ARTICULATA 2013 28 (1/2): 91–102 FAUNISTIK

First record and current distribution of *Omocestus minutus* (Brullé, 1832) (Orthoptera: Acrididae) in Hungary

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Abstract

Omocestus minutus was found for the first time in Hungary in 2009, in the county of Bács-Kiskun (A. Panrok). Since then the authors have found more localities within the area of the Great Plain. It is not clear if the species has been present here for a longer period or if it has recently spread from the south

Zusammenfassung

Im Jahr 2009 wurde *Omocestus minutus* erstmalig für Ungarn im Komitat Bács-Kiskun festgestellt (A. Panrok). Seitdem konnten weitere Vorkommen durch die beiden Autoren innerhalb der Großen Tiefebene nachgewiesen werden. Es ist derzeit noch unklar, ob die aktuellen Neufunde bereits über einen längeren Zeitraum bestehen oder ob es sich dabei um eine jüngere Ausbreitung aus dem Süden handelt.

Introduction

Omocestus minutus was described by BRULLÉ (1832) from Greece. The species has a pontic distribution and its area covers Asia Minor and southeast Europe from Greece to Macedonia, Bulgaria, Romania and Serbia as well as the southwest of the former SSSR (HARZ 1957, CHOBANOV 2009) which today includes the southern parts of Ukraine and Moldavia. The eastern limit of its distribution is unknown.

Concerning the actual status *O. minutus* is considered "rare" in Moldavia, and "present" over the eastern and southern parts of the country in Romania (IORGU 2008), while in Bulgaria it is relative widespread (CHOBANOV 2009).

The nearest occurrences to the Hungarian populations lie just inside the Carpathian Basin, in North Serbia (Deliblat/Vojvodina) (ADAMOVIĆ 1971, NAGY 2009) at 210 km, and in southwest Romania (KIS 1970: "South Banat", IORGU et al. 2008: "Banat Hills") at about 170 km.

The main habitat types of *O. minutus* are open xerophilous, thermophilous places on sand dunes or biotopes with sandy soils. But it can be found in mesoxerophilous meadows too (HARZ 1957, IORGU 2008). However in Bulgaria and Macedonia beside open xeric lowland habitats it also occurs in middle mountainous ranges up to 1000-1500 m a.s.l. (CHOBANOV 2009).

Results and Discussion

First record and the localities near Bugac

Omocestus minutus was found in Hungary for the first time on 21st August 2009 near Bugac (Kiskunság region, southeast Hungary, Bugac-1: Bugac/ Akác-tanya, N 46° 40.28' E 19° 31.82'; fig. 1 and photo 1). On this afternoon the first author focussed on one and later on three "strange singing males of *Omocestus haemorrhoidalis*". At that time he did not know *Omocestus minutus* and he didn't have any bioacoustic sound samples available. The verses sounded very similar to those of *O. haemorrhoidalis* but they were always obviously shorter ("half-time") with noticeable longer breaks between the verses. After making some sound recordings with a Zoom-H4 Recorder the specimens were caught and inspected more precisely and after taking some pictures released again. The impression remained of a "long winged and paler" form or subspecies of *O. haemorrhoidalis* or another species of the genus *Omocestus*. Their habitat here was a small fallow on sandy ground with scant vegetation close to a forest line. Despite the availability of similar habitats in the surrounding area no more specimens could be found.

Throughout the winter season 2009/2010 it became more and more clear that the specimens were in fact *O. minutus* and were finally determined as that species by Ionuţ Iorgu (Romania) and Barnabás Nagy (Hungary). This is a new grasshopper species in the Hungarian Orthoptera fauna which now counts 126 species, including the extinct steppe species (*Onconotus servillei* Fischer de Waldheim 1846 and *Bradyporus dasypus* (Illiger 1800) (NAGY 2003a, SZÖVÉNYI 2011a).

