cameron (2016). Digital photographs were taken with a Progress Gryphax camera mounted on the stereomicroscope.

We compared *T. pieperi* with all the other congeneric species, mainly for anatomical characteristics given by Subai (1996) and with specimens from the rich material in the Invertebrate collections of Natural History Museum of Crete (NHMC).

The distribution map was created with ArcGIS v. 10.6.

Results

Shell description. The description of *Thiessea pieperi* was given by Subai (1996) based on three old or possibly subfossil shells. Here we present the description of the shell based on the fresh specimens we collected.

The shell is flat, almost smooth, with very light wrinkles. Its colour is light brownish, the underside is lighter than the upper side. A dark-brown band bordered by two white bands is present on the last whorl (Fig. 2A). There are three growth interruptions on adult shells. The number of whorls ranges from 3¾ to 4¼, while the protoconch has 1¾ whorls and wrinkled. The last whorl is double in width than the penultimate. The suture is deep. The lip is strongly reflected (Fig. 2A). The umbilicus is deep and narrow, widening only on the last whorl. Hairs are present in juvenile shells, but a few hairs remain either within the umbilicus or at the sutures in subadults and adults (Fig. 3).

Dimensions (n = 5): SW: 19.94–21.88 mm, SH: 10.12–12.19 mm, Wh: 3¾–4¼. Abbreviations as in Table 1.

Reproductive system. The genitalia are typical of the genus (Subai 1996; Schileyko 2006). There are two simple mucus glands, their length is double that of the dart sac. The length of diverticulum of the gametolytic gland is nearly equal, slightly shorter, than the stalk of the gametolytic gland. The vagina is a little shorter than the dart sac. The epiphallus is very short. The flagellum is as long as the combined length

