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**STUDIES ON THE POPULATIONS OF  
*CARABUS (MORPHOCARABUS) SCHEIDLERI SERIATISSIMUS*  
REITTER, 1896 (INSECTA: COLEOPTERA) IN MARAMUREȘ  
(NORTH ROMANIA)**

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**Abstract.** *Carabus (Morphocarabus) scheidleri seriatissimus* Reitter, 1896 is a subspecies whose distribution is poorly known in Romania, only mentioned in two locations in the Maramureș county at Vișeu de Sus and near Sighetu Marmăției. The research conducted by the authors in Maramureș (2007–2009) allowed the identification of 5 other locations. It also occurs in the Bistrița-Năsăud county, west of the Rodna Mountains, at Fiad and Telciu.

**Résumé.** *Carabus (Morphocarabus) scheidleri seriatissimus* Reitter, 1896 est une sous-espèce dont la répartition est mal connue en Roumanie, seulement mentionnée de deux localités du département de Maramureș à Vișeu de Sus et à proximité de Sighetu Marmăției. Les recherches poursuivies par les auteurs en Maramureș (2007–2009) ont permis d'identifier 5 autres localités. Elle se rencontre aussi dans le département de Bistrița-Năsăud sur la bordure occidentale des montagnes des Rodna à Fiad et Telciu.

**Key words:** Coleoptera (Carabidae), new faunistic and zoogeographic data, carabofaune, Maramureș county, Romania.

INTRODUCTION

Fuss (1873) mentioned *Carabus scheidleri zawadzki* Kraatz, 1854 from the surroundings of Lăpuș locality, in Maramureș.

The attribution of the taxon *seriatissimus* Reiter, 1896 to the subspecific level is a controversial subject:

- considered a subspecies of *C. (Morphocarabus) zawadzki* Kraatz, 1854 by Lapouge (1916), Breuning (1932), Csiki (1906, 1946), Turin et al. (2003) and Deuve (2004, 2009);
- or a subspecies of *C. (Morphocarabus) scheidleri* Panzer, 1799 by Kleinfeld & Schütze (1999), Brezina (1999, 2003) and Bousquet et al. (2003).

At present, most specialists consider the taxon *zawadzki*, a subspecies of the species *C. scheidleri*.

The distinction between the two subspecies is made up by the 4 primary intervals in *zawadzki* in comparison with 3 in *scheidleri*. The studies of large series of samples for the species attributed to *scheidleri* (Mandl, 1965; Brezina, 2003), and to *zawadzki* (Lapouge, 1916) show the great variability of the number of primary detectable intervals.

The examination of an elevated effective individual of *seriatissimus* from different locations in the Maramureș and Bistrița-Năsăud counties confirms this observation, particularly as regards the populations from areas with a sunny exposure (especially for male individuals). In this case, elytra presents in the elytral part, near the external border, the fairly dense granulation which hinders the

identification of the 4<sup>th</sup> primary and especially the presence of mucron with a very characteristic form encountered in the superior part of foveae by other primary intervals. These ones are sparse and not very deep. In the absence of additional criteria [for example the papers on the molecular biology (Szél et al., 2008)], we consider *seriatissimus* as belonging to *C. (Morphocarabus) scheidleri* Panzer, 1799.

#### MATERIAL AND METHODS

The presented data reflect the observations registered in 2007 (18 - 30 May), 2008 (20 May - 06 June), 2009 (27 May - 03 July), 2010 (01 May - 28 May) on the material collected using the Barber traps with vinegar, in the stations referred into literature but also in the new stations where the authors discovered the species.

#### RESULTS AND DISCUSSIONS

*C. scheidleri seriatissimus* Reitter, 1896 is considered to have the largest size (some ♀♀ are 42 mm long, 15 mm wide) among the species of the subgenus *Morphocarabus*. This species of the north-east Maramureş could be confused with *C. (Morphocarabus) rothi hampei* var. *gutiensis* Takács & Lie, 1992 without a detailed examination.

The following morphometric characteristics allow their distinction:

- pronounced elytral striation in *C. rothi hampei* var. *gutiensis* Takács & Lie, 1992, which is reduced in *C. scheidleri seriatissimus* Reitter, 1896 (Fig. 1);
- pronotal ratio, with a pronotum two times larger than their height ( $e/h=1.54-1.55$ ) for *gutiensis* and higher than their length ( $e/h=1.38-1.40$ ) for *seriatissimus* (Tab. 1) and, secondarily, the elytra size for ratio  $Le/L$ .

