FOLIA MALACOLOGICA
Folia Malacol. 34(3): 196–211
ISSN 1506-7629 (print) • ISSN 2300-7125 (on-line)
The Association of Polish Malacologists
Faculty of Biology, Adam Mickiewicz University
Bogucki Wydawnictwo Naukowe
Poznań, September 2026
https://doi.org/10.12657/folmal.034.020

A NEW SPECIES OF *ZONITES* MONTFORT, 1810 FROM THE AEGEAN (CHTAPODIA, GREECE): ISLET ENDEMIC AND CRITICALLY ENDANGERED

KOSTAS A. TRIANTIS[1]*, KATERINA VARDINOYANNIS[2], GALATEIA GOUDELI[1], MOISIS MYLONAS[3]

[1] Faculty of Biology, Department of Ecology and Taxonomy, National & Kapodistrian University of Athens, Greece (e-mail: ktriantis@biol.uoa.gr); KT https://orcid.org/0000-0003-2737-8890; GG https://orcid.org/0009-0009-3831-9678
[2] Natural History Museum of Crete, University of Crete, Greece; https://orcid.org/0000-0001-7368-0965
[3] Department of Biology, University of Crete, Greece; https://orcid.org/0009-0000-1473-613X
* corresponding author

ABSTRACT: The species *Zonites whittakeri* n. sp. (Zonitidae) is described from two islets off Mykonos Island (Cyclades, Aegean, Greece). A small population of the species persists on the islet of Chtapodia, whereas only subfossil shells were recovered from Tragonisi islet, suggesting that the species is locally extinct. The species is diagnosed on the basis of shell morphology as well as its reproductive system, and is distinguished from congeners by a combination of characters including a medium-sized shell with 5.2–5.8 nearly flat whorls, shallow sutures, light brown colour, much paler underside; keel present in juveniles but fading on the last whorl of adults; penis long and bipartite with internal hooked spines only in its proximal part. *Zonites whittakeri* n. sp. is assessed as Critically Endangered under the IUCN Red List criteria due to its highly restricted area of occupancy, small population size, and the ongoing threat posed by rodent predation. The species name honours Professor Robert J. Whittaker (University of Oxford) in recognition of his contributions to island biogeography.

KEYWORDS: Aegean archipelago; extinction; IUCN Red List; land snails; *Zonites whittakeri*

Publication LSID: urn:lsid:zoobank.org:pub:BAB1362F-034D-4174-9B67-DA2A491CA44B

INTRODUCTION

At the heart of Aegean biodiversity lies a critically important component: its islets. More than 90% of Aegean islands are smaller than 10 km^2, and these small landmasses contribute much to the region's endemic diversity. Many Aegean islets have never been connected to the mainland or to larger islands even during the maximum eustatic regressions of the Pleistocene. Some have remained isolated for more than 400 kyr in the southeastern Aegean, and others have been isolated since at least the most recent major glacial stages of the Pleistocene (LYKOUSIS 2009, GALANIDOU et al. 2020). This prolonged isolation has acted as a powerful engine of differentiation, generating highly localised endemic forms across multiple taxonomic groups (TRIANTIS & MYLONAS 2009, SFENTHOURAKIS & TRIANTIS 2017, MYLONAS & VARDINOYANNIS 2022). Beyond endemism, Aegean islets also serve as refugia for threatened species, as documented for example in the case of the land snail *Helix godetiana* Kobelt, 1878 (e.g., MAROULIS et al. 2025).

The Aegean islands host 419 species, representing 60% of all species recorded in Greece, and 51% of the Aegean species are country endemics (MYLONAS 1982, TRIANTIS et al. 2008, VARDINOYANNIS et al. 2018, VARDINOYANNIS & MYLONAS 2019, PROIOS et al. 2024). The genus *Zonites* Montfort, 1810 offers perhaps the most striking illustration of island-level endemism and its conservation implications within the Aegean malacofauna. Of its 27 extant or recently

OPEN ACCESS
This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
CC BY 4.0
Copyright © The Association of Polish Malacologists 2026

extinct species, 18 are endemic to Greece, 12 are island endemics, and four of these are found exclusively on islets of the Aegean: *Zonites astakidae* Riedel, 1985, *Zonites embolium* Fuchs et Käufel, 1936, *Zonites invitus* Riedel et Mylonas, 1995 and *Zonites nautarum* Riedel et Mylonas, 1995 (Riedel 1992, Welter-Schultes 2012, Bank et al. 2025). The differentiation of the genus into such highly localised insular forms is a direct consequence of the long-lasting isolation of the islands and the tendency of the genus to produce local endemic forms (Riedel & Mylonas 1995, Mylonas & Vardinoyannis 2022). However, the very conditions that promote differentiation – small, isolated populations on restricted landmasses – also render these species vulnerable, with two island endemics already confirmed as extinct – *Zonites siphnicus* Fuchs et Käufel, 1936 from Sifnos, Folegandros and Sikinos (Riedel 1985) and *Zonites santoriniensis* Riedel et Norris, 1987 from Santorini (Riedel 1992). *Zonites embolium* should also provisionally be regarded as extinct, as no living individuals were recorded during recent surveys on the islets from which it is known (Mylonas & Vardinoyannis 2022 and recent unpublished observations). For the islet endemic species in particular, the main current threats stem from introduced species, notably rats (through predation) and rabbits (through habitat modification via burrowing), both of which represent a widespread problem across small islands in Greece (NECCA 2024). Of the remaining nine island endemic species, eight are classified under one of the three IUCN threatened categories, i.e. Critically Endangered, Endangered or Vulnerable (NECCA 2024, IUCN 2025), making *Zonites* one of the most threatened genera of the European malacofauna.

Here, we describe a new species of *Zonites* from Chtapodia and Tragonisi, two islets off Mykonos Island, examine its taxonomic affinities with congeners, and evaluate its conservation status using the IUCN Red List criteria, proposing measures for its immediate protection.

MATERIAL AND METHODS

STUDY AREA

The island group of Mykonos includes several smaller islands and islets, the most notable of which are the archaeologically significant islands of Delos and Rineia. To the east of the complex lie the two islets Chtapodia and Tragonisi (Figs 1 and 2). Chtapodia is an uninhabited islet located 10 km east of Mykonos, with an area of 0.5 km^2 and a maximum elevation of 110 m. It consists of volcanic substrates with scree formations, as well as sediments containing marine fossils of bivalves and gastropods (Skoulikidis & Markopoulou-Diakandoni 1993). The vegetation is dominated by phrygana, the most common species are *Sarcopoterium spinosum* (L.) Spach and *Euphorbia acanthothamnos* Heldr. et Sartori ex Boiss. and degraded maquis, due to wind exposure, mainly composed of *Pistacia lentiscus* L. Tragonisi is also an uninhabited islet, with an area of 1.1 km^2 and a maximum elevation of 98 m. It lies 1 km east of Mykonos. The substrate is granitic, with slope deposits mainly on the western side, where subfossil remains of terrestrial snails have been found in a ravine close to the sea. The vegetation consists of phrygana, dominated by *Sarcopoterium spinosum*.