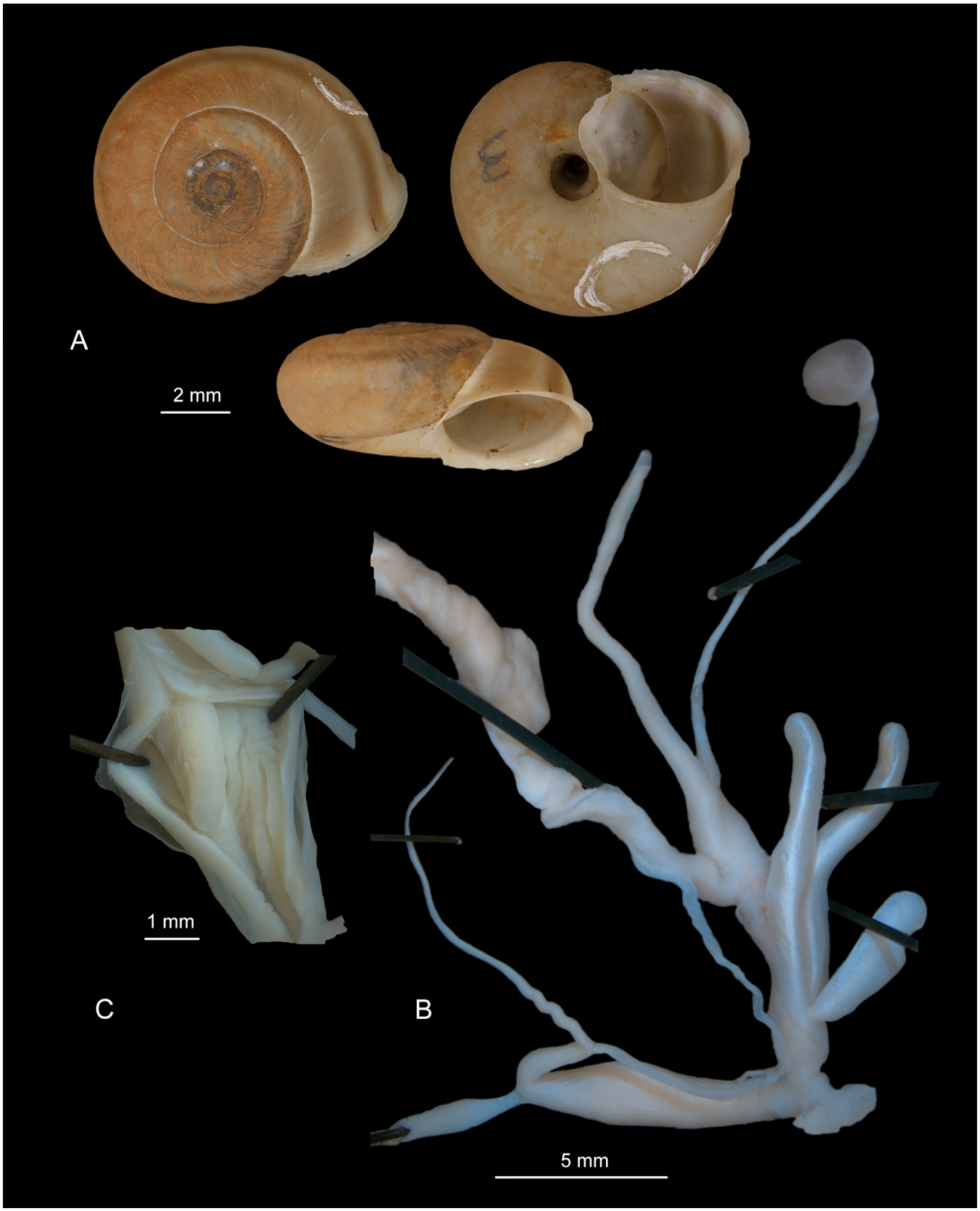

Figure 2. *Thiessea pieperi* from Mount Prionas, Kasos, Dodekanisa, Greece (NHMC.50.56332.1). **A**, shell. **B**, whole reproductive system. **C**, penial papilla.

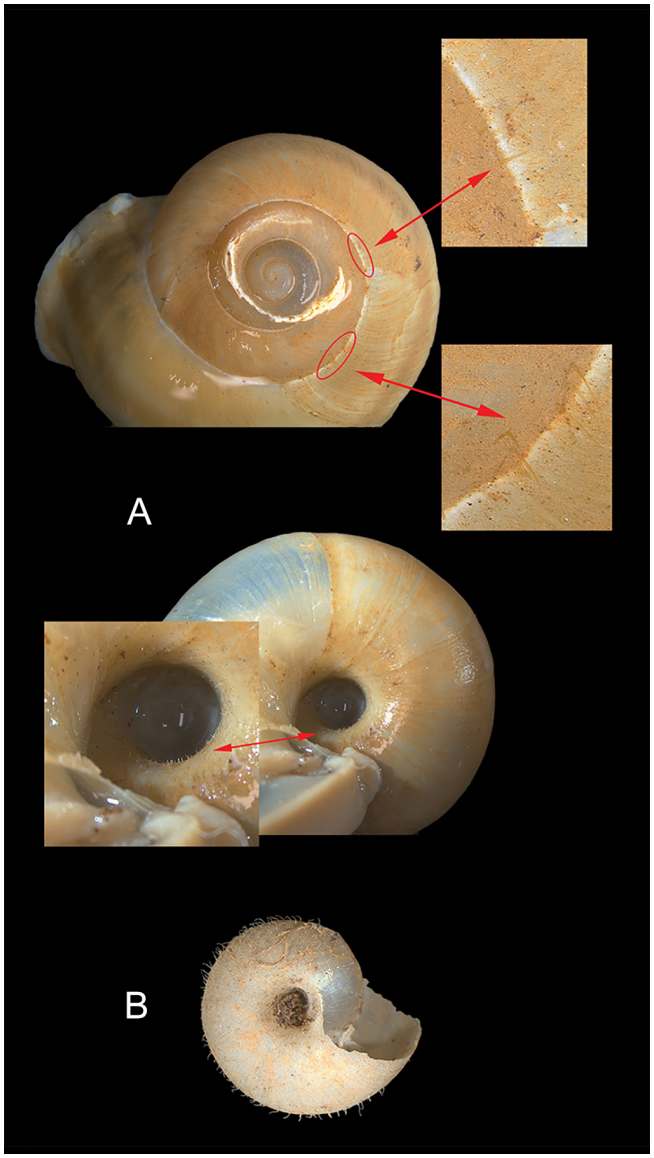

Figure 3. *Thiessea pieperi.* **A**, adult shell with hairs on the suture or in the umbilicus (right) (NHMC.50.56332.2). **B**, juvenile shell with hairs (NHMC.50.56332.3).

of the penis and epiphallus (Fig. 2B). The penis papilla is conical, long, more than half of the length of the penis, and with very few and weak longitudinal grooves. The internal wall of the penis bears longitudinal grooves (Fig. 2C).

Habitat. Subai (1996) provided no information on the habitat of *T. pieperi*, as his material had been long dead. We found living individuals in the limestone area on the southern slopes of Mount Prionas. The vegetation of the site consists of phrygana dominated by *Sarcopoterium spinosum*, *Genista fasselata*, and *Euphorbia acanthothamnos* Heldr. & Sart. ex Boiss.