Table 1

Morphometric criteria.

Species	Size (mm)				Ratio						Pronotum	
	L		l		L/l		Le/L <sup>(1)</sup>		Le/l		e/h	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
<i>seriatissimus</i>	33.2	36.7	12.1	12.9	2.69	2.78	62.3	61.9	1.68	1.72	1.38	1.40
<i>gutiensis</i>	33.9	36.3	12.9	13.7	2.63	2.65	65.6	65.9	1.73	1.75	1.55	1.54
ppds <sup>(2)</sup> p=0.05	0.7	0.4	0.4	0.5	0.09	1.10	1.2	1.8	0.9	0.8	0.06	0.08

L=insect total length; l=maximum width of elytra; Le=elytral length; e=pronotum length; h=pronotum height on median line;

<sup>(1)</sup> ratio in percentage; <sup>(2)</sup> The Newman-Keuls test (statistical test).

#### Geographical origins of collected material:

- *C. rothi hampei* var. *gutiensis* Takács & Lie, 1992 results from overlooking the forest at the superior Bodi Lake in the Gutâi Mountains (47°40'N, 23°46'E, alt. 740 m);
- *C. scheidleri seriatissimus* Reitter, 1896 results from Lunca la Tisa (47°56'N, 24°0'E, alt. 330 m), on the banks of the Tisa River.

We made measurements on 50 ♂♂ and 50 ♀♀ for statistical analysis.

Otherwise, the aedeagus has a very different form (Fig. 1), especially the apex aspect, quite characteristically, as Ishikawa underlines (in Lie, 1992).