In July 2011 *O. minutus* was found in a greater number (>15 males) within the Bugacpuszta protected area of the Kiskunság National Park (Bugac-2: Bugac/ Bugacpuszta, N 46° 39.88' E 19° 37.68'; fig. 1 and photo 2, A. Panrok). The specimens there were also constricted to a small range, being absent in the near surroundings with missing completely just a few meters away from that population. In September 2012 a second site was found in same area (Bugac-3: Bugac/ Bugacpuszta, N 46° 40.07' E 19° 37.83'; fig. 1 and photo 3, A. Panrok), where more than five males could be found next to the entrance of the conservation area. Re-examination of the first locality (Bugac-2) revealed five males and two females. So the patchy distribution of very small populations seems to be characteristic for all the Bugac-habitats. The species seems to be lacking in large areas with seemingly suitable habitat in that area. The distance between Bugac-2 and Bugac-3 is about 400 meters. An intensive search between those points and especially around Bugac-2 brought no more records but it is well possible that *O. minutus* can be more widespread in and around Bugacpuszta. Searches at similar Kiskunság sandy grasslands around Fülöpháza in 2011 and 2012 yielded no further records (A. Panrok).

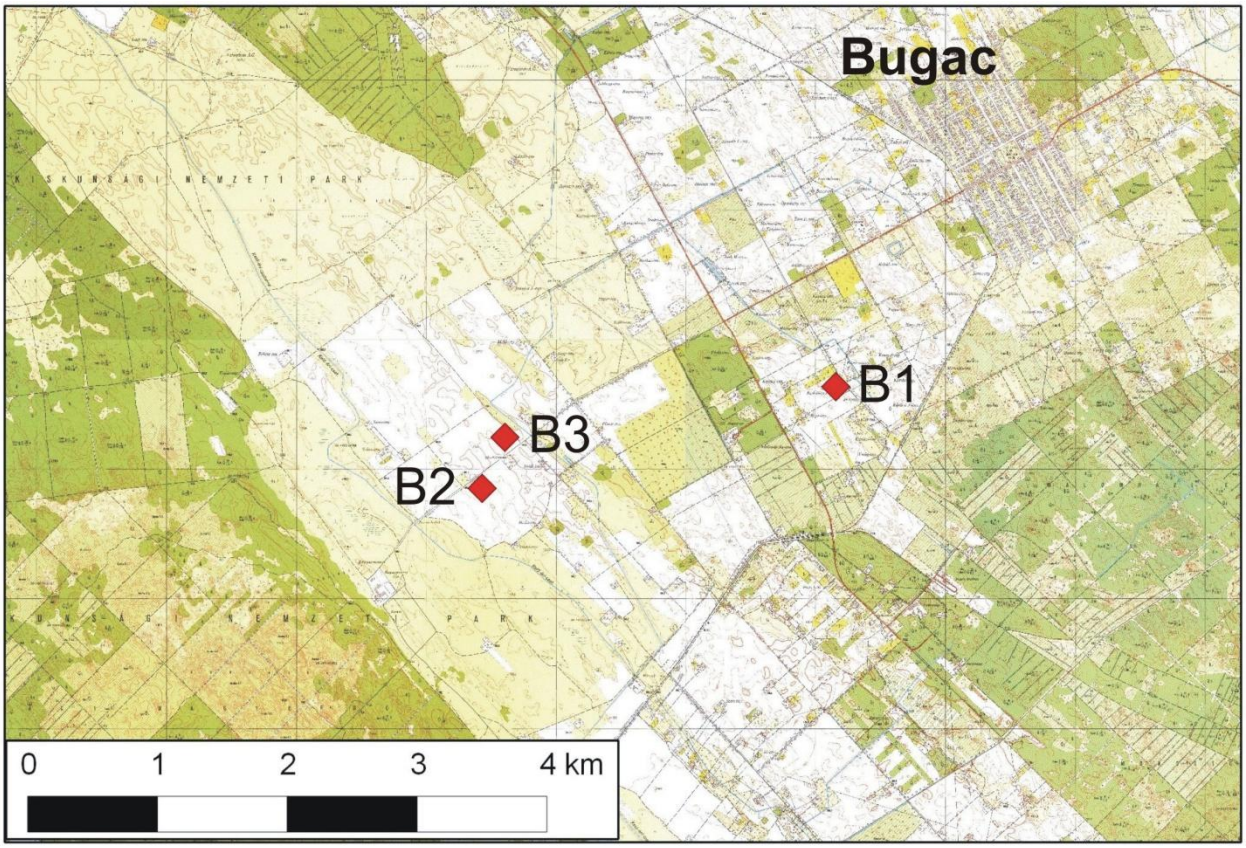

Figure 1: The locations of *Omocestus minutus* (B-1-2-3) near Bugac.