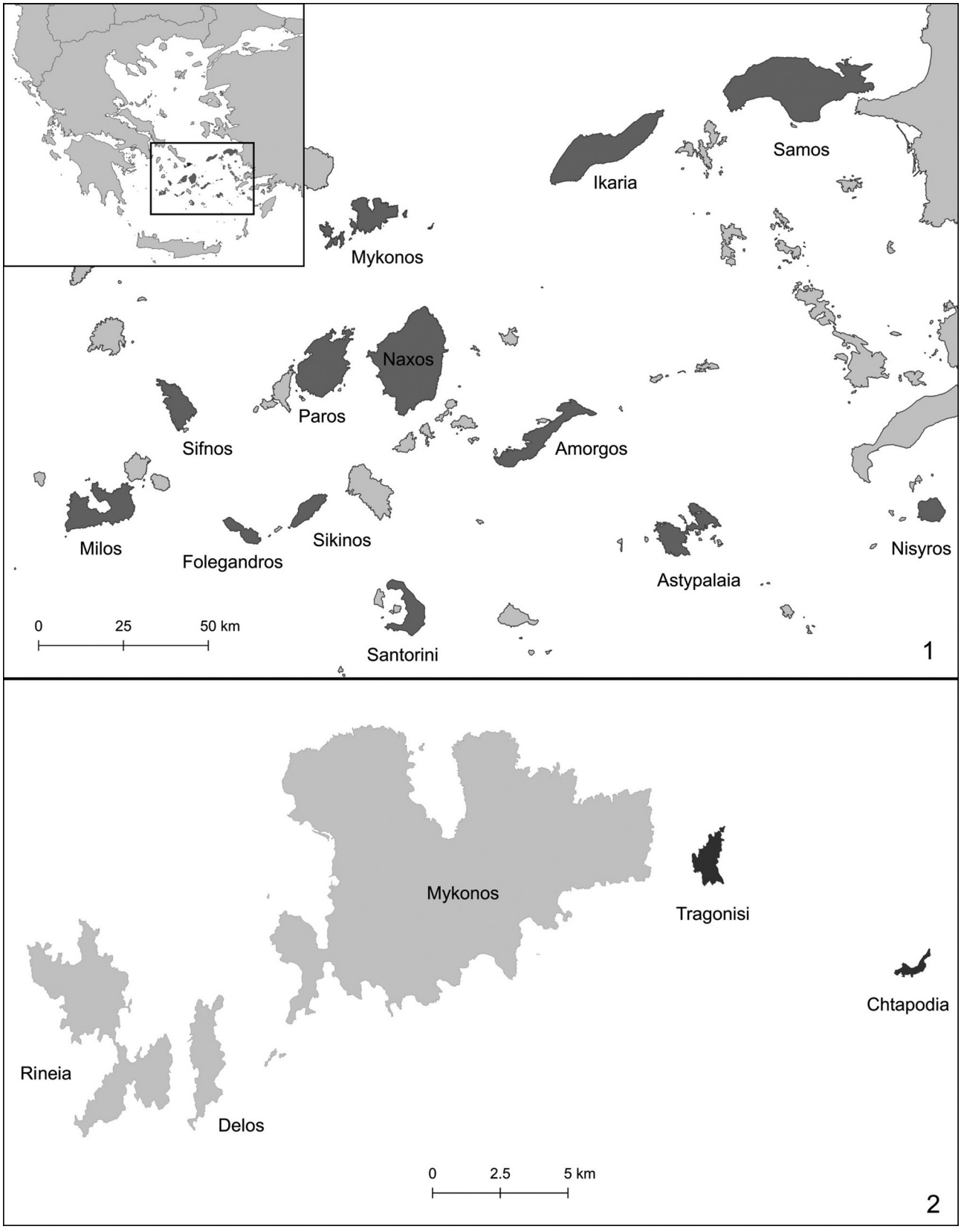
SAMPLING AND MATERIAL COLLECTED

During the first field trip on Chtapodia islet conducted on 30 April 2023 by KA Triantis, 11 adult shells, 11 subadult, one juvenile, and shell fragments of *Zonites* were collected, all referring to rather old shells. During the second sampling, on 10 January 2025, one live adult individual, eight fresh adult shells showing signs of rodent gnawing, and three old subadult shells were collected. All specimens were found within the upper 25 m of the islet, in areas with piles of stones and large shrubs of *Pistacia lentiscus*. The live individual was found at a depth of 30 cm beneath stones and soil, in aestivation, although the soil was moist and the climatic conditions were favourable for activity. Tragonisi islet was visited on 10 January 2025, and in colluvial stream deposits on the western side of the islet, four adult, five subadult, and three juvenile subfossil shells were found.

The live specimen was preserved in 75% ethanol after drowning for 24 hours. All adult and intact shells were measured with an electronic calliper, while the anatomy of the reproductive system of the holotype was examined under a Zeiss Stemi 508 stereomicroscope. Whorls were counted following Cameron (2016). Digital photographs were taken with a ProgRes GRYPHAX camera attached to the stereomicroscope. All material is deposited in the Invertebrate Division of the Natural History Museum of Crete (NHMC), University of Crete.

RED LIST STATUS

The conservation status of the new species was assessed against the IUCN Red List Categories and Criteria: Version 3.1 (IUCN 2012).



Figs 1–2. Study area: 1 – map of the central Aegean Sea, highlighting Mykonos and neighbouring islands; 2 – map of the Mykonos island group, with Chtapodia and Tragonisi islets where *Zonites whittakeri* n. sp. is reported from