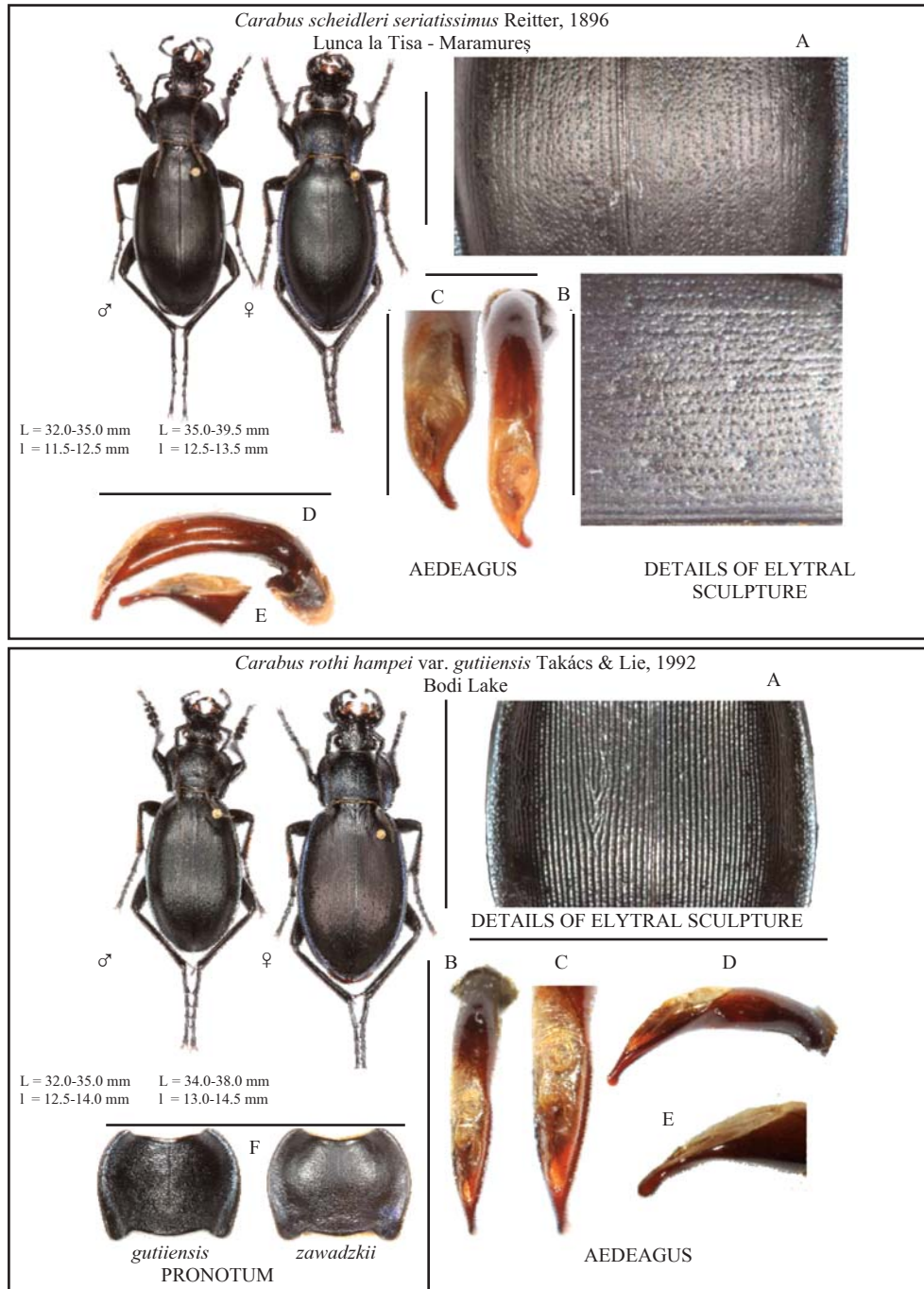


Fig. 1 - Morphological details of *C. scheidleri seriatissimus* Reitter, 1896 (top side) and *C. rothi hampei* var. *guttiensis* Takács & Lie, 1992 (bottom side): A, elytral sculpture; B, front view of aedeagus; C, front view of aedeagus apex; D, profile view of aedeagus; E, profile view of aedeagus apex; F, pronotum.

- *C. scheidleri seriatissimus* Reitter, 1896 presents an aedeagus with apex distinctly bent view from the front, the ostioles being of average dimension;
- *C. rothi hampei* var. *gutiensis* Takács & Lie, 1992 according to the figure 1 view is almost straight, apex pointed, extremity enlarged in palette and the ostioles of large size (almost half of the aedeagus).

#### *Geographical localization*

##### *a. Literature data*

The ancient data provided little information on the *C. scheidleri seriatissimus* Reitter, 1896 localization contrary to the *zawadzkii* type with a distribution area quite delimited in Serbia, Ukraine, Slovakia and Poland.

For *C. scheidleri seriatissimus* Reitter, 1896:

- Březina (1999), resuming on old data, cites pointing to the Hoverla massive in the Ukraine Carpathians (Maramureş Mountains). According to our recent research in the Romanian locations, this seems quite plausible (Hoverla 48°09'N, 24°30'E);
- Breuning (1932), without distinguishing between *zawadzkii* and *seriatissimus*, names Maramoros, Szigeth, Černá Hora and Rodna Mountains (Romania);
- Niedl (1957), for the *beheimi* form, cites Mukachevo in west of Ukraine;
- Mandl (1965), for *maramaroschensis* form, names Maramureş of Romania without much precision;
- Bodola & Takács (2002), Takács (1987) named Vişeu de Sus (Romania);
- Takács (1987; 2002 a, b), Takács & Bodola (2003) and Merkl (2008) designated Sighetu Marmătiei (Maramureş).

##### *b. New records*

Our collections of 2007 to 2009 permitted to identify the locations mentioned below (Fig. 2).

Maramureş county:

- Bocicioiu Mare-Lunca la Tisa 47°56'N, 24°01'E, alt. 320 m;
- Ruscova and Repedea (Maramureş Mountains) 47°49'N, 24°21'E, alt. 500 m;
- Bogdan Vodă 47°41'N, 24°17'E and Bocicoel 47°42'N, 24°18'E, alt. 480 m;
- Borşa (Secul) 47°37'N, 24°48'E, alt. 920 m.

Bistriţa Năsăud county:

- Fiad and Telciu 47°28'N, 24°22'E, alt. 440 m (western borders of the Rodna Mountains).

All the capture places are situated either at the forest edge, either under lighter forest cover or in the places near the permanent streams.

#### *The population characteristics*

The populations from the places mentioned above have the morphometric characteristics as they are presented in table 2.

