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The reptiles of the Matese Massif (southern Italy)

ABSTRACT

Long-term investigations on the reptiles of the Matese Massif (Campania side and Molise side, southern Italy) were carried out from 2008 to 2019. Eighteen species of reptiles (2 Testudines, 7 Sauria, 9 Serpentes) were found: *Emys orbicularis, Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica, Anguis veronensis, Lacerta bilineata, Podarcis muralis, Podarcis siculus, Chalcides chalcides, Coronella austriaca, Coronella girondica, Elaphe quatuorlineata, Hierophis viridiflavus, Natrix helvetica, Natrix tessellata, Zamenis lineatus, Zamenis longissimus,* and *Vipera aspis*. This is very interesting as the number of species found in the study area is the same of that so far observed in much wider geographically areas of southern Italy, i.e. Campania and Molise regions. The most widespread species are *Lacerta bilineata, Podarcis muralis, Podarcis siculus, Anguis veronensis, Hierophis viridiflavus* and *Natrix helvetica,* while the most localized ones are *Emys orbicularis, Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica,* and *Coronella girondica*. In the study area both species *Zamenis lineatus* and *Z. longissimus* occur sympatrically. The results of our investigation point out the environmental importance and the high herpetological interest of the study area. Therefore, the maintenance of natural habitats and their correct management for conservation of the local populations of reptiles are of crucial importance.

Keywords: Campania, checklist, conservation, distribution, Matese Massif, Molise, reptiles, southern Italy.

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INTRODUCTION

The knowledge on the reptiles occurring in the Matese Massif, a wide mountainous area located between the Campania and Molise regions (southern Italian Peninsula), is currently very scarce. In fact, only few data are available in the literature (e.g. Bruno, 1973; Bruno & Guacci, 1993; Mancini *et al.*, 2001; Guarino *et al.*, 2012; Capula *et al.*, 2018), and to date no thorough research has been carried out on the presence, distribution and ecology of the reptile species of the massif. The only study carried out on the local herpetological fauna, although relating to the Campania side of the massif only, is that carried out by Guarino *et al.* (2002) in the protected area of the Matese Regional Park (Province of Caserta), where a total of nine reptile species were found.

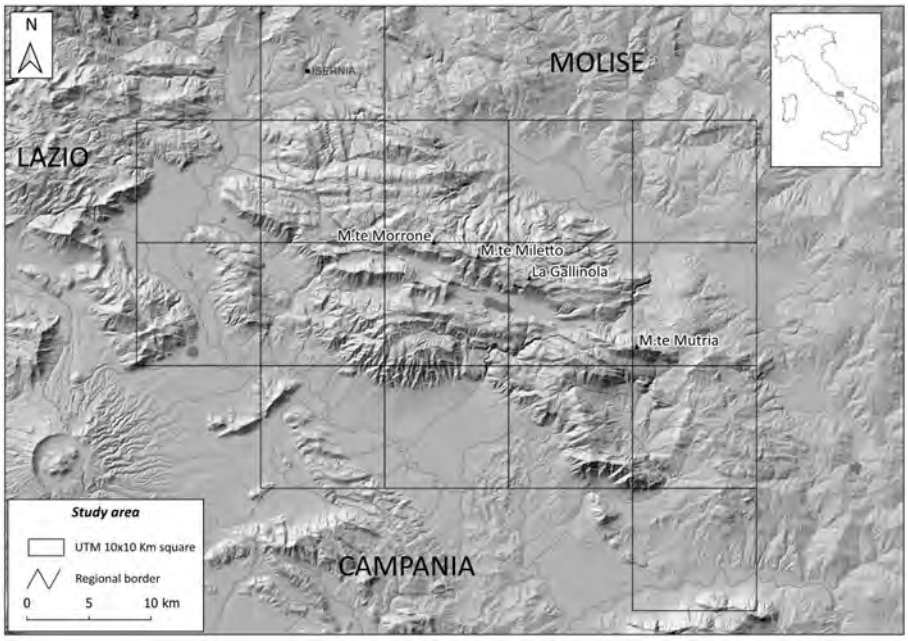

Fig. 1. The 16 UTM 10x10 km grid units superimposing the Matese Massif (study area). The upper rectangle at the right side shows the position of the study area in the Italian Peninsula.

The present work reports the results of original investigations, which were carried out from 2008 to 2019 and integrated also using literature data, on the presence and distribution of the reptile species in the Matese Massif. These researches were carried out with the primary purpose to provide for the first time a comprehensive annotated checklist of the reptile species, to acquire better information on their presence and distribution, and in consideration of the fact that the acquisition of this knowledge is essential for the conservation of local

populations of reptiles as well for a correct and appropriate management of their habitats.

MATERIAL AND METHODS

Study area

The study area corresponds entirely to the Matese Massif (Fig. 1), including both the Campania side and the Molise side. The massif spreads over an area of about 50,000 hectares and extends, with a W-E orientation, between the Volturno River and the upper valley of the Tammaro River, and culminates with the Monte Miletto (2050 m a.s.l.). The massif is characterized by the predominance of limestone soils and karst phenomena. There are some lake basins, among which the Matese Lake stands out, lying in a karst depression about 8 km long and about 2 km wide, at the foot of the Monte Miletto.

Some of the main protected natural reserves of the Molise and Campania regions fall within the Matese area. On the Molise side there are the WWF Guardiaregia-Campochiaro Regional Nature Reserve, and the Callora Torrent Nature Reserve, both falling within the SAC IT 7222287 called "La Gallinola-Monte Miletto-Monti del Matese". On the Campania side there is the Matese Regional Park, which extends for 33,326.5 ha. The Campania side is administratively assigned to the provinces of Caserta and Benevento, while the Molise side is assigned to the provinces of Isernia and Campobasso. On both sides of the Matese Massif there is a mosaic of habitats: plant formations typical of the Mediterranean scrub, semi-desert stony ground on the south-western side, wood formations consisting of beech forests, calcicolous and rocky grassy formations of the sunny slopes, up to the mountain and alpine calcareous scree.

The guide species for the phytoclimatic type are: *Fagus sylvatica, Taxus baccata, Ilex aquifolium, Acer lobelii, Ostrya carpinifolia, Sorbus aria, Arum lucanum, Linum capitatum*, and *Geranium cinereum* (Lucchese, 1995).

Methods

Data obtained from field surveys (original data) performed over a period of 12 years (2008-2019) were mainly used for the redaction of this paper. In addition to the original data, data collected on the basis of the analysis of the scientific literature (literature data), and data from the herpetological database "Progetto Atlante degli Anfibi e dei Rettili del Molise" (Capula *et al.*, 2008, 2010, 2018) were also used.

The collection of data in the field was carried out mainly, but not exclusively, during spring and summer months (March-October), according to the methodologies reported by Maio *et al.* (2000) and Cirucci *et al.* (2023).