Thiessea pieperi is a rock-dwelling species living in crevices of limestone rocks (Fig. 4B). Although we surveyed in mid-spring (end of March), the species was already aestivating, hidden deep in crevices.

Table 1. Shell measurements and number of whorls of five intact adult shells of *Thiessea pieperi* from Mount Prionas, Kasos, Dodekanisa, Greece. Measurements (in mm): SW = shell width, SH = shell height, AH = aperture height, AW = aperture width, LW = last whorl width, PLW = penultimate whorl width, UmW = Umbilicus width. Wh = number of whorls.

	SW	SH	AH	AW	LW	PLW	UmW	Wh
1	19.94	10.12	8.54	9.49	8.74	4.41	3.74	4.00
2	20.31	11.91	10.24	11.21	9.26	4.69	4.01	3.75
3	21.46	10.94	10.40	11.45	8.43	4.05	4.13	4.15
4	21.88	11.88	10.77	11.95	10.57	3.33	3.77	4.00
5	20.90	12.19	9.70	11.87	10.28	4.54	3.22	4.15

Discussion

The genus *Thiessea* is characterised by a flat or depressed, medium-sized shell, with a reflected lip, and periostracal hairs on fresh shells (Subai 1996; Schileyko 2006). According to Subai (1996), the most important diagnostic shell features are the protoconch and the presence or absence and density of hairs. In the reproductive system, the key diagnostic features include the structure of the mucus glands, the length of the flagellum, the relative length of the diverticulum, and the inner structure of the penis, particularly the form, size, and grooves on the penial papilla.

Subai's (1996) diagnosis of the species relied solely on shell characteristics, namely a whitish shell with one brown band, a wrinkled protoconch, dense radial striation on the teleoconch, and the overall size of the shell.

However, our description of the live individuals differs in several aspects. Shells are smooth but with very faint wrinkles, light brown, and with only one brown band. Hairs are present on the entire surface in juvenile shells, whereas in subadult and adult shells very few hairs persist at the suture and in the umbilicus. In adult shells there are no pits or scars indicative of former hair attachment. Furthermore, the shells we examined are smaller than the ones reported by Subai (1996).

In the revision of *Thiessea* by Subai (1996), *T. pieperi* was compared with *T. nympha* (Subai, 1996) present in eastern Aegean islands (Ikaria, Samos, Fournoi, Leros), *T. fuchsiana* (Knipper, 1939) in the southeastern Aegean islets (Syrna group), and *T. posthuma* (Knipper, 1939) in northeastern Cyclades (Andros and Tinos).