On the whole, the population values did not differ significantly, except for the males, elytra narrower at Ruscova (cold and wet station) and at Borşa (station at altitude) (Tab. 2).

At Telciu and Lunca la Tisa, some female individuals reached 42 mm long and 14.5 to 15.0 mm elytral width. All populations had a black colour, sometimes with bright greenish blue reflection, quite frequent with males. The elytral and pronotal borders had the dominant blue or blue-black colour.

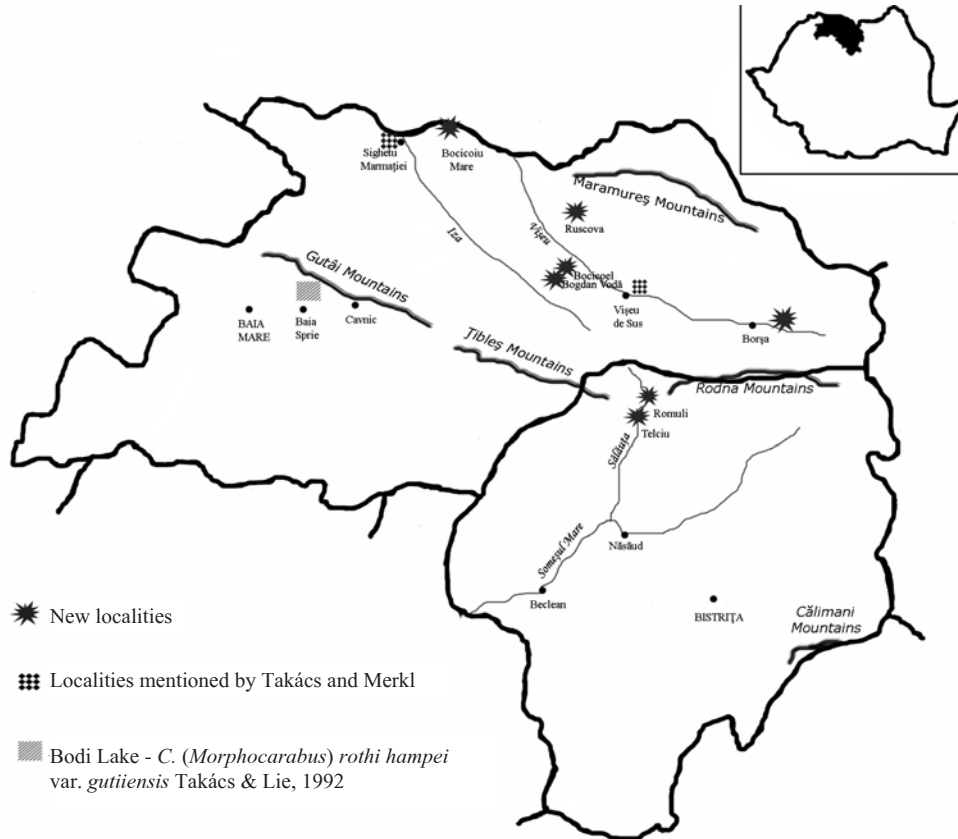


Fig. 2 - Geographical localization of the species *C. scheidleri seriatissimus* Reitter, 1896.

Table 2

Morphometric characteristics of different populations <sup>(1)</sup>.

Place	Size (mm)				Ratio						Pronotum	
	L		l		L/l		Le/L		Le/l		e/h	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Lunca <sup>(2)</sup>	33.2	36.7	12.1	12.9	2.69	2.78	62.3	61.9	1.68	1.72	1.38	1.40
Ruscova	31.6	35.0	11.7	12.6	2.69	2.78	62.3	61.8	1.67	1.71	1.37	1.41
Bocicoel	34.4	36.1	12.1	12.8	2.85	2.83	61.7	62.9	1.76	1.78	1.43	1.48
Borșa	33.0	35.1	11.2	12.7	2.93	2.76	61.4	64.0	1.80	1.76	1.34	1.43
Average	33.0	35.7	11.8	12.7	2.79	2.79	61.9	62.6	1.73	1.74	1.38	1.43

<sup>(1)</sup> Stock measured on the spot: 30 ♂♂ and 30 ♀♀ and the significance of the abbreviations is contained in the above table; <sup>(2)</sup> Lunca la Tisa; the measured individuals came from three year's collections, 2007, 2008 and 2009, especially from the places where the annual stock was reduced.