Municipalities	Province	No. of investigated localities
Ailano	Caserta (Campania)	4
Alife	Caserta (Campania)	4
Bojano	Campobasso (Molise)	10
Campochiaro	Campobasso (Molise)	13
Cantalupo nel Sannio	Isernia (Molise)	1
Capriati al Volturno	Caserta (Campania)	19
Castello del Matese	Caserta (Campania)	8
Castelpetroso	Isernia (Molise)	13
Castelpizzuto	Isernia (Molise)	4
Cerreto Sannita	Benevento (Campania)	9
Ciorlano	Caserta (Campania)	2
Cusano Mutri	Benevento (Campania)	23
Fontegreca	Caserta (Campania)	2
Gallo Matese	Caserta (Campania)	14
Gioia Sannitica	Caserta (Campania)	5
Guardiaregia	Campobasso (Molise)	47
Isernia	Isernia (Molise)	6
Letino	Caserta (Campania)	16
Longano	Isernia (Molise)	3
Monteroduni	Isernia (Molise)	6
Piedimonte Matese	Caserta (Campania)	23
Pietraroja	Benevento (Campania)	19
Prata Sannita	Caserta (Campania)	2
Raviscanina	Caserta (Campania)	9
Roccamandolfi	Isernia (Molise)	11
Ruviano	Caserta (Campania)	1
San Giuliano Del Sannio	Campobasso (Molise)	4
San Gregorio Matese	Caserta (Campania)	30
San Lorenzello	Benevento (Campania)	1
San Massimo	Campobasso (Molise)	6
San Polo Matese	Campobasso (Molise)	5
San Potito Sannitico	Caserta (Campania)	2
Santa Maria del Molise	Isernia (Molise)	1
Sant'Agapito	Isernia (Molise)	7
Sant'Angelo D'Alife	Caserta (Campania)	3
Sepino	Campobasso (Molise)	23
Valle Agricola	Caserta (Campania)	3
Venafro	Isernia (Molise)	2

Tab. I. Municipalities and number of localities in the Matese Massif from which data were collected.

The field surveys, lasting one day each (for a total of 103 research days), were carried out during day hours, traveling along predetermined transects which

were based on cartographic and vegetational characteristics, and recording the observations of the encountered species on paper notebooks.

During field investigations, data relating to distribution, frequency and type of activity (i.e. reproduction, feeding) of the observed species were collected, and the macro-environmental characteristics of the observation sites were recorded. Particular attention was paid to the collection of data relating to the species included in the Habitat Directive 92/43/EEC, and to the threatened species included in the Italian and European Community red lists (Bulgarini *et al.*, 1998; Rondinini *et al.*, 2013; IUCN, 2023). All records of reptile species were associated with a given land cover type based on GPS position. The CORINE levels were grouped together into three macro-classes depending on the CORINE category: (1) Natural; (2) Agricultural; and (3) Urban.

SPECIES	No. of UTM 10x10 km squares	% study area occupied by the species	Altitudinal range (min-max m a.s.l.; average in brackets)	No. of records
Emys orbicularis	1	6	176	2
Testudo hermanni	3	19	179-400 (289)	5
Hemidactylus turcicus	3	19	170-744 (457)	5
Tarentola mauritanica	1	6	168-224 (196)	2
Chalcides chalcides	8	50	124-1250 (687)	16
Lacerta bilineata	15	94	89-1300 (694)	60
Podarcis muralis	11	69	121-1680 (900)	48
Podarcis siculus	13	81	121-1298 (709)	46
Anguis veronensis	10	62	175-1359 (767)	15
Coronella austriaca	6	37	354-1420 (887)	7
Coronella girondica	1	6	60	1
Elaphe quatuorlineata	7	44	175-835 (592)	9
Hierophis viridiflavus	14	87	124-1028 (576)	63
Natrix helvetica	12	75	124-1350 (737)	29
Natrix tessellata	4	25	124-650 (387)	4
Zamenis lineatus	5	31	125-662 (407)	5
Zamenis longissimus	6	33	561-1300 (930)	18
Vipera aspis	8	50	300-1380 (840)	25

Tab. II. Reptile species occurring in the study area, number of UTM 10X10 km squares in which the species were found, their altitudinal range, and number of records.

The field investigations were based on visual observations only, i.e. detection by direct visual observation, and no individual was caught during the research. The records were collected from 38 municipalities that are listed in Tab. I. Both the original records from the field and literature data were screened, validated and entered as records in a database prepared using Microsoft EXCEL software. Each record was geo-referenced using WGS 84/UTM33N. The database was projected to the same coordinate system (WGS84) and transformed into a 10×10 km grid. We

aggregated the occurrence records to the Universal Transverse Mercator (UTM) grid system at a spatial resolution of 100 km^2 (UTM 10×10 km). We mapped the species occurrence by assigning each species to the corresponding UTM 10×10 km square following Sillero *et al.* (2005) and Cirucci *et al.* (2023), and the study area was divided into 16 UTM 10×10 km squares (Fig. 1).

Species were identified according to their morphology and coloration following Corti *et al.* (2011). The nomenclature adopted for the species in this paper is that proposed by Di Nicola *et al.* (2019) and Uetz *et al.* (2023).

RESULTS

Based on long-term field investigations and literature data analysis a total of 362 records (1 record = 1 species per 1 locality) were collected and the occurrence of 18 autochthonous species of reptiles (one Emydidae, one Testudinidae, one Gekkonidae, one Phyllodactylidae, three Lacertidae, one Anguidae, one Scincidae, six Colubridae, two Natricidae, one Viperidae) was assessed (see checklist in Tab. II). No exotic/alien species was found. This is very interesting, as this number corresponds to the total number of reptile species occurring in much wider regions of southern Italy, i.e. Campania (13.670 km²; Guarino *et al.*, 2012) and Molise (4.438 km²; Capula *et al.,* 2018).

The distribution maps of the species found in the study area are reported in Figs. 2-19. The most widespread species were *Lacerta biliineata* (94% of the study area), *Hierophis viridiflavus* (87%), *Podarcis siculus* (81%), *Natrix helvetica* (75%), *Podarcis muralis* (69%) and *Anguis veronensis* (62%). On the other hand, *Testudo hermanni* was detected in 19% of the study area, *Hemidactylus turcicus* in 19%, *Emys orbicularis* in 6%, *Tarentola mauritanica* in 6%, and *Coronella girondica* in 6%. At this regard it is to be noted that *Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica* and *Coronella girondica* are thermophilous species, usually occurring in Mediterranean xeric habitats at lowest altitudes only. Of particular interest is the sympatric presence in the Matese Massif of *Zamenis longissimus* and *Z. lineatus*. Indeed, in this macro-area the ranges of the two species partially overlap (Capula & Luiselli, 2013). At this regard it is to be noted that some putative natural hybrids between the two species were encountered during field investigations in the western part of the study area. The supposed hybrid origin of these individuals is hypothesized on the basis of the intermediacy of morphological and chromatic characters typical of both *longissimus* (light nuchal blotches) and *lineatus* (reddish iris colour; large black stripe which extends from the rear edge of the eye towards the corner of the mouth, joining the black spot at the lower part of the jaw; vertical narrow black stripe below the eyes reaching the supralabials) (see Fig. 20) and needs to be confirmed by further morphological and genetic investigations.

As to the species richness, the analysis shows that in 9 out of 16 UTM cells, that is 56% of the investigated area, the number of recorded species ranges from 9 to 12, and in 4 UTM cells (25% of the investigated area) this number ranges from 5 to

8 (Fig. 21). The areas with few or no reptile records in the cells included places occupied by lakes or human-altered environments, such as roads, urbanized areas, and intensive farming and pastures. Most of the species found in the Matese Massif were recorded in two land cover categories (see Tab. III). Over 50% of the records concerning 16 species (*Emys orbicularis, Testudo hermanni, Chalcides chalcides, Lacerta bilineata, Podarcis muralis, Podarcis siculus, Anguis veronensis, Hierophis viridiflavus, Coronella austriaca, Coronella girondica, Elaphe quatuorlineata, Natrix helvetica, Natrix tessellata, Zamenis lineatus, Zamenis longissimus,* and *Vipera aspis*) were from a single land cover typology (Natural land cover macro-class). Urbanized areas were negatively selected by most species, excluding geckos (*Hemidactylus turcicus* and *Tarentola mauritanica*). Geckos represent an exception to this pattern because they usually avoid closed habitats such as dense forests, and take advantage from colonizing the building walls (Luiselli & Capizzi, 1999). A low number of species were found in agricultural habitats (*Podarcis muralis, Podarcis siculus, Lacerta bilineata, Chalcides chalcides, Hierophis viridiflavus, Natrix helvetica,* and *Zamenis longissimus*) and this is likely due to low environment heterogeneity and high disturbance due to human activities. *Testudo hermanni* and *Emys orbicularis* were observed in natural land cover categories only, and no data concerning these species was recorded in urbanized and agricultural land cover macro-classes. Within the natural habitats (natural land cover macro-class), mixed forest represented the most species-rich habitat, followed by Mediterranean habitats and wetlands.