RESULTS

SYSTEMATICS

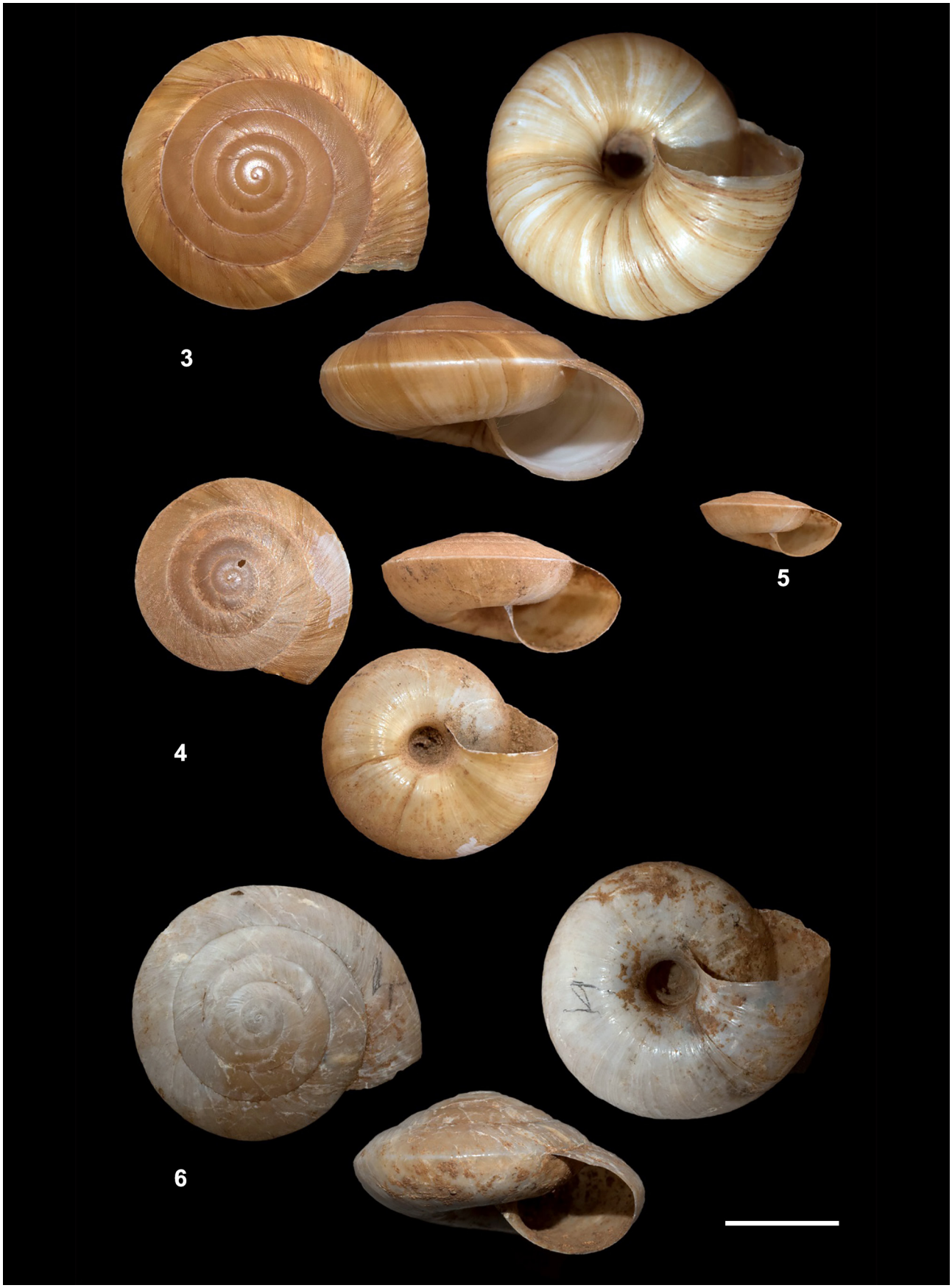
Order Stylommatophora A. Schmidt, 1855
Family Zonitidae Mörch, 1864
Genus *Zonites* Montfort, 1810

Zonites whittakeri n. sp. Triantis, Vardinoyannis, Goudeli et Mylonas, 2026

(Figs 3–7)

urn:lsid:zoobank.org:act:72A3235B-50AB-448B-AE17-283A686BE4E3

Type locality. Chtapodia (Χταπόδια) islet (37°24'38.8"N, 25°34'13.5"E), Mykonos (Μύκονος) Island group, Cyclades, Aegean Sea, Greece.
Type material. Holotype: adult, collected alive 10 January 2025, preserved in 75% ethanol; NHMC 50.57144; deposited in the Natural History Museum of Crete (NHMC), University of Crete, Herakleio, Crete, Greece.
Paratypes: 11 adult shells NHMC 50.57145.1-11, collected 30 April 2023, same locality as holotype, deposited in NHMC.
Additional material examined: 8 adult and 3 subadult shells NHMC 50.55233, collected 10 January 2025, same locality as holotype, deposited in NHMC; 4 adult, 5 subadult, and 3 juvenile subfossil shells NHMC 50.55261, collected 10 January 2025 from colluvial stream deposits on the western side of Tragonisi (Τραγονήσι) islet, (37°27'02.4"N, 25°28'59.9"E) Mykonos island group, Cyclades, Aegean Sea, Greece, deposited in NHMC.
Diagnosis. Shell of medium size (range of shell diameter 22.5–28 mm), with flat whorls (5.2–5.8) and shallow sutures. A keel is always present in juvenile specimens, but fades in adults, leaving a whitish trace. The upper surface is light brown, while the underside is much paler, making it one of the palest species of *Zonites*. The umbilicus is deep and conical, measuring approximately one-fifth to one-sixth of the shell width. The penis is long and bipartite, bearing internal hooked spines only in its proximal part. The caecum is long and finger-like.
Shell description. The shell is of medium size (Figs 3–6, Table 1), with the largest specimen reaching a diameter of 28 mm. It is slightly conical, with a blunt apex. The shell has 5.2–5.8 whorls, which are nearly flat, and the sutures are shallow; only between the last and the penultimate whorl is the suture deep, as the upper surface of the last whorl is distinctly convex. The width of the last whorl does not exceed twice the width of the penultimate whorl. The height of the spire is approximately half the height of the aperture. Aperture diameter is always larger than the aperture height, resulting in an oval opening. In adult specimens, the keel fades on the last whorl, leaving a whitish trace – juvenile specimens always exhibit a pronounced keel. The protoconch consists of 1.6 whorls. From the apex to about three-quarters of the first whorl, it bears very faint tubercles, while irregular radial wrinkles are more clearly visible. Beyond the first whorl, the tubercles are arranged in a spiral pattern, accompanied by faint, irregular growth lines. In the last half of the body whorl, the tubercles disappear and the growth lines become more irregular and more pronounced. The lower surface bears no tubercles, but only radial growth lines. The coloration of the upper surface is light brown, becoming paler on the last whorl as lighter radial bands increase in prominence. The lower surface is much paler brown than the upper, due to the presence of extensive white radial bands. The umbilicus is deep and conical, slightly eccentric. Its width ranges between one-fifth and one-sixth of the total shell diameter. Based on the shell characteristics and the measurements taken from the largest individuals of the populations of Tragonisi and Chtapodia (Table 1), no substantial differences were found between them, as confirmed by a PERMANOVA (1820 permutations) on the full set of shell measurements (Euclidean distance; df = 1.14, pseudo-F = 1.92, p = 0.151).
Reproductive system. The penis of the fully mature individual is long, bipartite, with a swelling in its proximal, and cylindrical in its distal part. The penial sheath is thin and covers the distal three-quarters of the penis; its upper edge is connected to the proximal one-third of the epiphallus by muscular fibres. In the dissected specimen, the distal part of the penis is everted, giving the impression of a shorter length (Fig. 7). Internally, only the proximal part of the penis bears hooked spines arranged on folds of varying thickness, while the cylindrical distal part has only small folds. The penial retractor muscle is long and slender and originates laterally on the flagellum, according to Riedel (1985), or caecum, according to Schileyko (2003), slightly above the penis–epiphallus junction. The caecum is finger-like, as long as the proximal part of the penis. The epiphallus is very long, about twice the length of the penis, and opens laterally at the junction of the penis and caecum. The vagina is elongate, approximately as long as the penis, covered by the perivaginal gland. The free oviduct is shorter than the vagina, equal in length to the duct of the spermatheca but much thicker. The spermatheca is elongate, very large, with attenuated apical part.
Distribution and habitat. The species was found alive only on the islet of Chtapodia, whereas subfos-