*Carabofaune*

The tables below group together for some of these study localities the fauna of Carabidae captured in 2009 from May 25 to July 03, in 4 collections (Barber traps containing vinegar). The first date may seem a little tardily for the species with premature exit like *C. (Eucarabus) obsoletus obsoletus* Sturm, 1815 but the capture is also based on the results of 2007 and 2008. Although, at Ruscova-Repedea (clammy station), more than half of the males of *C. scheidleri seriaticus* Reitter, 1896, captured in May, were immature.

Table 3

Captures at Lunca la Tisa.

Species	Effective	%
<i>Carabus (Tachypus) cancellatus durus</i> Reitter, 1896	261	28.2
<i>C. (Megodontus) violaceus andrzejusci</i> Fischer von Waldheim, 1823	187	20.2
<i>Abax carinatus</i> (Duftschmid, 1812)	168	18.2
<i>C. (Morphocarabus) scheidleri seriaticus</i> Reitter, 1896	101	10.9
<i>A. schueppeli</i> Palliardi, 1825	93	10.1
<i>C. (Eucarabus) obsoletus obsoletus</i> Sturm, 1815	62	6.7
<i>C. (Procrustes) coriaceus rugifer</i> (Kraatz, 1877)	32	3.5
<i>C. (Hygrocarabus) variolosus</i> Fabricius, 1787	10	1.1
<i>C. (Orinocarabus) linnaei</i> Panzer, 1812	7	0.8
<i>Molops piceus</i> (Panzer, 1793)	2	0.2
<i>C. (Tomocarabus) convexus simplicipennis</i> Dejean, 1825	1	0.1
Total stock	924	
Shannon diversity indices		1.765

*C. (Morphocarabus) scheidleri seriaticus* Reitter, 1896 is encountered in different carabocenoses (Tabs 3-6), but it often represents a small part of the total stock of the carabidae capture (3 to 11 %) excepting Repedea, where it range up to a quarter of the represented species (23 %). This station (Repedea-Ruscova) is situated in the Romanian Maramureş Mountains, which are an extension of the Ukrainian ones.

These species came out rather tardily (the end of May - the beginning of June), but that activity extending until the end of July.

The more constant accompaniment species are (besides g. *Abax*):

- *Carabus (Tachypus) cancellatus durus* Reitter, 1896, with a variable size and very abundant all over;
- *Carabus (Megodontus) violaceus andrzejusci* Fischer von Waldheim, 1823, small and narrow especially in ♂♂, the borders are blue greenish (for instance to Bocicoel, ♂ L/l=28.5-9.8; ♀=30.1-10.7 mm).

In the stations, where the *Carabus (Eucarabus) obsoletus* can be found, the following occur:

- the type species of *obsoletus obsoletus* Sturm, 1815 with large size for ♀♀ at Lunca la Tisa (♀♀ L/l=30.5-12.5 mm), very polychrome. In the station with the optimal environmental conditions (Lunca la Tisa, Borşa), the populations presented a high percentage of individuals with elytra very smooth on the disc (very subdued striation, the 1<sup>0</sup> and 2<sup>0</sup> primary with foveae, little numerous or absent and very superficial);

- form *obsoletus csikii* Mallasz, 1901 to Repedea = the individuals of small size, polychromes smooth and without punctuation of intervals I (or very rare superficial foveae);
- *Carabus (Orinocarabus) linnaei* Panzer, 1812, present in the altitude forests (Borșa 920 m) and also found at Lunca la Tisa (320 m);
- *Carabus (Eucarabus) ulrichii* Germar, 1824 is less frequent (Bocicoel), not being reported in Maramureș by Merkl (2008). These may be due to the fact that the collection date was a latter one, the species having a precocious coming out.

All the stations (excepting Borșa) hold characteristic species for humid places = *Carabus (Hygrocarabus) variolosus* Fabricius, 1787; *Carabus (Carabus) granulatus* Linné, 1758. It has also been previously indicated that *C. (Morphocarabus) scheidleri seriatissimus* Reitter, 1896 occurred in the areas with a permanent stream.