In particular, fragmented woodlands are the habitats where most of the data concerning the occurrence of snakes were recorded, supporting the hypothesis that these habitats are positively selected by snakes in several areas of Peninsular Italy (Luiselli & Capizzi, 1997). *Lacerta bilineata, Podarcis muralis, Podarcis siculus, Hierophis viridiflavus, Zamenis lineatus, Z. longissimus* and *Vipera aspis* were found in a wide variety of habitats (Mediterranean scrub areas, wood edges, bushy meadows, pastures, rocky areas) and can be considered as eurikous species in the study area. *Chalcides chalcides* and *Elaphe quatuorlineata* were mainly observed in small valleys characterized by xeric habitats and grassy pastures, often close to watercourses and small ponds. *Natrix helvetica* and *N. tessellata* were found almost exclusively near swamps, ponds, streams, small lakes and rivers, either in woods or pastures. *Emys orbicularis* was extremely localized in the study area and it was observed in localities characterized by riparian hygrophilous woods close to ponds and swamps. *Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica* and *Coronella girondica* are strictly thermophilous species and were encountered at low altitudes only, especially in xeric landscapes such as open areas with dry bushy grassland *(T. h., C. g.*) and ruins, dry stone walls and old buildings (churches and castles) (*H. t., T. m.*). *Anguis veronensis* and *Coronella austriaca* were rather secretive species and were mainly found on the edge of mixed forests and in pastures with bushes and outcropping rocks.

Altitudinal distribution of the species, expressed as min-max m a.s.l., is reported in Fig. 22. The altitudinal records ranged from 60 m a.s.l. (*Coronella*

girondica) to 1680 m a.s.l. (*Podarcis muralis*), with *Podarcis muralis, P. siculus,* and *Lacerta bilineata* being the species with the widest altitudinal range.

	LAND COVER		
REPTILES	NATURAL	AGRICULTURAL	URBANIZED
Testudines	2	0	0
Sauria	5	4	3
Serpentes	9	3	1

Tab. III. Pattern of reptile species richness distribution in three land cover macro-classes.

DISCUSSION

Our investigations highly increased the knowledge on the occurrence and distribution of the species of reptiles in the Matese Massif. Eighteen reptile species, that is 90% of the overall species occurring in the Southern Apennines (Sindaco *et al.*, 2006; Corti *et al.*, 2011), were recorded within the study area. The high diversity of species remarks the high biogeographic and conservation interest of the whole territory.

We can infer that the high number of species is probably due to the mosaic of natural habitats, the optimal biological conditions of local waterbodies and the low number of threats related to human activities such as e.g. the use of pesticides in agriculture (see Cirucci *et al.*, 2023). To date, the Matese Massif is the Italian mountainous area with the highest number of reptile species surveyed in relation to the geographical surface when compared with other mountainous areas of central and southern Italy (see Tab. IV).

Some species are characterized by a wide distribution (*Anguis veronensis, Lacerta bilineata, Podarcis muralis, P. siculus, Hierophis viridiflavus,* and *Natrix helvetica*), while other species – mainly the thermophilous ones - were found in a few localities only (*Emys orbicularis, Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica,* and *Coronella girondica*). As for *Coronella girondica*, the occurrence of the species in the study area was assessed on the basis of a single literature record (Abbazia della Ferrara, Telesia, Caserta Province, Campania; Bruno, 1973). In southern Italy *Coronella girondica* is known to occur in a few localities of Molise and in one locality of northern Apulia (Corti *et al.*, 2011; Capula *et al.*, 2018). Guarino *et al.* (2012) do not indicate the presence of the species in Campania and do not report the record by Bruno (1973) for this region. However, it is to be noted that in the book by Guarino *et al.* (2012) there is a photo of an individual *Coronella girondica* (on page 241), erroneously indicated as *Coronella austrica* by the authors (sic!), that could have been photographed just in Campania.

This being the case, further field investigations are needed to definitively confirm the presence of the species in Campania.

MOUNTAINUOS AREA	N. OF SPECIES	REFERENCE
Sibillini Mounts (Sibillini National Park, central Italy)	14	Fiacchini, 2013
Majella Massif (Majella National Park, central Italy)	14	Scalera *et al.*, 2006
Prenestini Mountains (central Italy)	15	Bologna *et al.*, 2001
Lepini Mountains (central Italy)	17	Corsetti & Capula, 1992
Lucretili Mountains (central Italy)	13	Carpaneto, 2000
Vesuvio (Vesuvius National Park, southern Italy)	14	Maio *et al.*, 2000
Alburni Massif (southern Italy)	13	Caputo *et al.*, 1985
Matese Massif (southern Italy)	18	This paper

Tab. IV. Number of reptile species recorded in some mountainous areas of central and southern Italy.

The Matese Massif is extremely interesting from the herpetological point of view also as it is to date the only Italian geographic area in which two species of the genus *Zamenis* (*Z. lineatus* and *Z. longissimus*) occur simpatrically, and in this macro-area the occurrence of some individuals characterized by intermediate chromatic characters between the two species was also pointed out.

The ratio between Sauria and Serpentes was 0,77, that is $r \leq 1$, as observed in other mountainous areas of central and southern Italy, i.e. balanced or heavily favourable to Serpentes. Uncommon levels of species richness, i.e. sinthopic presence of a number of species ranging from 9 to 12, were observed in an area corresponding to more than half of the investigated territory (Fig. 21). This macro-area is therefore considered strategic for conservation of reptile species as well of their natural habitats, and thus it should be continuously monitored and strictly protected by local authorities. Within this area intensive agriculture and pastoral activities and the increase in the extension of land used for agricultural purposes should be avoided as much as possible, in the perspective that it may enter into a functional network of wide protected areas. Natural land use categories were positively selected by most species. On the other hand, agricultural environments supported a low number of species (Tab. III). Exceptions to this pattern were *Hemidactylus turcicus* and *Tarentola mauritanica*; which were mostly found in urbanized areas.

Based on the above mentioned evidences, the application of precise conservation measures for the appropriate management of the local populations of reptiles and their fragile habitats is urgently needed and recommended in order to prevent the major threats to the survival of the reptiles: fires, deforestation, intensive agriculture, introduction of alien species of vertebrates, increase in local populations of wild boars (Sindaco *et al.*, 2006; Capula & Contini, 2009). At this regard it must

be stressed that the species considered in the present study are strictly protected and monitored inside the WWF Guardiaregia-Campochiaro Regional Nature Reserve, and the Callora Torrent Nature Reserve, (Province of Campobasso, Molise side), and within the Matese Regional Park (Province of Caserta, Campania side). Moreover, all species of reptiles are formally protected by the regional law of Molise (Regional Law 26/1996), and some species at least (*Emys orbicularis, Testudo hermanni,* and *Elaphe quatuorlineata*) are also included in the Appendix II of the European Council Directive 92/43/EEC (Habitat Directive on the conservation of natural habitats and wild fauna and flora) as deserving high conservation priority.

