Xerotyphlops vermicularis (Merrem, 1820), along the Bulgarian Black Sea coast: a compilation of new and published records

The Eurasian Blind Snake, *Xerotyphlops vermicularis* (Merrem, 1820), the only representative of the snake family Typhlopidae (superfamily Scolecophidia) in Europe (Grillitsch & Grillitsch 1993), is found in the southern parts of the Balkan Peninsula (Grillitsch & Grillitsch 1993; Sillero et al. 2014). The snake represents an element of the Turano-Mediterranean chorotype (Mizsei et al. 2017), in which all populations in the Balkans probably originate from eastern Anatolian ancestors (Kornilios 2017). The Eurasian Blind Snake prefers xerothermic habitats with deep, dry and soft (sandy) soil where it can burrow, typically rocky slopes with low, sparse bush vegetation, open areas with stones as well as cultivated fields (Grillitsch & Grillitsch 1993). The northeastern edge of the snake's distribution in the Balkans runs through Bulgaria (see Beshkov & Nanev 2006; Stojanov et al. 2011), where it occurs scattered at altitudes below 500 m a.s.l. in the southern parts of the country, along the warm valleys of the Struma River (SW Bulgaria), the lower Maritsa River (Harmanli region), the Arda River (eastern Rhodope Mts.) and the Tundja River (Derventski Heights, SE Bulgaria; Fig. 1A), in which the Mediterranean climatic influence is strongest (Beshkov 1998; Stojanov et al. 2011). After more than 100 years, the species was rediscovered in the western Rhodope Mts. (Jablonski & Balej 2015). Besides, there are historical, no longer confirmed records of *X. vermicularis* from isolated localities southeast of Burgas city (Black Sea coast, eastern slopes of Strandzha Mts. (see Stojanov et al. 2011).

To compile the knowledge of records of this species along the Bulgarian Black Sea coast, the authors of the present note reviewed the available literature (Buresh & Zonkov 1934; Beshkov 1956, 1961, 1985; Papsdorf 1971; Bartosik 1981; Kühnemann 1981; Buseke 1982; Thieme 1986; Čihař 1989; Grillitsch & Grillitsch 1993; Stojanov et al. 2011) and added their unpub-

lished data and recent observations from several field excursions. Coordinates assigned to some historical records correspond to assumed closest named places and thus, are not accurate (Table 1).

Fifteen different observations of *X. vermicularis*, reporting more than 30 observed individuals, were published between 1934 and 1989 (for references see Table 1). All these observations were made in the period of May until August, from mainly stony and sandy habitats, at altitudes ranging from 0 to 100 m a. s. l. Most records are from Cape "Maslen Nos" (five records between 1954 and 1957) and Arkutino (four records, 1976–1980). Interestingly, the northernmost record originates from an island (Sveti Ivan) located 1 km off the coast; the southernost is from a small valley between the town of Ahtopol and the Veleka River (Fig. 1). Moreover, the authors add three recent records obtained during field studies: one adult individual observed near Primorsko town (observed by Nikolay TZANKOV) in June 2009; two adults and one juvenile found near Arkutino (observed by Andrei STOJANOV) in March 2010; and one adult, not far from the second record locality (observed by Thomas REICH), in June 2017 (Fig. 2). All individuals of these recent records were found under stones in the immediate environs of two unfinished and abandoned hotel complexes "Perla 2" and "Zname Na Mira". Overall, 18 records of *X. vermicularis* are known from the Bulgarian Black Sea coast to date.

The record localities, which are closest to the Black Sea records, are situated along the Tundzha River (Lesovo village, Derventski Heights - STOEV 2000; STOJANOV et al. 2001), approximately 100 km upcountry (Fig. 1A). Between the Tundzha River valley and the Black Sea coast populations there are agricultural fields and the wooded areas of the Strandzha Mts., which both lack suitable habitats for the species. The authors hypothesize that these two populations are currently isolated from each other; however, additional field research is necessary to verify this assumption. Both populations are probably remnants of Anatolian colonization waves that propagated along the Black Sea coast during the Holocene. The closest known localities in Turkey lie in the vicinity of Istanbul, approximately 160 km in a southeastern direction. No recent records are known from the Black Sea coast of European Turkey (JABLONSKI & STLOUKAL 2012; AFSAR et al. 2016), although, a model of the potential distribution of *X. vermicularis* in Turkey (AFSAR et al. 2016) roughly identified the whole European part of this country as a suitable habitat for this species.