Figs 3–6. Shells of *Zonites whittakeri* n. sp., from Chtapodia islet: 3 – holotype; 4 – subadult; 5 – juvenile; from Tragonisi islet: 6 – subfossil. Scale bar 10 mm

Table 1. Shell measurements in mm of adult *Zonites whittakeri* n. sp. from Chtapodia and Tragonisi islets. Abbreviations: SD – Shell diameter, SH – Shell height, AD – Aperture diameter, AH – Aperture height, SpH – Spire height, Wh – Whorls, UD – Umbilicus diameter, LWhD – Last whorl diameter, PWhD – Penultimate whorl diameter. Specimens 2–12 from Chtapodia are paratypes

Islet	No	SD	SH	AD	AH	SpH	Wh	UD	LWhD	PWhD
Chtapodia	Holotype	26.3	15.0	11.9	9.9	5.3	5.7	4.3	6.0	3.5
	2	23.6	12.4	10.4	8.8	3.6	5.2	4.4	5.3	3.1
	3	22.5	11.8	10.0	7.9	3.0	5.3	4.0	4.9	3.0
	4	24.7	12.4	11.4	8.8	3.6	5.4	4.3	5.4	3.1
	5	24.0	12.5	11.8	8.7	3.8	5.4	4.0	5.6	2.8
	6	24.3	13.4	11.6	9.0	4.2	5.4	4.2	5.5	3.2
	7	24.2	12.7	11.5	8.8	3.9	5.4	4.0	5.7	3.1
	8	24.4	12.8	11.8	8.8	4.0	5.3	4.0	5.8	3.1
	9	24.4	12.1	11.7	8.8	3.3	5.3	4.3	5.4	3.0
	10	24.5	13.7	11.8	9.1	4.5	5.5	4.4	5.5	3.2
	11	28.0	16.0	12.6	10.0	6.0	5.8	5.0	6.4	3.4
	12	24.0	13.0	11.3	8.6	3.4	5.3	4.2	5.2	3.2
	Mean±SD	24.6±1.4	13.1±1.2	11.5±0.7	8.9±0.6	4.0±0.9	5.4±0.2	4.3±0.3	5.6±0.4	3.1±0.2
Tragonisi	1	24.2	13.1	10.9	8.4	4.5	5.3	4.5	5.6	3.4
	2	25.0	13.2	11.7	8.9	4.8	5.5	4.2	5.4	3.6
	3	26.4	14.1	11.8	9.0	6.1	5.5	4.8	5.8	3.6
	4	25.6	13.4	11.7	8.9	5.3	5.3	5.2	5.7	3.3
	Mean±SD	25.3±0.9	13.5±0.5	11.5±0.4	8.8±0.3	5.2±0.7	5.4±0.1	4.7±0.4	5.6±0.2	3.5±0.2
All	Mean±SD	24.8±1.3	13.2±1.1	11.5±0.6	8.9±0.5	4.3±0.9	5.4±0.2	4.4±0.4	5.6±0.3	3.2±0.2

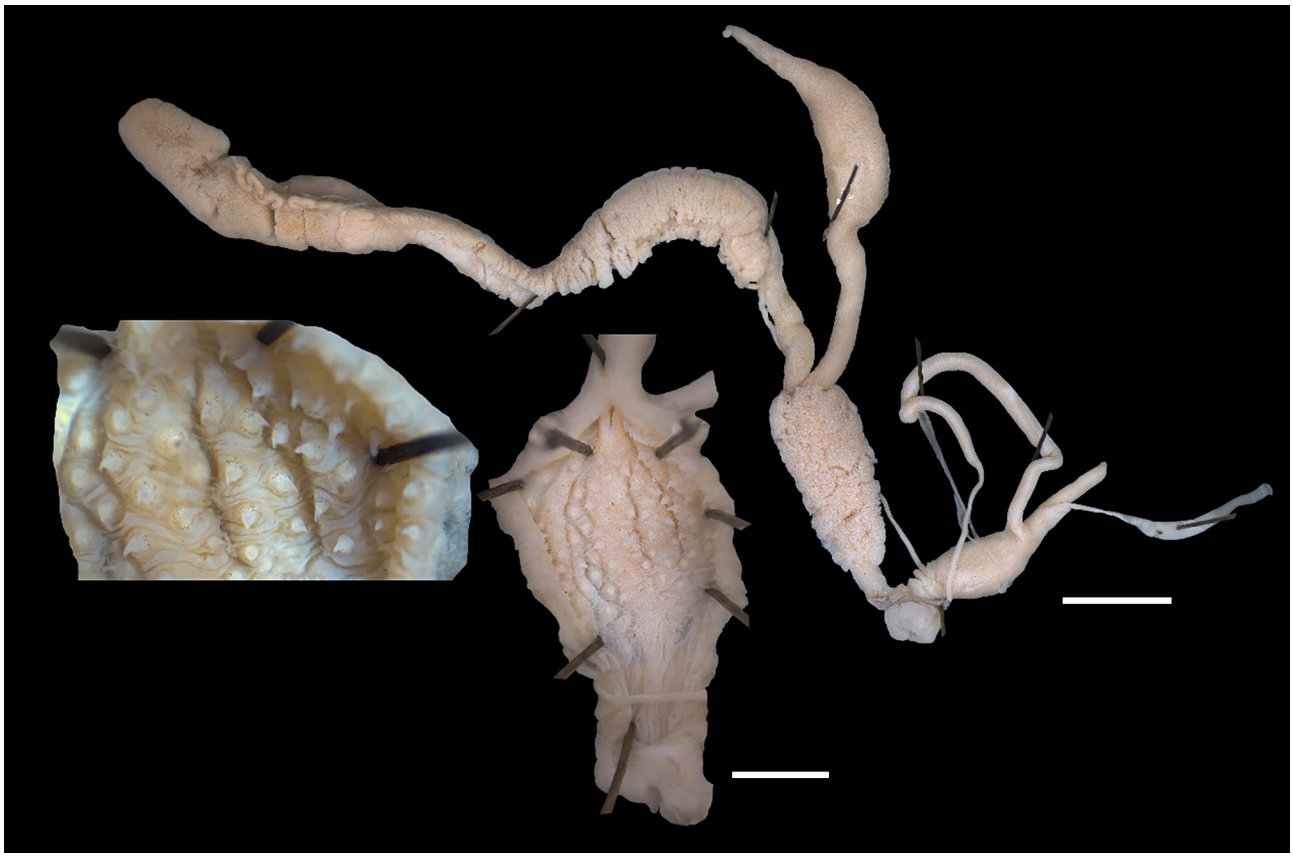


Fig. 7. Reproductive system and the internal structure of penis of *Zonites whittakeri* n. sp. Scale bars 2 mm (left) and 5 mm (right)