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RIASSUNTO

I rettili del Massiccio del Matese (Italia meridionale).

Dal 2008 al 2019 sono state condotte ricerche approfondite sulla presenza e sulla distribuzione dei rettili nel Massiccio del Matese (versante Campano e versante Molisano). Sono state censite 18 specie di rettili: *Emys orbicularis, Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica, Anguis veronensis, Lacerta bilineata, Podarcis muralis, Podarcis siculus, Chalcides chalcides, Coronella austriaca, Coronella girondica, Elaphe quatuorlineata, Hierophis viridiflavus, Natrix helvetica, Natrix tessellata, Zamenis lineatus, Zamenis longissimus* e *Vipera aspis*. Le specie più diffuse nell'area di studio sono *Lacerta bilineata, Podarcis muralis, Podarcis siculus, Anguis veronensis, Hierophis viridiflavus e Natrix helvetica,* mentre quelle più localizzate sono *Emys orbicularis, Testudo hermanni, Hemidactylus turcicus, Tarentola mauritanica* e *Coronella girondica*. Di grande rilievo biogeografico risulta essere la presenza simpatrica nel Matese di *Zamenis lineatus* e *Z. longissimus* e l'osservazione di alcuni esemplari con fenotipo intermedio tra le due specie. I risultati di questa indagine a lungo termine mettono in evidenza la grande importanza ambientale e l'elevato interesse erpetologico del Massiccio del Matese. La conservazione e il monitoraggio degli ambienti naturali presenti nel Massiccio risultano quindi estremamente importanti ai fini della conservazione e della sopravvivenza delle locali popolazioni di rettili. In tale ottica risulterebbe estremamente utile l'istituzione di nuove aree protette nelle zone di maggiore interesse naturalistico del Matese.

Parole chiave: Campania, checklist, conservazione, distribuzione, Italia meridionale, Massiccio del Matese, Molise, rettili.

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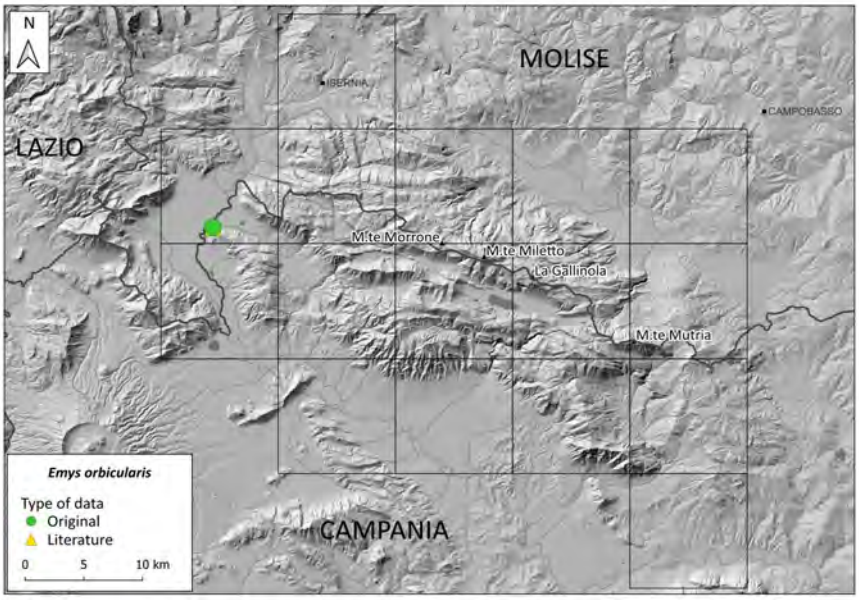

Fig. 2. Distribution map of *Emys orbicularis* in the study area.

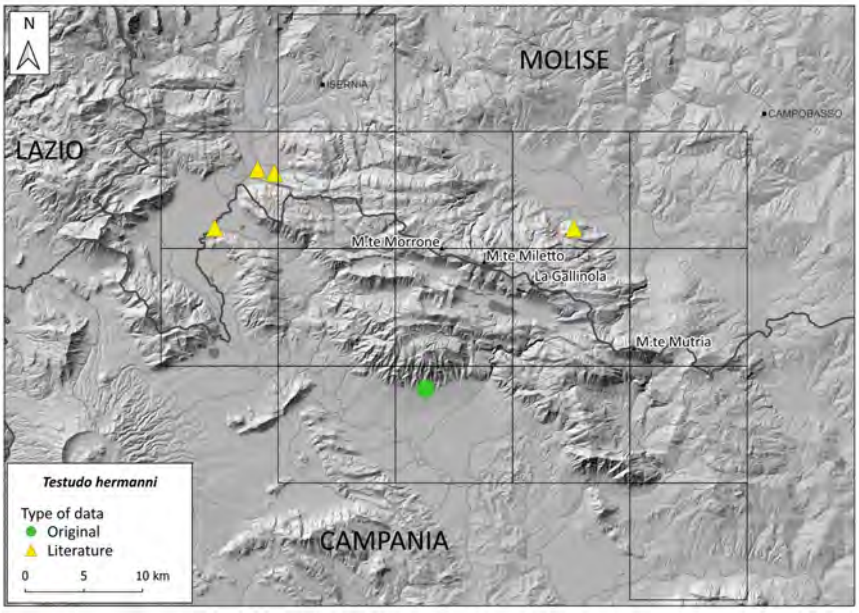

Fig. 3. Distribution map of *Testudo hermanni* in the study area.

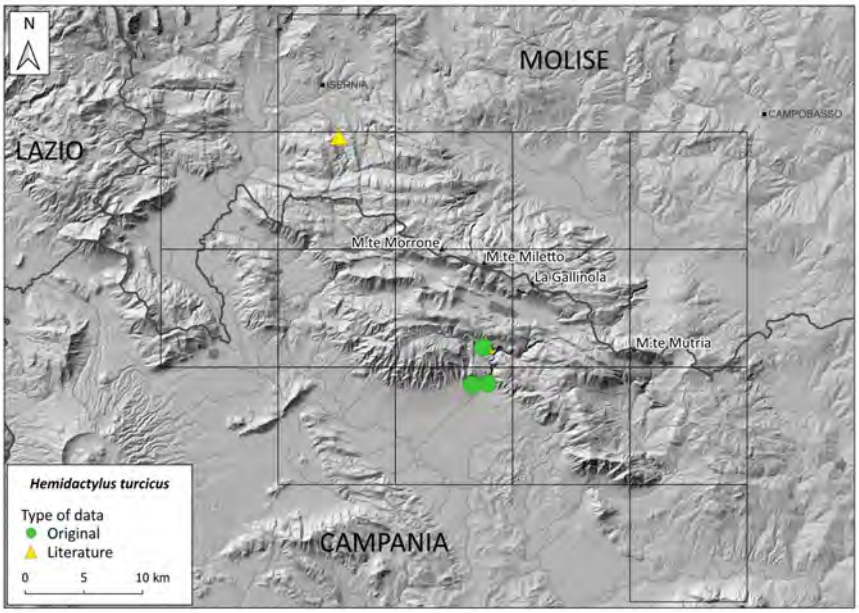

Fig.4. Distribution map of *Hemidactylus turcicus* in the study area.