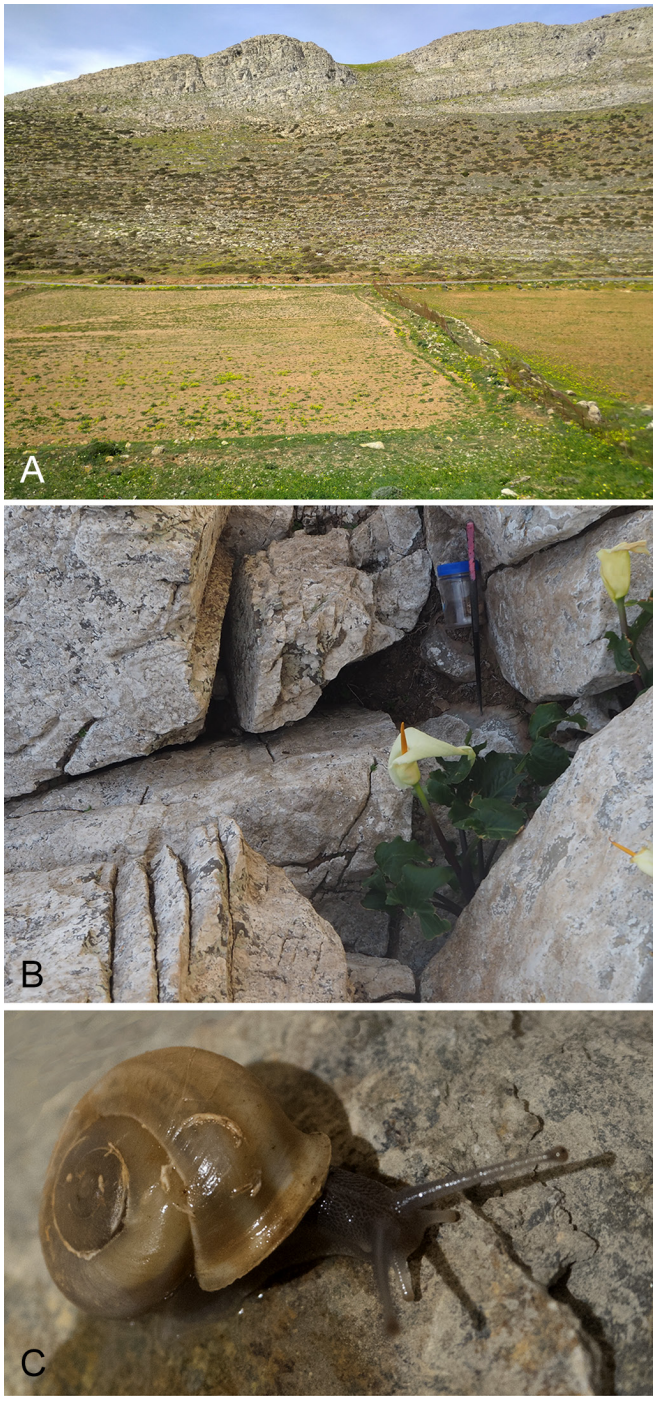

Figure 4. *Thiessea pieperi* habitat and live animal. **A**, Mount Prionas showing limestone cliffs in the background. **B**, limestone rock crevices in which the species was found. **C**, live animal on site.

Based on the measurements of our specimens, we agree that *T. pieperi* has a smaller shell than *T. nympha* and that it differs from *T. fuchsiana* in shell sculpture. However, the size of *T. posthuma*, which according to Subai (1996) constitutes the main distinguishing feature from *T. pieperi,* falls within the size range of our *T. pieperi* specimens.

While shell morphology does not appear to provide clear evidence for the distinction of *T. pieperi*, the reproductive system exhibits significant differences from the aforementioned species. In all three species the diverticulum of the gametolytic gland is longer than the length of the stalk of the gametolytic gland. Additionally, in *T. fuchsiana* the dart sac is very small in relation to the mucus glands, and the penial papilla is shorter. The difference with *T. nympha* and *T. posthuma* is that these two species have a very short penial papilla. Moreover, in *T. nympha* the flagellum is very long, more than double the length of the penis and epiphallus combined.

Thiessea pieperi differs from *T. bacchica* (E. von Martens, 1889), *T. matrella* (Westerlund, 1898), *T. melpomene* (Subai, 1996), *T. polyhymnia* (Subai, 1996), *T. euboeae* (Frauenfeld, 1867), *T. hymetti* (Mousson, 1854), *T. amorgia amorgia* (Westerlund, 1889), and *T. amorgia furia* (Subai, 1996) in having a diverticulum that is slightly shorter than the stalk of the gametolytic gland; in these other species it is longer. *Thiessea sphaeriostoma* (Bourguignat, 1857) and *T. arcadica* (L. Pfeiffer, 1853) possess a very short flagellum and a small dart sac, while *T. heldreichi* (L. Pfeiffer, 1846) has a long epiphallus and a curved penial papilla. In *T. cyclolabris* (Deshayes, 1840) the flagellum is more than double the combined length of the penis and epiphallus, and the dart sac is large.

The shell of *T. pieperi* appears to be similar to *T. polyhymnia* (endemic of Donousa island, north-eastern Cyclades), as both species have weak striation and similar umbilicus. However, they present significant differences in their reproductive system; *T. polyhymnia* has a longer epiphallus and a very long diverticulum. In *T. pieperi* the penial papilla is more than half the length of the penis, while in *T. polyhymnia* it is one-third the length of the penis. The flagellum is very long in *T. polyhymnia*, while in *T. pieperi* it is shorter.

Finding live individuals enabled us to compare *T. pieperi* with the congeneric species and verify its taxonomic status, since the reproductive system is more reliable for taxonomy than shell characteristics, which can vary due to environmental conditions (Goodfriend 1988; Pfenninger *et al.* 2005; Cameron 2016).

Thiessea pieperi is endemic to Kasos, living in a very small area on Mount Prionas. It is the only living population known so far. The Area of Occupancy is very small, approximately 4 km^2. Possible future threats include the degradation of its habitat by large-scale engineering projects, such as road construction for the installation of wind farms, which could drive the species to Critically Endangered or Extinct

status. The present findings strongly support the re-assessment of the species as Vulnerable, under the International Union for the Conservation of Nature Red List criterion D2 (G. Goudeli pers. comm.).