sil shells of the species were found on Tragonisi islet. On Chtapodia, fresh shells were recorded on the southern and western slopes of the summit of the islet, within an area not exceeding 2000 m^2. In this area, the vegetation is denser, with well-developed shrubs of *Pistacia lentiscus* and *Euphorbia acanthothamnos*, and includes several accumulations of stones. The live individual was discovered deep beneath stones and soil.

Etymology. Named in honour of Robert J. Whittaker (Emeritus Professor of Biogeography, University of Oxford), in recognition of his outstanding contributions to island biogeography. As well as, in recognition of his authorship of "Island Biogeography: Ecology, Evolution, and Conservation", the field's defining synthetic treatment, and his landmark research on the recolonisation of the Krakatau volcanic islands, it is particularly fitting that his name be borne by a species inhabiting a volcanic islet. A founding member and former President of the International Biogeography Society, Whittaker received the Alfred Russel Wallace Award in 2024 – the Society's highest distinction – for a lifetime of eminent contributions to biogeography.

Red List Status. This species is endemic to the islet of Chtapodia (Aegean Sea, Greece) and occupies a very restricted area, approximately 0.002 km^2. The population size is very small, with all individuals belonging to a single subpopulation. Two surveys have been conducted on the islet, during which the species was found at only one locality, situated at its summit. The total number of recorded shells was 34 and only one live adult specimen was collected. It is therefore estimated that the number of mature individuals is fewer than 50. The subfossil shells recovered from Tragonisi confirm a former presence on that islet; however, no live individuals or fresh shells were recorded there, and the Tragonisi population is considered extinct. The overall population of the species is therefore in decline. The islet is remote and lies within a Natura 2000 protected area (GR4220027); consequently, direct threats from human activities are unlikely to pose a major risk to the species. However, the principal threat appears to be predation by rodents, as several shells bore clear signs of predation. Accordingly, a continuing decline in the number of mature individuals of the species is projected. Taking the above into consideration, *Zonites whittakeri* n. sp. is assessed as Critically Endangered (CR), B2ab(v); C2a(i,ii); D (see: Appendix for full assessment).

DISCUSSION

Zonites is one of the most well-studied genera in the Greek malacofauna (Riedel 1985, 1987, 1992, Riedel & Mylonas 1995, 1997, Kornilios et al. 2009, Goudeli et al. 2026), yet the description of a new species underscores the importance of Aegean islets for the endemic biodiversity of Greece. This pattern extends well beyond molluscs. New species continue to be described from Aegean islets across a broad range of taxonomic groups, including a new plant, *Ornithogalum christiniae* (Asparagaceae), from the islet of Agria Gramvousa off northwestern Crete (Kypriotakis et al. 2025), a new lizard, *Podarcis levendis* (Lacertidae), from the islet of Pori (Lymberakis et al. 2008), and two new beetles, *Amphimallon claudiae* and *A. pim* (Scarabaeidae), from the islets of Glaronisia and Paximadi near Milos in the Cyclades (Lo Cascio et al. 2025). These examples, together with the new species described herein, reinforce the view that Aegean islets, despite their small size and apparent ecological simplicity, harbour endemic biotas whose full extent remains to be documented, particularly on the most remote and least-surveyed ones.

The occurrence of *Z. whittakeri* n. sp. on the islets of Chtapodia and Tragonisi, together with *Z. nisyrius* Riedel et Mylonas, 1997 from Nisyros, demonstrates that the genus *Zonites* is capable of persisting and undergoing differentiation not only on calcareous substrates, but also on volcanic formations. Both on Nisyros and Chtapodia, extant populations occupy comparable microhabitats characterised by piles of stones, friable soil, and maquis vegetation. The presence of a subfossil population on Tragonisi further suggests that *Z. whittakeri* n. sp. may have had a broader former distribution within the Mykonos island complex. Consequently, its occurrence in analogous colluvial deposits on Mykonos cannot be excluded and merits targeted investigation.

Zonites whittakeri n. sp. shows its closest conchological and anatomical affinities with certain forms of the highly polymorphic *Z. pergranulatus* Kobelt, 1878, a species distributed throughout the central Cyclades, including Naxos and Paros, and extending southwards to Amorgos and Astypalaia (Mylonas 1982, Riedel 1985, 1987, 1992, Triantis et al. 2008, Maroulis et al. 2022). Nevertheless, *Z. whittakeri* n. sp. can be readily distinguished by its markedly paler shell coloration, flatter whorls, shallower sutures, and by the absence of tubercles on the ventral surface of adult shells. Anatomically, the most diagnostic difference concerns penial morphology and armature. In *Z. whittakeri* n. sp., the hooked penial spines are restricted to the proximal region of the penis, whereas in *Z. pergranulatus* they extend throughout the entire penial lumen. *Zonites whittakeri* n. sp. dif-

fers substantially from additional species occurring in the broader Aegean region. *Zonites nikariae* Pfeffer, 1930, reported from Ikaria (Bank & Maassen 1998, Goudeli et al. 2026), Samos (Bank & Maassen 1998), and Delos as subfossil (Riedel 1985), possesses a more depressed shell, with spire height approximately one-third of aperture height, compared with approximately one-half in *Z. whittakeri* n. sp.; it further exhibits a relatively broader umbilicus. The reproductive anatomy of *Z. nikariae* differs primarily in the morphology of the caecum, which is spherical to pyriform, in the absence of penial spines, and in the proportions of the female genitalia, where the free oviduct is longer than the spermathecal duct; in *Z. whittakeri* n. sp., by contrast, these two structures are subequal in length. *Zonites chloroticus* (L. Pfeiffer, 1852) occurring on Ikaria and further eastwards (Bank et al. 2025, Goudeli et al. 2026), differs markedly from the new species in both conchological and anatomical characters. Its shell lacks a keel throughout ontogeny, is nearly hemispherical with distinctly convex whorls, and possesses a comparatively narrow umbilicus. Anatomically, *Z. chloroticus* differs in the configuration of the penis, whose distal part is more robust, and in the caecum, which terminates in a slender tubular appendage. In addition, the perivaginal gland is spherical and attached to the body wall by numerous muscular fibres.