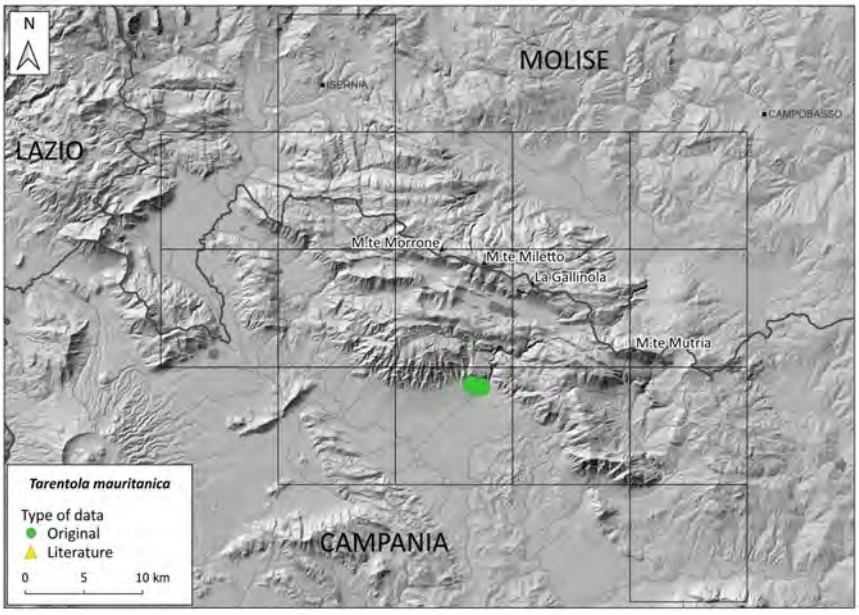

Fig. 5. Distribution map of *Tarentola mauritanica* in the study area.

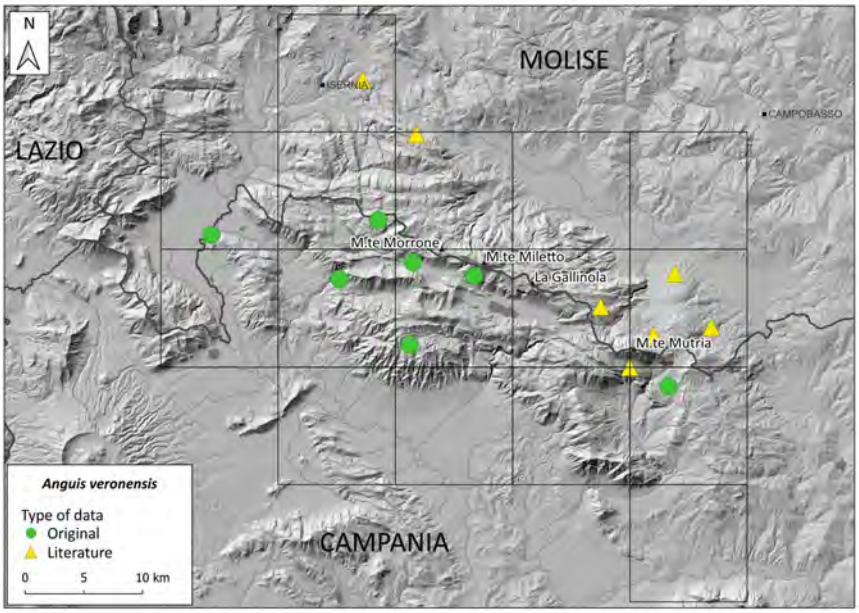

Fig. 6. Distribution map of *Anguis veronensis* in the study area.

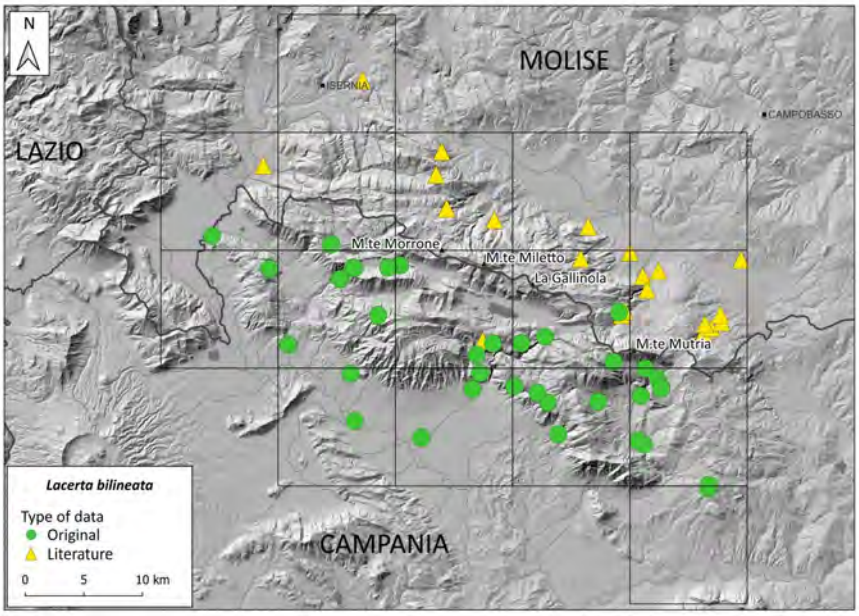

Fig. 7. Distribution map of *Lacerta bilineata* in the study area.

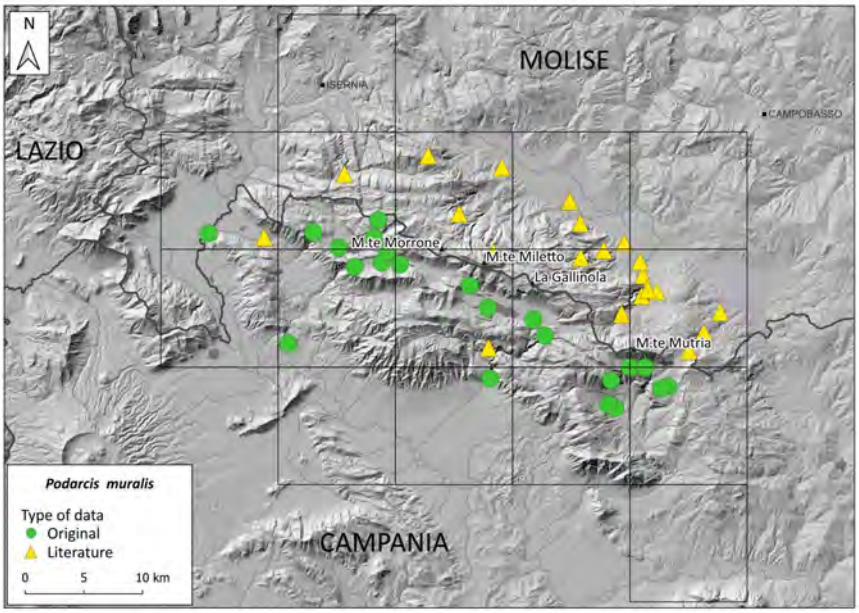

Fig. 8. Distribution map of *Podarcis muralis* in the study area.

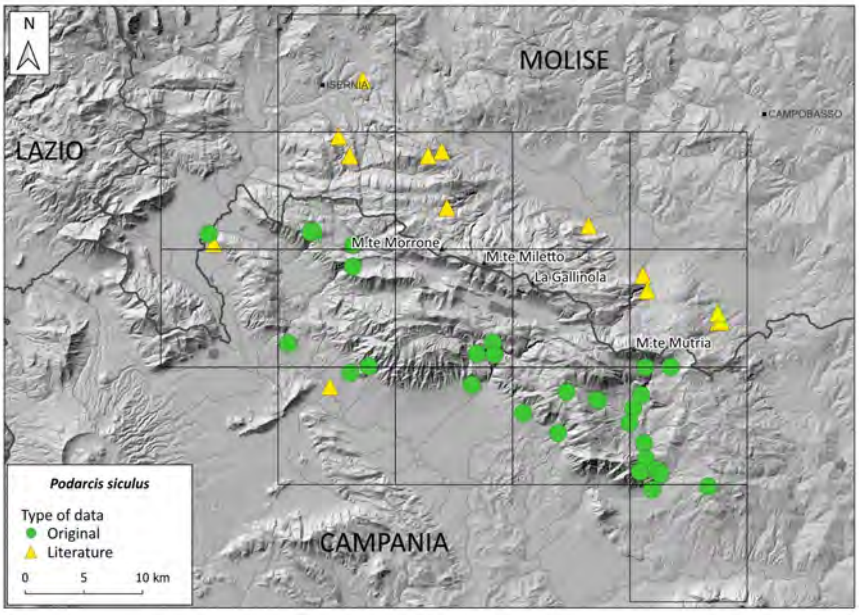

Fig. 9. Distribution map of *Podarcis siculus* in the study area.