Based on the published records, the Bulgarian Black Sea *Xerotyphlops* are currently isolated from the neighboring populations in Bulgaria and Turkey. A similar distribution has been observed in the snake species *Platyceps collaris* (MÜLLER, 1878), and *Zamenis situla* (LINNAEUS, 1758), which are missing in some Black Sea regions of European Turkey but found in southeast Bulgaria between Ahtopol and Burgas or in their close vicinity (STOJANOV et al. 2011; SINDACO et al. 2013). In the light of its isolated occurrence near the Bulgarian Black Sea coast, one cannot exclude accidental introduction of *X. vermicularis* (e. g., from Greece) along with soils and building materials, in ancient times. As is known, ancient towns such as Sozopol or Ahtopol had strong commercial and cultural relations to cities of Ancient Greece. A similar pattern of accidental historical introduction from Greek territory to other Mediterranean areas was described for *Chalcides ocellatus* (FORSKÅL, 1775) (KORNILIOS et al. 2010).

If the theory of unintentional anthropogenic introduction (e.g., from Ancient Greece) is discarded, the present occurrence of *X. vermicularis* along the Bulgarian Black Sea coast is most likely the result of discontinuous peripheral shrinkage of its once wider and continuous range that had established before the formation of the Bosphorus Strait, more than 11,000 ybp (KEREY et al. 2004). This explanation is supported by two facts: (i) the southwestern Black Sea coastal area was less wooded than now (ORACHEV 2012) and, thus more suitable for *X. vermicularis*, and (ii) the Island of Sveti Ivan near Sozopol, record locality of *X. vermicularis*, can have been colonized in a natural way since the island was connected to the mainland until 6,000 ybp (when the coastline was at least 10 m lower than today; see FILIPOVA-MARINOVA et al. 2011).

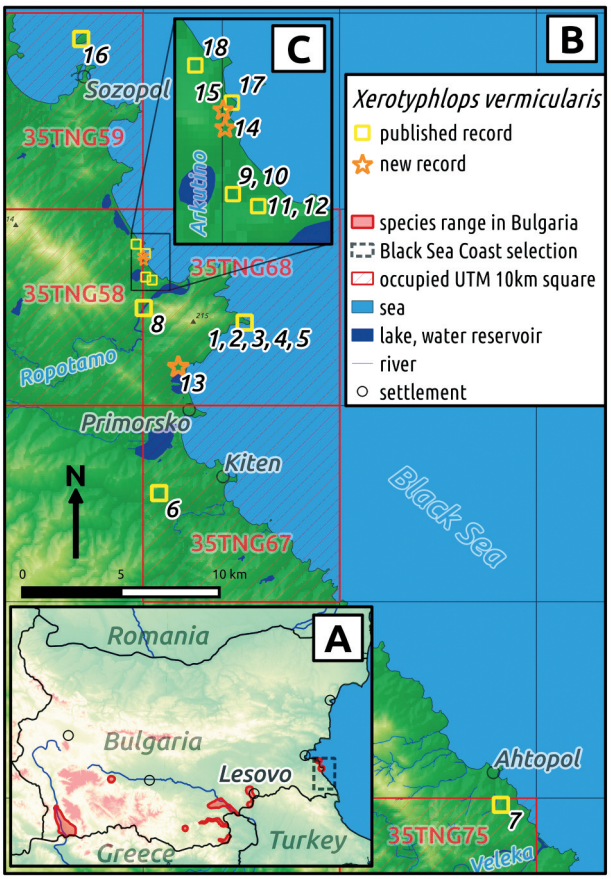

Fig. 1: Distribution map of published and new record localities of *Xerotyphlops vermicularis* (MERREM, 1820), along the Bulgarian Black Sea coast (for details see corresponding numbers in Table 1). A – Inset showing the current distribution of the species in Bulgaria based on STOJANOV et al. (2001). The position of map B is shown; B – Records along the Bulgarian Black Sea coast; C – Inset showing details of the area north of Arkutino.