These comparisons are also informative for the biogeography of *Zonites*. According to Riedel (1992), the genus dispersed into Greece from Asia Minor through the Cyclades during the Neogene. The occurrence of *Z. whittakeri* n. sp. on Chtapodia and Tragonisi does not appear to support the hypothesis of an east–west dispersal pathway via Samos, Ikaria, and the Mykonos island complex. Indeed, the more easterly taxa *Z. nikariae* and *Z. chloroticus* – the presence of *Z. nikariae* on Delos having been interpreted as the result of anthropogenic introduction (Riedel 1985) – show substantially greater conchological and anatomical divergence from *Z. whittakeri* n. sp. than does *Z. pergranulatus*. Taken together, these affinities suggest that *Z. whittakeri* n. sp. is more plausibly related to the *Z. pergranulatus* lineage of the central Cyclades than to the eastern Aegean *Zonites* taxa, a pattern that may reflect a more complex biogeographical history within the southern Aegean region.

Concerning conservation status, *Z. whittakeri* n. sp. qualifies as Critically Endangered on the basis of its extremely restricted area of occupancy and a single known extant subpopulation of fewer than 50 estimated mature individuals, with a projected continuing decline (see also Appendix). Subfossil shells from Tragonisi suggest a formerly wider distribution and the subsequent extirpation of the species from this islet. The new species conforms to a broader pattern within the genus: at least two *Zonites* species are already confirmed extinct, an additional one is presumed so, and the vast majority of the remaining taxa are considered threatened (NECCA 2024, IUCN 2025). The principal threat identified during our surveys is rodent predation by *Rattus rattus* (Linnaeus, 1758), evidenced by gnawing marks on fresh shells from Chtapodia. Studies from various regions worldwide show that introduced rats are among the most destructive forces acting on endemic island land snails, capable of driving populations to near-extinction through sustained predation; declines of 85% within a single decade have been documented in isolated snail populations under rat pressure, and island-wide extinction rates of 30–80% have been attributed largely to invasive predators (e.g. St Clair 2011, Cowie et al. 2026). Although Chtapodia islet is part of the Natura 2000 network (GR4220027), this offers no safeguard against invasive predators. Rodent eradication is therefore the most urgent conservation measure required; the small size of the islet makes it a tractable candidate for such an intervention, as demonstrated by similar eradication programmes on other small Mediterranean islands (Capizzi 2020). Regular population monitoring should be established in parallel to document the effectiveness of eradication efforts and detect any further decline (e.g. Hyman et al. 2024).

ACKNOWLEDGEMENTS

We are grateful to three anonymous reviewers for their insightful comments. Special thanks to the Hellenic Ornithological Society (HOS) for supporting the first field trip. Both visits were joint expeditions – the first with Danae Portolou and Angelos Evangelidis, the second with Tasos Dimalexis and to Tom Matthews for comments and suggestions.

REFERENCES

Bank R. A., Bochud E., Menkhorst H. P. M. G., Neubert E. 2025. Malacofauna Turcica: The terrestrial Gastropoda of Türkiye, 2 Vol. Conch Books, Harxheim.

Bank R. A., Maassen W. J. M. 1998. Beiträge zur Molluskenfauna der Präfektur Samos (Griechenland, östlichen Ägäis). De Kreukel 34 (4/5): 45–80.

Cameron R. A. D. 2016. Slugs and Snails. Collins New Naturalist Library, Book 133. Collins, London.

Capizzi D. 2020. A review of mammal eradications on Mediterranean islands. Mammal Review 50: 124–135. https://doi.org/10.1111/mam.12190

Cowie R. H., Bouchet P., Fontaine B. 2026. Devastation of island biodiversity: a land snail perspective. Philosophical Transactions of the Royal Society of London B: Biological Sciences 381 (1942): 20240425. https://doi.org/10.1098/rstb.2024.0425

Fuchs A., Käufel F. 1936. Anatomische und systematische Untersuchungen and Land- und Süßwasserschnecken aus Griechenland und von den Inseln des Ägäischen Meeres. Archiv für Naturgeschichte, Neue Folge 5(4): 541–662.

Galanidou N., Dellaporta K., Sakellariou D. 2020. Greece: unstable landscapes and underwater archaeology. In: Bailey G., Galanidou N., Peeters H., Jöns H., Mennenga M. (eds). The Archaeology of Europe's Drowned Landscapes. Springer Open, Cham: 371–392. https://doi.org/10.1007/978-3-030-37367-2_19

Goudeli G., Triantis K. A., Vardinoyannis K., Mylonas M. 2026. The *Zonites* species of Ikaria Island: Rediscovery after over a century and first description of the reproductive system. Folia Malacologica 34(2):119–126. https://doi.org/10.12657/folmal.034.012

Hyman I. T., Van Sluys M., Foon J. K., Macgregor N. A., Anderson A. H., Patel T., Williams Clow T., Wilson M., Daly A., Bennison K., Bonson P., Brown S., Christian B., Finlayson B., Greenup N., King L.-U., Köhler F. 2024. The challenge of preventing extinctions: lessons from managing threatened land snails on Norfolk Island. PLoS ONE 19(12): e0314300. https://doi.org/10.1371/journal.pone.0314300

IUCN 2012. IUCN Red List Categories and Criteria: Version 3.1. Second edition. Gland, Switzerland and Cambridge, UK.

IUCN 2025. The IUCN Red List of Threatened Species. Version 2025-2. Available online at https://www.iucnredlist.org (accessed 10 May 2026).

Kobelt W. 1878. Diagnosen neuer Arten. Jahrbücher der Deutschen Malakozoologischen Gesellschaft 5: 319–321. https://www.biodiversitylibrary.org/page/25214440

Kornilios P., Poulakakis N., Mylonas M., Vardinoyannis K. 2009. The phylogeny and biogeography of the genus *Zonites* Montfort, 1810 (Gastropoda: Pulmonata): preliminary evidence from mitochondrial data. Journal of Molluscan Studies 75: 109–117. https://doi.org/10.1093/mollus/eyp003

Kypriotakis Z., Tzanoudakis D., Antaloudaki E. 2025. *Ornithogalum christiniae* (Asparagaceae): a new species from an offshore islet on the Cretan area (S. Aegean, Greece). Nordic Journal of Botany 2025: e04485. https://doi.org/10.1111/njb.04485

Linnaeus C. 1758. Systema naturæ per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio decima, reformata. Tomus I: [4] + 824 pp. Salvius, Holmiæ. https://doi.org/10.5962/bhl.title.559