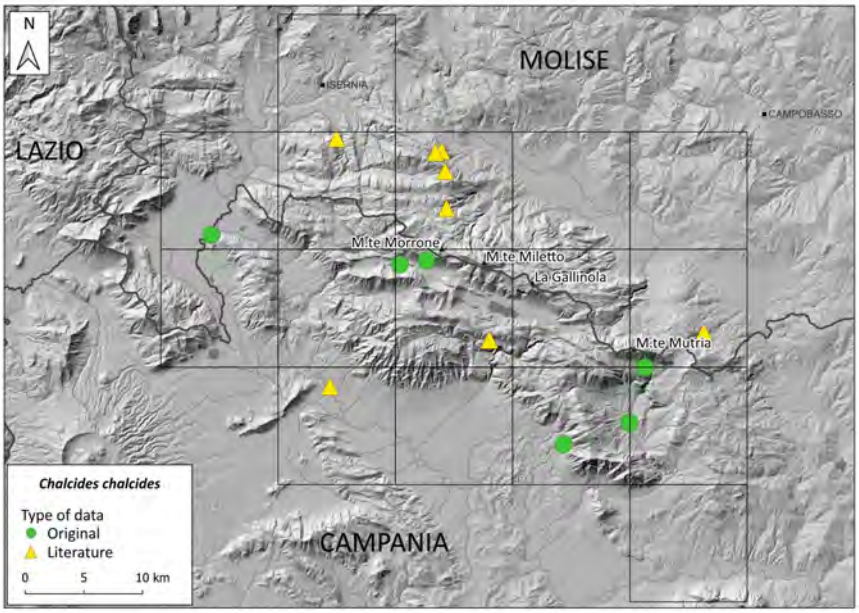

Fig. 10. Distribution map of *Chalcides chalcides* in the study area.

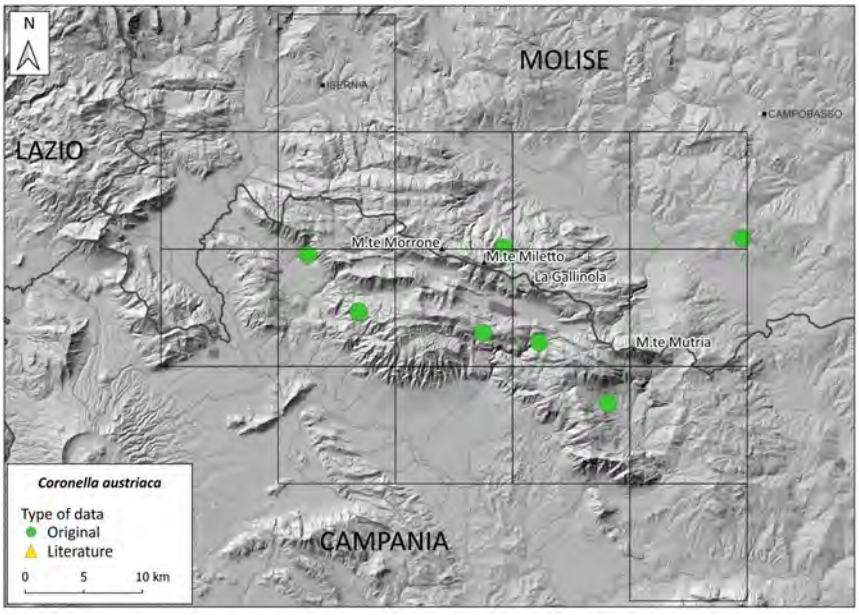

Fig. 11. Distribution map of *Coronella austriaca* in the study area.

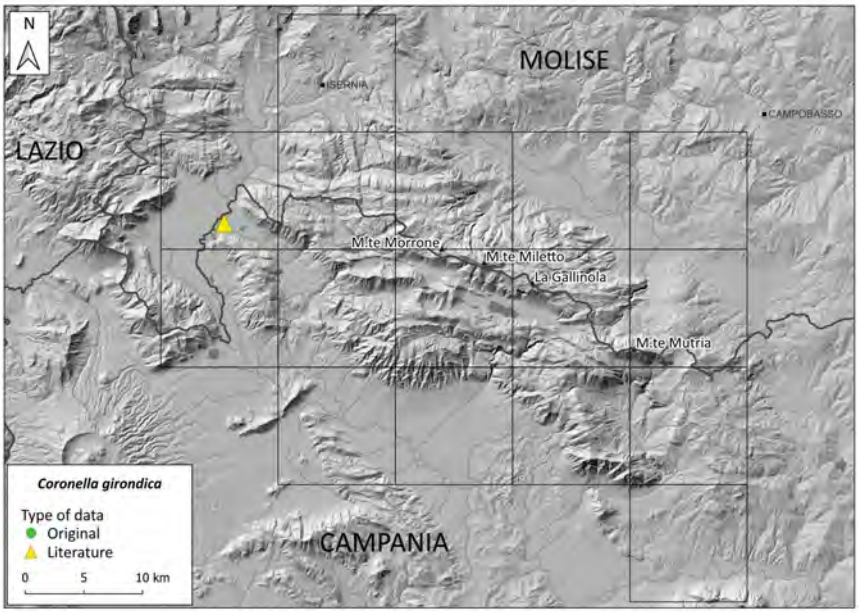

Fig. 12. Distribution map of *Coronella girondica* in the study area.

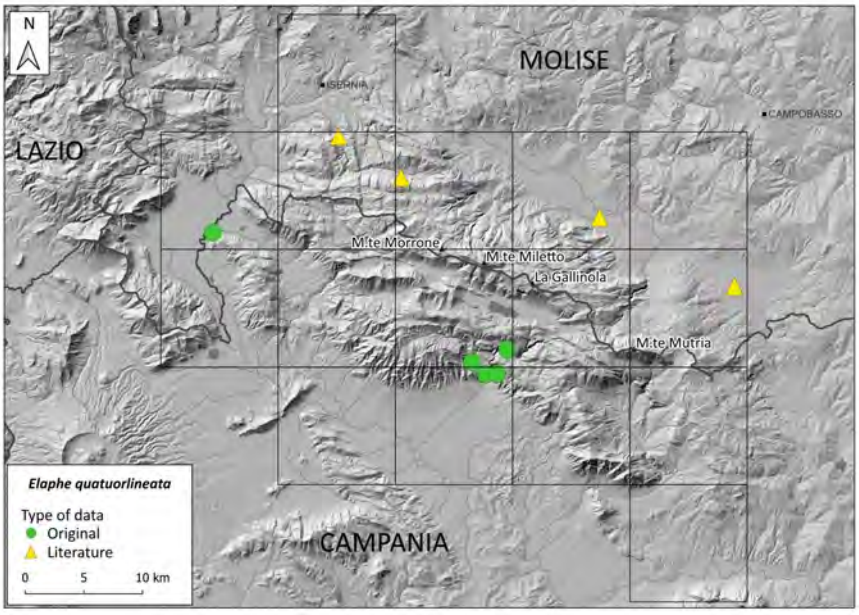

Fig. 13. Distribution map of *Elaphe quatuorlineata* in the study area.