Photo 1: Habitat Bugac-1, 15.7.2011.

Photo 2: Habitat Bugac-2, 8.9.2012.

Photo 3: Habitat Bugac-3, 8.9.2012.

The locality near Kunadacs

After hearing about the presence of *O. minutus* near Bugac (in May 2011) the second author found it in Kunadacs, in the northern part of Kiskunság, about 50 km northwestward from Bugac. The population was found on a regular sampling plot of the Hungarian Meadow Viper Conservation Programme, between Kunadacs and Kunpeszér, just near the county border between Pest and Bács-Kiskun counties (Kunadacs/Zombor Hill, N 47° 02.27' E 19° 16.92'; fig. 2), where the grasshopper assemblage was sampled two or three times per year since 2004 (see SZÖVÉNYI 2007). In a regular sampling here (13th July, 2011) a specimen of *Celes variabilis* (a rare species there) was detected in the sweep netting sample. After searching for further *Celes* specimens in the surroundings of the sampling plot one male specimen of *O. minutus* was accidentally and surprisingly discovered here. An hour of intensive visual and acoustic search did not result in more specimens. In the next sampling periods (August and September 2011) the species was not found again, neither in the similar neighboring grassland plots. In the next year (2012) in the same place one male specimen was caught by regular sweep netting and further adults (about 5 males and 5 females) were detected visually, but no more specimens were found in similar, seemingly suitable neighboring habitats. The habitat here was a ploughland, abandoned decades ago, near a swampy depression, which became open shortgrass sandy grassland with extensive patches of *Tortula ruralis* moss cover. After the first detection in Kunadacs, further places (near Alsónémedi, Ágasegyháza, Kéleshalom, Kunpeszér, Kunadacs, Ócsa, Tatárszentgyörgy) were investigated in order to find *O. minutus* in seemingly suitable habitat patches late Summer and early Autumn in 2011 and 2012, without any success.

The localities near Paks

In Autumn 2012 further *Omocestus minutus* populations were discovered south of Paks (Tolna county, fig. 3), at the western side of the Danube in the Mezőföld region, about 60 km west from Bugac. Mezőföld is a mainly loess covered lowland region intensively used by agriculture, but in its southern part a relatively small sandy subregion can be found. Its flora and fauna is very similar to that of the Kiskunság and it is considered to be a former part of that sandy region divided by the Danube valley long ago. Here altogether four localities of *O. minutus* were discovered, and here the species seems to be more widespread locally than in the Kiskunság.

Paks-1. (Paks/Csámpa, N 46° 35.48' E 18° 49.78') Here a dense population of *O. minutus* was detected (about 20 males and 30 females) on 25th September, 2012 on a degraded, overgrazed open sandy grassland plot within locust tree and black pine plantations.

Paks-2. (Paks, N 46° 35.18' E 18° 50.85') Here, near the northern edge of the Nuclear Power Pant of Paks, a small *O. minutus* population was found (only 1 male and 2 females detected) in 25th September, 2012, in a totally overgrazed, open sandy grassland plot with huge patches of bare sand, which is a grazing area for a captive fallow deer population.