Lo Cascio P., Davranoglou L.-R., Manolas N. 2025. Two new *Amphimallon* Latreille, 1825 from the tiny islets of Milos archipelago, Cyclades, Greece (Coleoptera Scarabaeidae Melolonthinae). Biodiversity Journal 16(3): 521–531. https://doi.org/10.31396/Biodiv.Jour.2025.16.3.521.531

Lykousis V. 2009. Sea-level changes and shelf-break prograding sequences during the last 400 ka in the Aegean margins: subsidence rates and palaeogeographic implications. Continental Shelf Research 29(16): 2037–2044. https://doi.org/10.1016/j.csr.2008.11.005

Lymberakis P., Poulakakis N., Kaliontzopoulou A., Valakos E., Mylonas M. 2008. Two new species of *Podarcis* (Squamata; Lacertidae) from Greece. Systematics and Biodiversity 6(3): 307–318. https://doi.org/10.1017/S1477200008002727

Maroulis L., Poulakakis N., Proios K., Karakasi D., Triantis K. A., Mylonas M., Vardinoyannis K. 2025. On the path to extinction: *Helix godetiana* Kobelt, 1878, the only threatened *Helix* species in Greece. Nature Conservation 58: 1–10. https://doi.org/10.3897/natureconservation.58.129016

Maroulis L., Proios K., Mylonas M., Vardinoyannis K., Triantis K. A. 2022. Filling the gaps: first record of *Zonites* Montfort, 1810 from Paros island (Cyclades, Aegean, Greece). Folia Malacologica 30(4): 251–253. https://doi.org/10.12657/folmal.030.022

Montfort P. Denys de 1810. Conchyliologie systématique et classification méthodique des coquilles. Vol. 2: pp. 676 + 16. Schoell, Paris. https://www.biodiversitylibrary.org/item/41566

Mörch [Mørch] O. A. L. 1864. Fortegnelse over de i Danmark forekommende land- og ferskvandsblöddyr. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Köbenhavn (2) 1863 (17–22): 265–367. https://www.biodiversitylibrary.org/page/35851876

Mylonas M. 1982. The zoogeography and ecology of the terrestrial mollusks of Cyclades. [PhD dissertation], [Athens]: University of Athens.

Mylonas M., Vardinoyannis K. 2022. The terrestrial malacofauna of the Southeast – Central Aegean islets. Journal of Conchology 44(4): 317–334. https://conchsoc.org/sites/default/files/jconch/44/4/2022-44401.pdf

NECCA 2024. Natural Environment and Climate Change Agency. The Greek Red List of Threatened Species. Athens, Greece. Available online at redlist.necca.gov.gr (accessed 13/12/2025).

Pfeffer G. 1930. Die Unterfamilie Zonitinae (Moll., Pulm.). Mitteilungen aus dem Zoologischen Museum in Berlin 16(3): 411–507.

Pfeiffer L. 1852. Neue Heliceen. Zeitschrift für Malakozoologie 8(8): 127–128. https://www.biodiversitylibrary.org/page/16300627

Proios K., Maroulis L., Rigal F., Matthews T. J., Cameron R. A. D., Sfenthourakis S., Whittaker R. J., Vardinoyannis K., Mylonas M., Triantis K. A. 2024. Functional diversity and community convergence of land snails in the Aegean Sea islands. Journal of Biogeography 51(9): 1632–1645. https://doi.org/10.1111/jbi.14740

RIEDEL A. 1985. Revision der Gattung *Zonites* Montfort (Gastropoda, Zonitidae): griechische Arten. Annales Zoologici 39(1): 1–67.

RIEDEL A. 1987. Revision der Gattung *Zonites* Montfort (Gastropoda, Zonitidae): türkische Arten. Nebst Ergänzungen und Verzeichnis aller *Zonites*-Arten. Annales Zoologici 41(1): 1–42.

RIEDEL A. 1992. The Zonitidae (sensu lato) (Gastropoda, Pulmonata) of Greece. Fauna Graeciae V. Hellenic Zoological Society, Athens.

RIEDEL A., MYLONAS M. 1995. The Zonitidae of the South-East Aegean islets (Gastropoda: Pulmonata). Genus 6(2): 229–245.

RIEDEL A., MYLONAS M. 1997. Neue Angaben über einige *Zonites*-Arten von den griechischen Inseln, nebst Beschreibung neuer Taxa (Gastropoda: Stylommatophora: Zonitidae). Malakologische Abhandlungen 18(14): 153–164.

RIEDEL A., NORRIS A. 1987. An undescribed species of *Zonites* from the island of Santorini, Greece. Journal of Conchology 32: 377–378. https://doi.org/10.5962/p.407915

SCHILEYKO A. A. 2003. Treatise on Recent terrestrial pulmonate molluscs. Part 10. Ariophantidae, Ostracolethidae, Ryssotidae, Milacidae, Dyakiidae, Staffordiidae, Gastrodontidae, Zonitidae, Daudebardiidae, Parmacellidae. Ruthenica (Supplement) 2: 1309–1466.

SCHMIDT A. 1855. Der Geschlechtsapparat der Stylommatophoren in taxonomischer Hinsicht gewürdigt. Abhandlungen des Naturwissenschaftlichen Vereins für Sachsen und Thüringen in Halle 1: 1–52.

SFENTHOURAKIS S., TRIANTIS K. A. 2017. The Aegean archipelago: a natural laboratory of evolution, ecology and civilisations. Journal of Biological Research – Thessaloniki 24(4): 1–13. https://doi.org/10.1186/s40709-017-0061-3

SKOULIKIDIS N., MARKOPOULOU-DIAKANDONI A. 1993. Contribution to the stratigraphic and palaeogeographic evolution of the Aegean Neogene. The islet Chtapodia (Cyclades). Bulletin of the Geological Society of Greece 29: 71–82. [in Greek with English abstract]

ST CLAIR J. J. H. 2011. The impacts of invasive rodents on island invertebrates. Biological Conservation 144: 68–81. https://doi.org/10.1016/j.biocon.2010.10.006

TRIANTIS K. A., MYLONAS M. 2009. Greek islands, biology. In: GILLESPIE R. G., CLAGUE D. A. (eds). Encyclopedia of Islands. University of California Press, Berkeley, pp. 388–392. https://doi.org/10.1525/9780520943728-091

TRIANTIS K. A., VARDINOYANNIS K., MYLONAS M. 2008. Biogeography, land snails and incomplete data sets: the case of three island groups in the Aegean Sea. Journal of Natural History 42(5–8): 467–490. https://doi.org/10.1080/00222930701835431

VARDINOYANNIS K., MYLONAS M. 2019. Land gastropods' view of the Aegean. Key islands and key species. 14th ICZEGAR, International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions, 27–30 June, 2019. Thessaloniki, Book of Abstracts: 147.