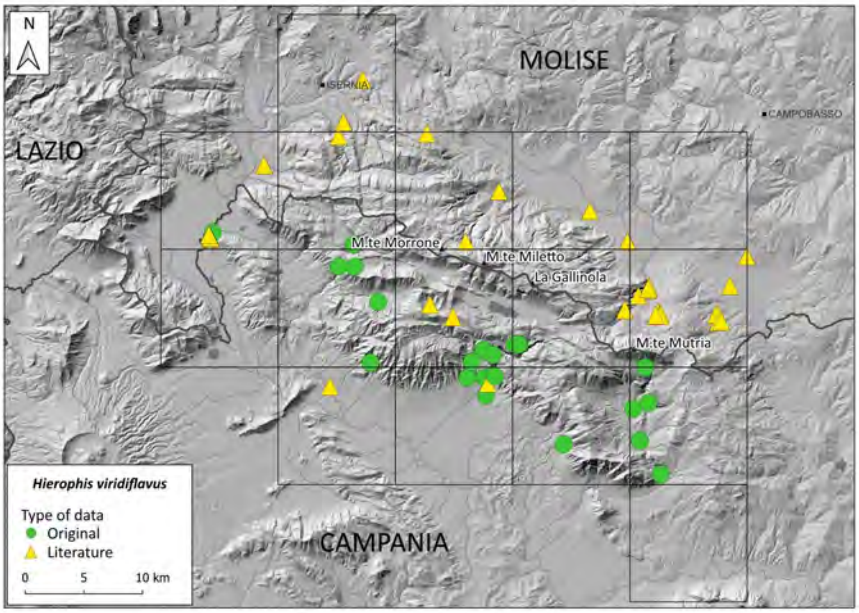

Fig. 14. Distribution map of *Hierophis viridiflavus* in the study area.

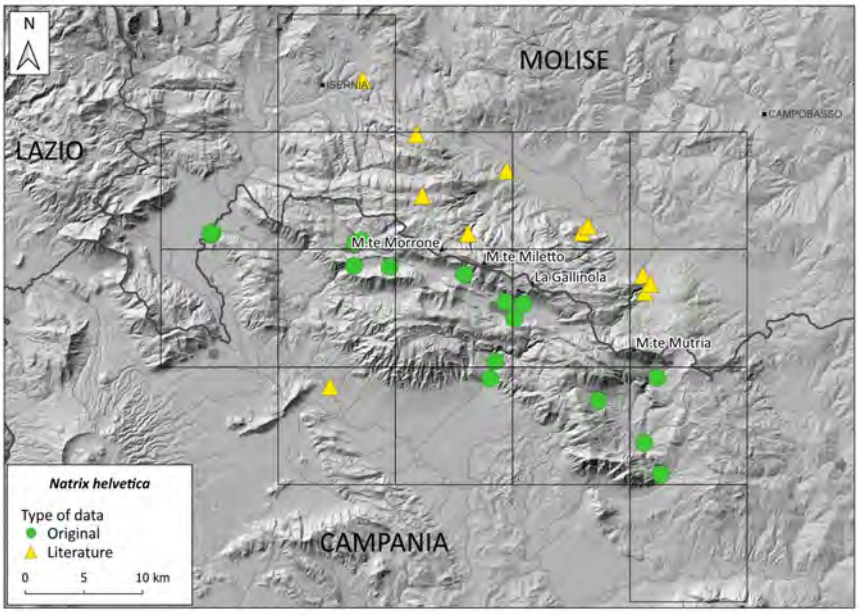

Fig. 15. Distribution map of *Natrix helvetica* in the study area.

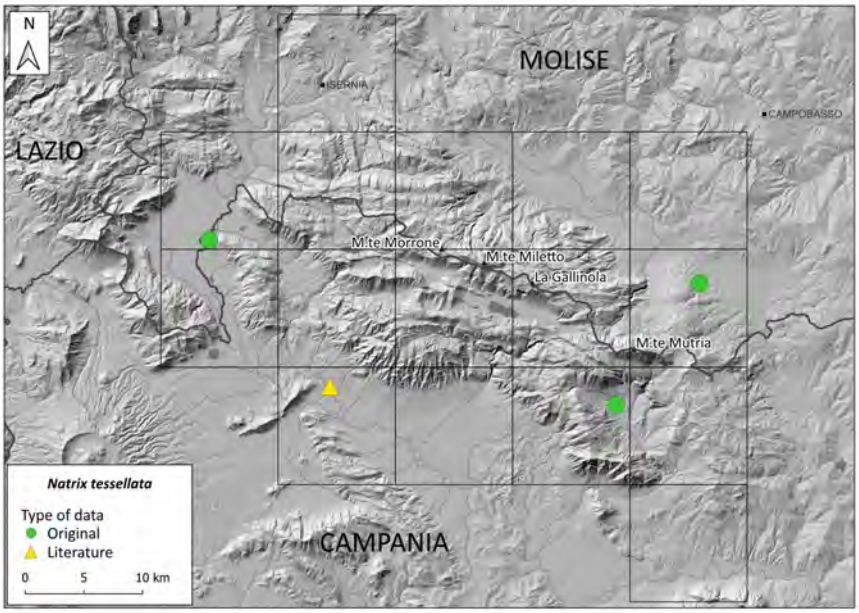

Fig. 16. Distribution map of *Natrix tessellata* in the study area.

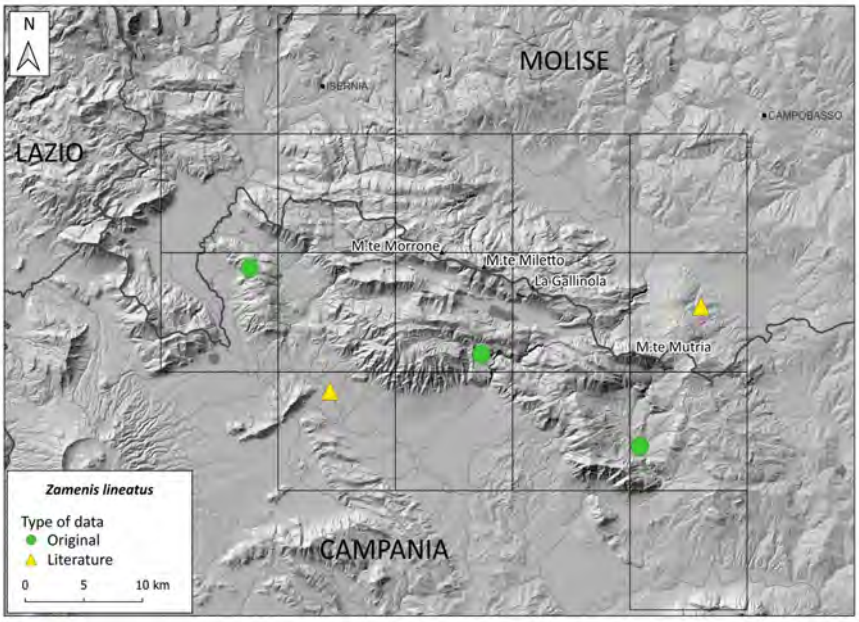

Fig. 17. Distribution map of *Zamenis lineatus* in the study area.