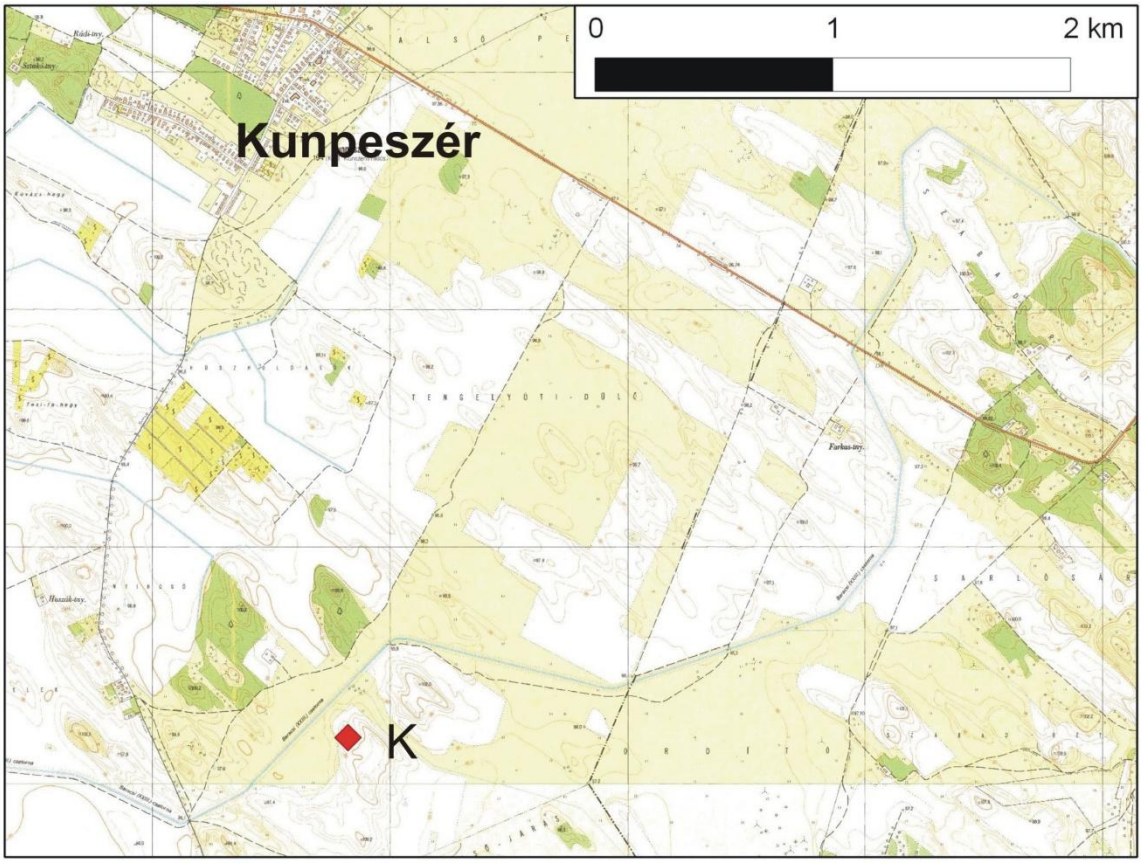

Figure 2: The location of *Omocestus minutus* (K) near Kunadacs.