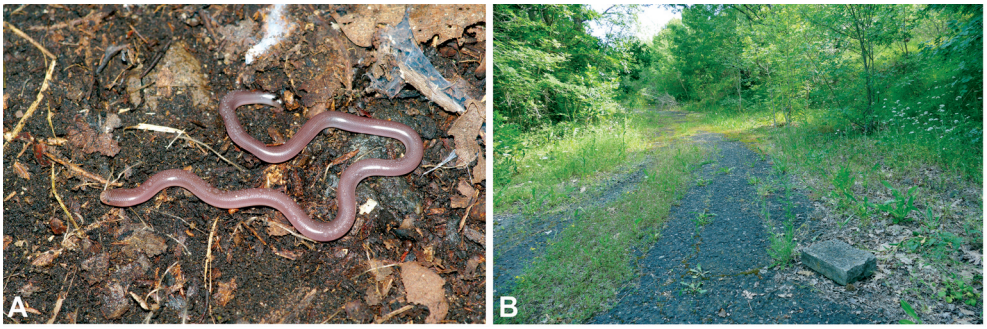

Fig. 2: A – The individual of *Xerotyphlops vermicularis* (MERREM, 1820), recorded near Arkutino in June 2017; B – The place of the finding. Photos Thomas REICH.

Table 1: A summary table of 15 published and three new records of *Xerotyphlops vermicularis* (MERREM, 1820), along the Bulgarian Black Sea coast. Locality numbers correspond to numbers in Fig. 1. n/a – no information available.

Locality number	Locality name	Latitude (° N)	Longitude (° E)	Approximate accuracy [m]	Altitude (m a.s.l.)	Number of individuals	Habitat	Date/Time (if available)	Source
1	The „Maslen Nos“ Cape	42.30757	27.79071	± 100	0-50	1	n/a	1954-V	BESHKOV (1956)
2	The „Maslen Nos“ Cape	42.30757	27.79071	± 100	0-50	10	in the soil	1955-VII-29	BESHKOV (1956)
3	The „Maslen Nos“ Cape	42.30757	27.79071	± 100	0-50	7	in the soil	1955-VIII-2	BESHKOV (1956)
4	The „Maslen Nos“ Cape	42.30757	27.79071	± 100	0-50	n/a	n/a	1957-VI-12	BESHKOV (1961)
5	The „Maslen Nos“ Cape	42.30757	27.79071	± 100	0-50	n/a	n/a	1957-VIII-10	BESHKOV (1961)
6	In the vicinity of Kiten, about 3 km from the seaside	42.22965	27.73703	± 2,000	0-100	3	under stones in a gully	1970-VIII	PAPSDORF (1971)
7	A brook valley between Ahtopol and Veleka River	42.08510	27.94539	± 2,000	0-50	1	under stone	1970	ČIHAŘ (1989)
8	Ropotamo River valley	42.31463	27.72854	± 2,000	0-50	1	n/a	1970	ČIHAŘ (1989)
9	Arkutino	42.32887	27.72992	± 1,000	0-50	2	under a stone on a dry hill at the seaside	1976	BARTOSIK (1981)
10	Arkutino	42.32887	27.72992	± 1,000	0-50	1	roadkill	1977	BARTOSIK (1981)
11	Near Arkutino	42.32743	27.73388	± 1,500	0-50	2	under a stone between dunes	1979-V	KÜHNEMANN (1981)
12	Dunes near Arkutino	42.32743	27.73388	± 1,000	0-50	4	in a depression between dunes	1980-V	BUSEKE (1982)
13	Unfinished hotel complex "Perla 2" (1.5 km north of Primorsko)	42.28734	27.74953	±10	16	1 adult	under a stone between abandoned buildings	2009-VI-4/ 9:00	This study (Nikolay TZANKOV)
14	Abandoned hotel complex "Zname Na Mira" (0.5 km northeast of the Arkutino Swamp)	42.33659	27.72877	± 10	24	2 adults, 1 juvenile	under a stone between abandoned buildings	2010-III/ 10:00-11:00	This study (Andrei STOJANOV)
15	About 0.5 km north of Arkutino	42.338697	27.728478	± 10	30	1 subadult	under a stone on the road in a bright broadleaf forest	2017-VI-5/ 15:00	This study (Thomas REICH)
16	"Sveti Ivan" Island near Sozopol	42.43832	27.69132	± 500	0-50	n/a	n/a	n/a	BURESCH & ZONKOW (1934)
17	Mainland seaside vis-à-vis "Zmiyskia Ostrov" Island = Sveti Toma	42.33959	27.72987	± 500	0-50	n/a	n/a	n/a	BESHKOV (1985)
18	Coast north of Arkutino	42.34399	27.72416	± 1,000	0-50	n/a	in a depression	n/a	THIEME (1986)

It is thus strongly suggested to conserve sparsely forested sandy or rocky habitats, if necessary, by appropriate management, to provide suitable conditions for the species to survive in the studied region.

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