Table 4

## Captures at Bocicoel.

Species	Effective	%
<i>Carabus (Tachypus) cancellatus durus</i> Reitter, 1896	124	44.9
<i>Abax schueppeli</i> Palliardi, 1825	40	14.5
<i>C. (Megodontus) violaceus andrzejuscii</i> Fischer von Waldheim, 1823	25	9.1
<i>A. carinatus</i> (Duftschmid, 1812)	25	9.1
<i>C. (Morphocarabus) scheidleri seriatissimus</i> Reitter, 1896	25	9.1
<i>C. (Hygrocarabus) variolosus</i> Fabricius, 1787	16	5.8
<i>Cychrus caraboides</i> (Linné, 1758)	10	3.6
<i>Carabus (Procrustes) coriaceus rugifer</i> (Kraatz, 1877)	6	2.2
<i>C. (Eucarabus) ulrichii</i> Germar, 1824	2	0.7
<i>C. (Eucarabus) obsoletus obsoletus</i> Sturm, 1815	1	0.4
<i>C. (Tomocarabus) convexus simplicipennis</i> Dejean, 1826	1	0.4
<i>Leistus piceus piceus</i> Frolich, 1799	1	0.4
Total effective	276	
Shannon diversity indices		2.123

Table 5

## Captures at Borșa.

Species	Effective	%
<i>Abax carinatus</i> (Duftschmid, 1812)	56	26.7
<i>Carabus (Tachypus) cancellatus durus</i> Reitter, 1896	54	25.7
<i>C. (Megodontus) violaceus andrzejuscii</i> Fischer von Waldheim, 1823	30	14.3
<i>C. (Eucarabus) obsoletus obsoletus</i> Sturm, 1815	22	10.5
<i>C. (Orinocarabus) linnaei</i> Panzer, 1812	14	6.7
<i>C. (Procrustes) coriaceus rugifer</i> (Kraatz, 1877)	12	5.7
<i>C. (Chrysocarabus) auronitens escheri</i> Palliardi, 1825	6	2.9
<i>C. (Morphocarabus) scheidleri seriatissimus</i> Reitter, 1896	6	2.9
<i>A. schueppeli</i> Palliardi, 1825	6	2.9
<i>Molops piceus</i> (Panzer, 1793)	3	1.4
<i>C. (Oreocarabus) glabratus extensus</i> Kraatz, 1885	1	0.5
Total effective	210	
Shannon diversity indices		2.133

Table 6

## Captures at Repedea.

Species	Effective	%
<i>Carabus (Morphocarabus) scheidleri seriaticus</i> Reitter, 1896	29	23.6
<i>C. (Tachypus) cancellatus durus</i> Reitter, 1896	20	16.3
<i>C. (Procrustes) coriaceus rugifer</i> (Kraatz, 1877)	16	13.0
<i>C. (Eucarabus) ulrichii</i> Germar, 1824	14	11.4
<i>C. (Chaetocarabus) intricatus</i> Linné, 1761	12	9.8
<i>C. (Carabus) granulatus</i> Linné, 1758	10	8.1
<i>C. (Eucarabus) obsoletus csikii</i> Mallasz, 1901	9	7.3
<i>C. (Megodontus) violaceus andrzejusci</i> Fischer von Waldheim, 1823	6	4.9
<i>Abax schueppeli</i> Palliardi, 1825	6	4.9
<i>Cychrus caraboides</i> (Linné, 1758)	1	0.8
Total effective	123	
Shannon diversity indices		2.975

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CERCETĂRI ASUPRA POPULAȚIILOR DE *CARABUS (MORPHOCARABUS) SCHEIDLERI SERIATICUS* REITTER, 1896 (INSECTA: COLEOPTERA) ÎN MARAMUREȘ (NORDUL ROMÂNIEI)

## REZUMAT

*Carabus (Morphocarabus) scheidleri seriaticus* Reitter, 1896 este o subspecie cu o distribuție puțin cunoscută în România, fiind semnalată doar în două localități din județul Maramureș, și anume la Vișeu de Sus și lângă Sighetu Marmăției. Cercetările făcute de autori în județul Maramureș (2007-2009) au condus la semnalarea acestei subspecii în alte cinci locuri. De asemenea, aceasta a fost găsită și în județul Bistrița-Năsăud, la Fiad și Telciu, la vest de Munții Rodnei.

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