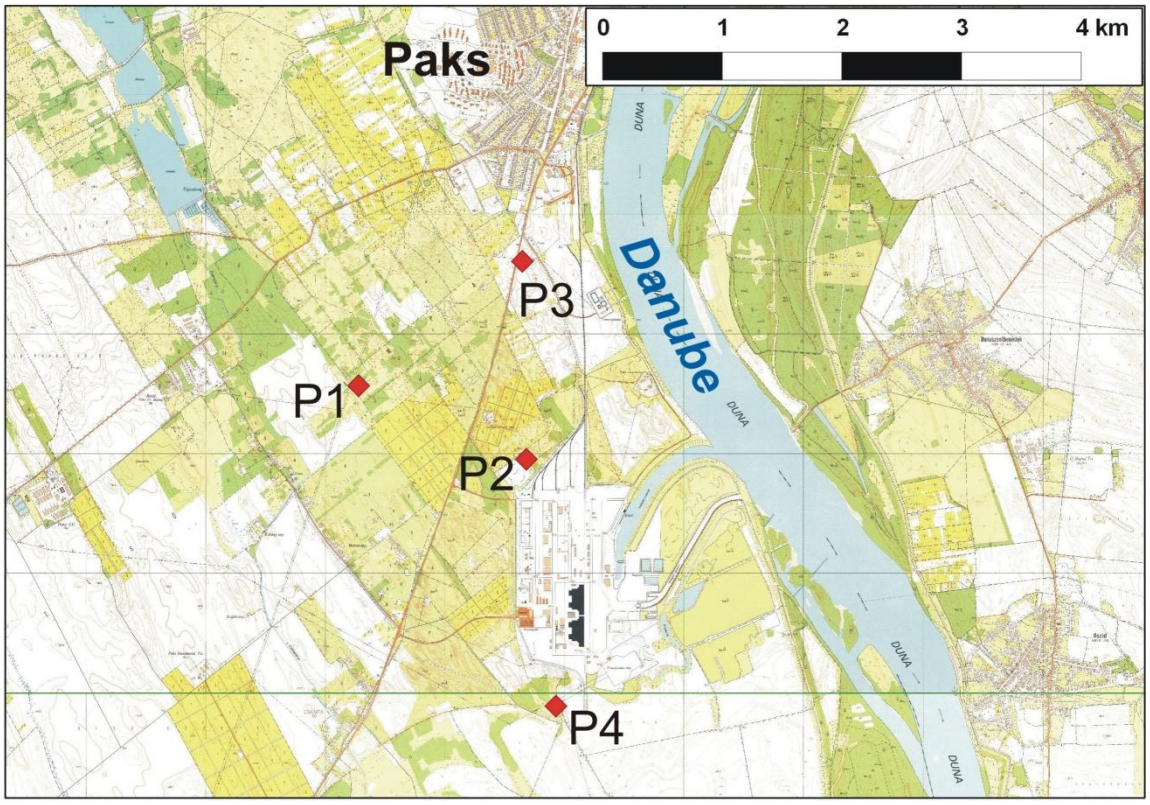

Figure 3: The locations of *Omocestus minutus* (P-1-2-3-4) near Paks.

Paks-3. (Paks, N 46° 36.02' E 18° 50.82'). This place is a sandy old field near the southern border of Paks (in the vicinity of the southernmost industrial building of the town), along the main road (no. 6), where open weedy vegetation grows with some sandy grassland elements. Here two females were found in 25th September, 2012.

Paks-4. (Paks, N 46° 34.02' E 18° 51.07') This is a relatively small remnant of the original, xeric calcareous sandy grasslands, dominated by *Stipa* and *Festuca*. The habitat was formerly widely distributed here, at the southern edge of Nuclear Power Plant, under and near a high voltage aerial line. In this isolated locality only one male specimen was detected in 25th September, 2012.

Omocestus minutus in Hungary

The Hungarian populations of *O. minutus* differ greatly in abundance of specimens. In Bugac-1, Kunadacs, and Paks-2-3-4 only very few specimens were detected, however in Bugac-2 and Paks-1 the populations are relatively dense (see table 1). It shows that most populations of the species are presumably small, but locally it can reach a relatively high abundance. In the populations detected specimens of various coloration were found between the pale light brownish and dark brown-light greyish variegated ones (see photos 4-8). Body length of measured live and released specimens in Bugac-2 in 2011 and 2012 were ♂: 11-14 mm (n=3), ♀: 14-16 mm (n=2), and in specimens from Paks-1 preserved in ethanol in 2012 were ♂: 11.3-13.5 mm (average=12.3 mm; n=11), ♀: 14.5-17.1 mm (average 15.6 mm; n=12).

Table 1: Number of Individuals of *Omocestus minutus* detected in the Hungarian localities between 2009 and 2012.