The Aegean region is widely recognized as a biodiversity hotspot (plants: Medail & Quézel 1997; insects: Blondel *et al*. 2010; Kaloveloni *et al*. 2018), with land snails alone exceeding 410 species (Vardinoyannis & Mylonas 2019). Despite a series of major adverse events affecting their survival, actual species extinctions during the Holocene appear to have remained remarkably limited in the archipelago (Vardinoyannis and Mylonas unpublished data). These events include: (a) the drastic reduction in island surface area due to a *c.* 120 m rise in sea level approximately 18,000 years ago (Lambeck 1995); (b) the eruption of the Santorini volcano around 3,600 years ago (Karátson *et al*. 2018), one of the largest volcanic eruptions globally; and (c) the long-standing and intensive human presence over the past 10,000 years (Cherry & Leppard 2018; Sampson 2018), including the introduction of non-native terrestrial gastropod species, which, according to Mylonas (1982), account for more than 30% of the gastropod fauna. Nevertheless, the number of documented extinctions in the whole Aegean archipelago remains strikingly low, not exceeding 10 species of land gastropod. The rediscovery of *T. pieperi*, a species assumed by Subai (1996) as extinct, further reinforces this pattern and highlights the importance of island systems in maintaining biodiversity (Brown & Kodric-Brown 1977).

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References

Blondel J, Aronson J, Bodiou J-Y, Boeuf G. 2010. *The Mediterranean Region: Biological Diversity in Space and Time*. Oxford University Press, Oxford, 376 pp.

Brown JH, Kodric-Brown A. 1977. Turnover rates in insular biogeography: effect of immigration on extinction. *Ecology* **58** (2): 445–449. doi: 10.2307/1935620

Cameron RAD. 2016. *Slugs and Snails*. (*The New Naturalist Library*). William Collins, 508 pp.

Cherry JF, Leppard TP. 2018. Patterning and its causation in the pre-Neolithic colonization of the Mediterranean islands (Late Pleistocene to Early Holocene). *The Journal of Island and Coastal Archaeology* **13** (2): 191–205. doi: 10.1080/15564894.2016.1276489

Goodfriend GA. 1988. Variation in land-snail shell form and size and its causes: a review. *Systematic Zoology* **35** (2): 204–233. doi: 10.1093/sysbio/35.2.204

Kaloveloni A, Tscheulin T, Petanidou T. 2018. Geography, climate, ecology: what is more important in determining bee diversity in the Aegean Archipelago? *Journal of Biogeography* **45**: 2690–2700. doi: 10.1111/jbi.13436

Karátson D, Gertisser R, Telbisz T, Vereb V, Quidelleur X, Druitt T, Nomikou P, Kósik S. 2018. Towards reconstruction of the lost Late Bronze Age intra-caldera island of Santorini, Greece. *Scientific Reports* **8** (1): 7026. doi: 10.1038/s41598-018-25301-2

Lambeck K. 1995. Late Pleistocene and Holocene sea-level change in Greece and south-western Turkey: separation of eustatic, isostatic and tectonic contributions. *Geophysical Journal International* **122** (3): 1022–1044. doi: 10.1111/j.1365-246x.1995.tb06853.x

Medail F, Quézel P. 1997. Hot-spots analysis for conservation of plant biodiversity in the Mediterranean Basin. *Annals of the Missouri Botanical Garden* **84** (1): 112–127. doi: 10.2307/2399957

Mylonas M. 1982. *Meleti pano sti zoogeografia kai oikologia ton chersaion malakion ton Kykladon*. Ph.D. thesis, University of Athens, 236 pp. [In Greek with English summary.]

Pfenninger M, Hrabáková M, Steinke D, Dèpraz A. 2005. Why do snails have hairs? A Bayesian inference of character evolution. *BMC Evolutionary Biology* **5**: 59. doi: 10.1186/1471-2148-5-59

Sampson N. 2018. The Mesolithic hunter-gatherers in the south-eastern Mediterranean and their contribution in the Neolithisation of the Aegean. *Archaeology and Culture* **1** (1): 11–36. doi: 10.22158/ac.v1n1p11

Subai P. 1996. Revision der Ariantinae. 1. Die *Helicigona*-Untergattung *Thiessea* (Gastropoda: Pulmonata: Helicidae). *Archiv für Molluskenkunde* **126**: 1–49. doi: 10.1127/arch.moll/126/1996/1

Schileyko AA. 2006. Treatise on recent terrestrial pulmonate molluscs. Part 13. Helicidae, Pleurodontidae, Polygyridae, Ammonitellidae, Oreohelicidae, Thysanophoridae. *Ruthenica.* Supplement **2**: 1765–1906.

Vardinoyannis K, Mylonas M. 2019. Land gastropods' view of the Aegean. Key islands and key species. P. 164 in: Tsikliras A, Dimarchopoulou, Youlatos D (Eds) *Proceedings of the International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions. 14th ICZEGAR, 27–30 June 2019, Thessaloniki, Greece*.

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