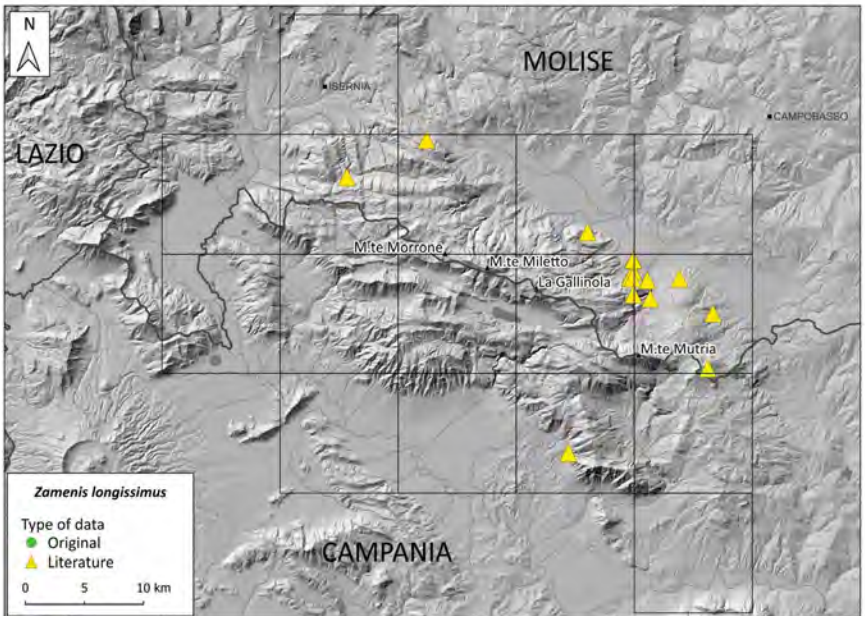

Fig. 18. Distribution map of *Zamenis longissimus* in the study area.

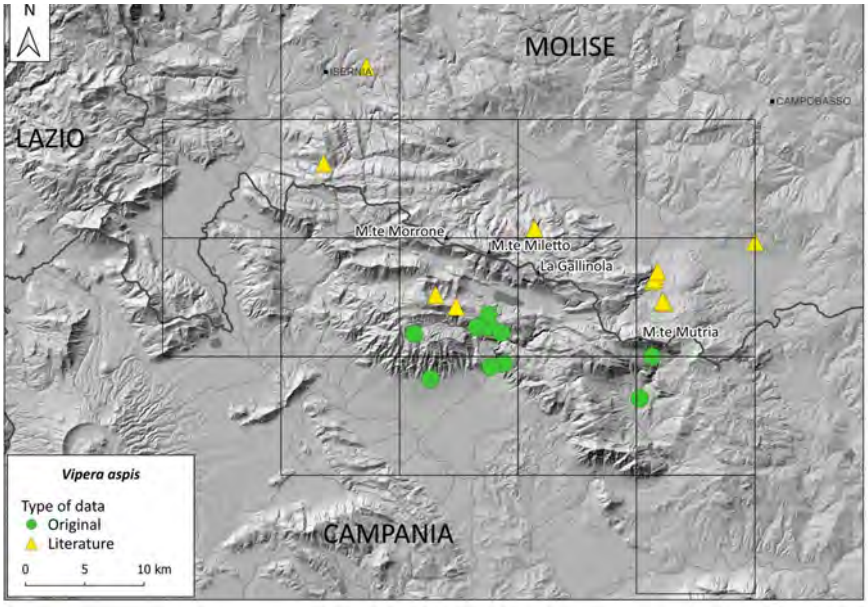

Fig. 19. Distribution map of *Vipera aspis* in the study area.

Fig. 20. Putative natural hybrid (juvenile) *Zamenis longissimus* x *Z. lineatus* from the Matese Massif. This individual is characterized by a mixture of chromatic characters typical of both *Z. longissimus* and *Z. lineatus* (see text).

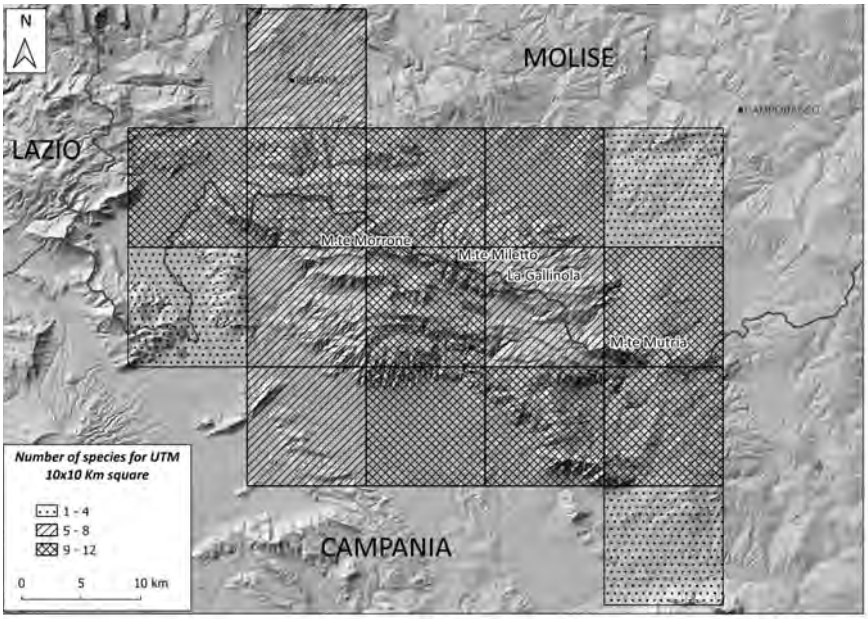

Fig. 21. Number of species recorded for each investigated UTM 10x10 km grid unit.

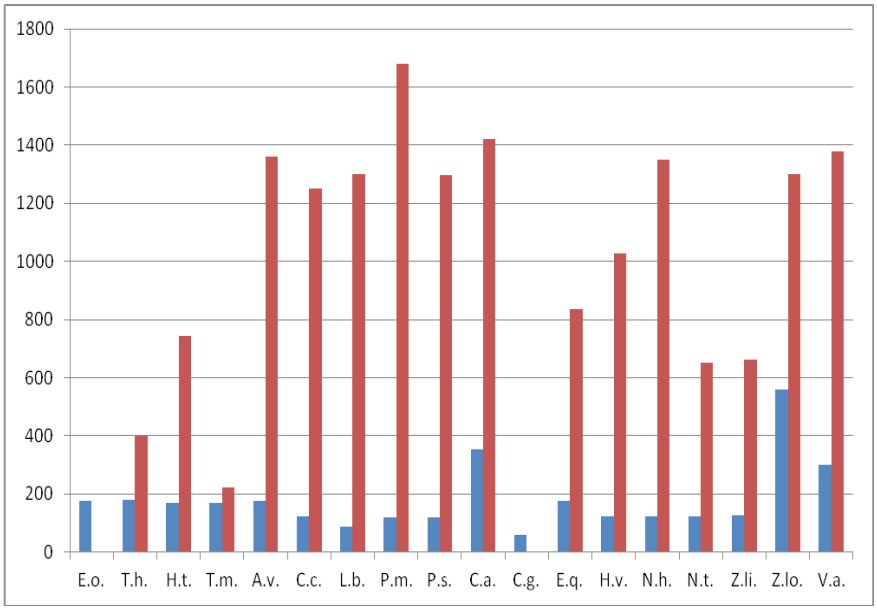

Fig. 22. Altitudinal ranges of the reptile species found in the Matese Massif. Altitude (m a.s.l.) is indicated in ordinate. Blue histogram: minimum altitude; Red histogram: maximum altitude.