	2009: Bugac-1	2011: Bugac-1	2011: Bugac-2	2012: Bugac -1	2012: Bugac-2	2012: Bugac-3	2011 Kunadacs	2012 Kunadacs	2012 Paks-1	2012 Paks-2	2012 Paks-3	2012 Paks-4
O. minutus (males)	3	2	>15	0	5	>5	1	>5	>20	1	0	1
O. minutus (females)		1	3	0	3	>2	0	>5	>30	2	2	0

Habitats and co-occurring Orthoptera assemblages

All known Hungarian *Omocestus minutus* populations can be found on calcareous sand in lowland habitats (between 92 and 110 m a.s.l.). Most of habitats are xeric grasslands with short and/or sparse, partly overgrazed vegetation, in some cases with a relative high proportion of *Tortula ruralis* moss cover. These (micro)habitat types presumably provide an elevated temperature compared to the more dense, or higher neighbouring vegetation patches because of the patches of bare ground and the blackish coloration of dried moss patches. Considering the generally rich Orthoptera assemblages (see table 2) *O. minutus* lives together partly with the most xerophilous and/or thermophilous species occurring in

Hungary. These are characteristic to the driest open types of sandy grassland vegetation in the Pannonian Plain (e.g. *Acrotylus insubricus, Acrida ungarica, Calliptamus barbarus, Chorthippus dichrous, Myrmeleotettix antennatus, Oedaleus decorus* etc.) and mostly reach their northern distribution limit in this region. According to our data the newly discovered *Omocestus minutus* populations in Hungary are living in environments with these dry and bare sandy surfaces nearly at semi desert conditions. This is similar to their habitats in North Serbia (Deliblat; NAGY 2009), where the species also prefers overgrazed open sandy grasslands with short grasses.

Table 2: Orthoptera assemblages with *Omocestus minutus* in Hungary.

	Bugac-1	Bugac-2	Bugac-3	Kunadacs	Paks-1	Paks-2	Paks-3	Paks-4
Gampsocleis glabra	X	X	X					
Metrioptera bicolor				X				X
Platycleis affinis	X	X	X	X				
Platycleis albopunctata grisea					X			
Platycleis montana		X	X					
Platycleis veyseli		X						X
Gryllus campestris							X	
Tetrix tenuicornis				X				
Calliptamus italicus	X	X	X	X		X		X
Calliptamus barbarus	X	X	X	X	X	X	X	X
Pezotettix giornae					X		X	
Oedipoda caerulescens	X	X	X	X	X		X	X
Acrotylus insubricus	X	X	X	X	X	X		X
Celes variabilis				X				
Oedaleus decorus	X	X	X		X			
Sphingonotus caerulans						X		
Acrida ungarica	X	X	X	X	X	X	X	X
Dociostaurus brevicollis	X	X	X	X				X
Myrmeleotettix maculatus			X	X		X		
Myrmeleotettix antennatus	X	X	X	X				
Omocestus haemorrhoidalis		X	X	X				
Omocestus minutus	X	X	X	X	X	X	X	X
Omocestus petraeus			X	X				
Omocestus rufipes				X				
Stenobothrus nigromaculatus		X	X	X				
Stenobothrus crassipes		X						
Chorthippus mollis	X	X	X	X	X	X	X	X
Chorthippus brunneus	X			X	X	X	X	X
Chorthippus dichrous		X	X	X			X	X
Euchorthippus declivus		X		X				X
Euchorthippus pulvinatus	X			X				X

Photo 4: Male of the first site (Bugac-1), 21.8.2009.

Photo 5: Male (Bugac-2), 8.9.2012.

Photo 6: Male (Bugac-3), 8.9.2012.

Photo 7: Female (Bugac-2), 16.7.2011.

Photo 8: Male - lateral view and fore-wings (Bugac-2), 16.7.2011.