VARDINOYANNIS K., PARMAKELIS A., TRIANTIS K. A., GIOKAS S. 2018. Land molluscs in Greece: the rich, unique, diverse and unprotected animal models. In: SFENTHOURAKIS S., PAFILIS P., PARMAKELIS A., POULAKAKIS N., TRIANTIS K. A. (eds). Biogeography and Biodiversity of the Aegean. In Honour of Prof. Moysis Mylonas. Broken Hill Publishers Ltd, Nicosia, pp. 47–66.

WELTER-SCHULTES F. W. 2012. European non-marine molluscs, a guide for species identification: Bestimmungsbuch für europäische Land- und Süsswassermollusken. Planet Poster Editions, Göttingen.

Received: May 30th, 2026
Revised: July 7th, 2026
Accepted: July 11th, 2026
Published on-line: September 14th, 2026

APPENDIX

RED LIST ASSESSMENT of *Zonites whittakeri* n. sp.

***Zonites whittakeri* n. sp.**

ANIMALIA – MOLLUSCA – GASTROPODA – STYLOMMATOPHORA – ZONITIDAE – *Zonites* – *whittakeri*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note: New species for science

Red List Status	
CR - Critically Endangered, B2ab(v); C2a(i,ii); D (IUCN version 3.1)	
Possibly Extinct:	No
Possibly Extinct in the Wild:	No
Date Last Recorded (in the wild):	10/01/2025

Red List Assessment/Assessment Information

Date of Assessment: 2026-03-28

Assessor(s): Goudeli, G.

Regions: Greece

Assessment Rationale

This species is endemic to the islet of Chtapodia (Aegean Sea, Greece) and occupies a very restricted area, approximately 0.002 km^2. The population size is very small, with all individuals belonging to a single subpopulation. Two surveys have been conducted on the islet, during which the species was found at only one locality, situated at its summit. The total number of recorded shells was 34 and only one live specimen was collected. It is therefore estimated that the number of mature individuals is fewer than 50. The subfossil shells recovered from Tragonisi confirm a former presence on that islet; however, no live individuals or fresh shells were recorded there, and the Tragonisi population is considered extinct. The overall population of the species is therefore in decline. The islet is remote and lies within a Natura 2000 protected area (GR4220027); consequently, direct threats from human activities are unlikely to pose a major risk to the species. However, the principal threat appears to be predation by rodents, as several shells bore clear signs of predation. Accordingly, a continuing decline in the number of mature individuals of the species is projected. Taking the above into consideration, *Zonites whittakeri* n. sp. is assessed as CR-Critically Endangered, B2ab(v); C2a(i,ii); D.

Distribution

Geographic Range

The species is endemic to the Islet of Chtapodia (Aegean Sea, Greece) (TRIANTIS et al. 2026). Very few shells and one live specimen were found exclusively on the islet's summit. The subfossil shells recovered from Tragonisi confirm a former presence on that islet.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km²	**Justification**
4	Estimated in GeoCAT based on the map produced by the assessor. However, the area of the islet is only 0.5 km², and the species was recorded from a single locality, Therefore, the actual occupied area is much smaller, approximately 0.002 km².

Continuing decline in area of occupancy (AOO)	**Qualifier**	**Justification**
No	-	-

Extreme fluctuations in area of occupancy (AOO)	**Justification**
No	-

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km²	**EOO estimate calculated from Minimum Convex Polygon**	**Justification**
NA		The species is endemic to the islet of Chtapodia (Aegean Sea, Greece), known only from a single locality.

Continuing decline in extent of occurrence (EOO)	**Qualifier**	**Justification**
No	-	-

Extreme fluctuations in extent of occurrence (EOO)	**Justification**
No	-

Locations Information

Number of Locations	**Justification**
1	Based on the known threat from introduced species, and occurrence on one islet, the number of locations identified is one.

Continuing decline in number of locations	**Qualifier**	**Justification**
No	-	-

Extreme fluctuations in the number of locations	Justification
No	-

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
Yes	The species are endemic to the islet of Chtapodia and it is known only from the locus typicus.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 85

Elevation Upper Limit (in metres above sea level): 110

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Point data (TRIANTIS et al. 2026)	-	false	-	Data points	

Biogeographic Realms

Biogeographic Realm: Palearctic

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Greece	Extant	Native	-	Resident

Population

The population is very small. The island has been surveyed twice (on 30 April 2023 and 10 January 2025). The species is recorded only from a small area on the islet's summit. In total, only one live individual and a few fresh shells have been found. Therefore, it is estimated that the total number of mature individuals is less than 50, all belonging to one single subpopulation. The subfossil shells recovered from Tragonisi confirm a former presence on that islet.

Population Information

Current Population Trend: Decreasing

Severely fragmented?	Justification
No	-

Continuing decline in number of mature individuals?	Qualifier	Justification
Yes	Inferred	Predation by rodents

All individuals in one subpopulation: Yes

Number of Subpopulations	Justification	Subpopulation Details	Subpopulation description	Number of mature individuals	Subpopulation trend	Qualifier	Location type	Number of Subpopulations	Location bounding box	Location coordinates	Notes
1	This species is endemic to the islet of Chtapodia (Aegean, Greece). The species is known from a single location	-	-	-	-	-	-	-	-	-	-

Habitats and Ecology

The species was found under a large pile of stones.

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
6. Rocky areas (eg. inland cliffs, mountain peaks)	Resident	Suitable	Yes

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
No	-	-

Systems

System: Terrestrial

Use and Trade

General Use and Trade Information

Species not utilised: true

This species is not used or traded.

Threats

The islet of Chtapodia is remote and is located within a Natura 2000 Protected Area (GR4220027). Therefore, direct threats from human activities are not a major issue for this species. The main threat to the species appears to be predation by rats.

Threats Classification Scheme

Threat	Timing	Scope	Severity
8.1.2. Invasive and other problematic species, genes & diseases -> Invasive non-native/alien species/diseases -> Named species	Ongoing	Whole (>90%)	Slow, significant declines

Conservation

The species occurs in a protected area (Natura 2000 site). There are no conservation actions regarding the species. Research is recommended upon the population trend and size, life history, and ecology of the species. Rodent eradication is the most urgent conservation measure required.

Conservation Actions In-Place

Occur in at least one PA	Note
Yes	-

Important Conservation Actions Needed

Conservation Actions	Note
1.1. Land/water protection -> Site/area protection	-
2.2. Land/water management -> Invasive/problematic species control	-
4.3. Education & awareness -> Awareness & communications	-
5.4.2. Law & policy -> Compliance and enforcement -> National level	-

Research Needed

Research	Note
1.1. Research -> Taxonomy	-
1.2. Research -> Population size, distribution & trends	-
1.5. Research -> Threats	-