Origin of the recently discovered populations

An important question is that where these populations of *Omocestus minutus* in the middle of the Pannonian Plain (see fig. 4) originate from. The Orthoptera fauna of Hungary is relatively well studied (see e.g. NAGY 2003b, 2005) albeit even in the last decade some species were discovered as new to Hungarian fauna (BIRÓ 2008, NAGY 2003b, SZÖVÉNYI 2011a). The grasshoppers of Kiskunság are also relatively intensively studied for a longer period (e.g. NAGY 1958, RÁCZ 1986, SZŐNYI and KINCSEK 1986, SZÖVÉNYI 2007, 2011b), even in some places where *O. minutus* is now found. Near Kunadacs exactly the same plot was sampled since 2004 by the second author, and in Bugacpuszta also intensive ecological (partly orthopterological) studies were conducted since 1976, in the northern part of the protected area by the Department of Ecology, University of Szeged without finding *O. minutus*. This suggests that until the last years *O. minutus* was absent from this region and its detection in Hungary is a clear sign of its recent expansion to north westward in the Pannonian plain. The recent northern expansion of many South European insect species is well documented in this region (e.g. KOZÁR 1997). Another possibility is that this species already occurs in Hungary for a long time, but it was overlooked until now. This could well be the case for the populations near Paks, on the opposite side of the Danube, at the western edge of the Great Pannonian Plain. To us it seems to be most likely that the species is present in Hungary for a longer time, but only in very few suitable habitats in small populations. The populations might fluctuate in their numbers and in extension according to climatic conditions. This could explain the relative distant sites. The recent climate changes, with hot and dry summers on the Pannonian plain, may have caused a recent expansion. A further population genetical analysis of the different populations may help to answer this question.

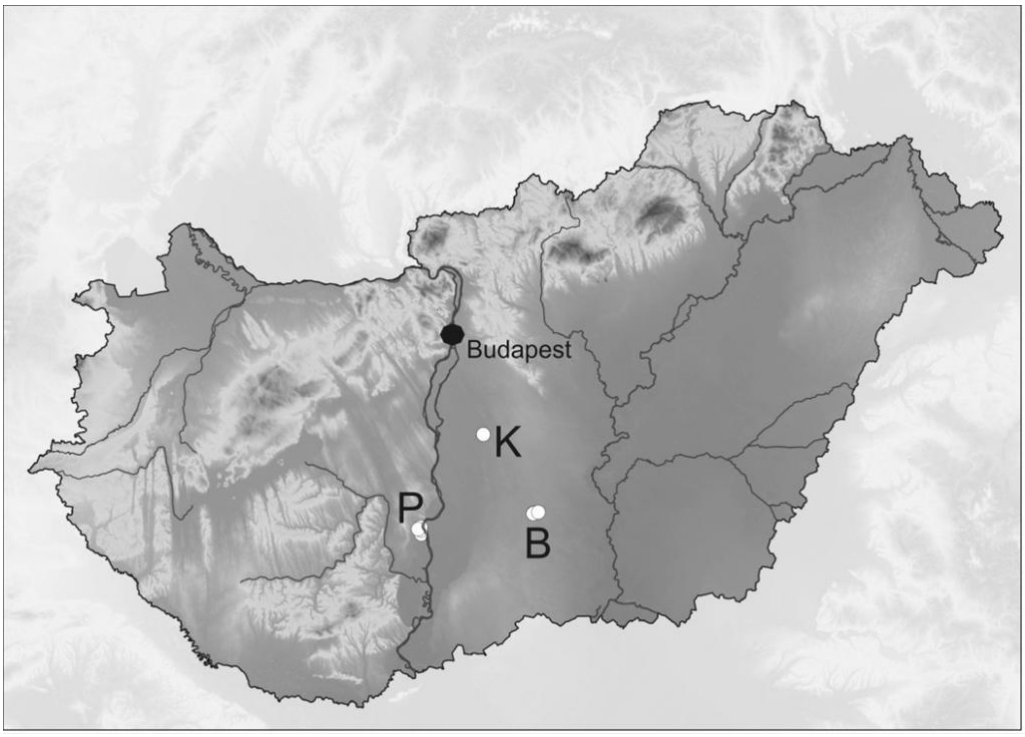

Figure 4: The recently known *Omocestus minutus* populations in Hungary (K: Kunadacs, B: Bugac-1-2-3, P: Paks-1-2-3-4).

Acknowledgements

Ionuţ Iorgu (Romania), Barnabas Nagy (Hungary), Christian Roesti (Switzerland) and Roy Kleukers (Netherlands).

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