

CONSIDERATIONS ON THE GENUS *CARABUS* SPECIES PROTECTED IN ROMANIA BY THE NATURA 2000 NETWORK

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Abstract. In Romania, the Natura 2000 network is highly developed, with 273 SIC covering 17% of the country and also has three biosphere reserves (Danube Delta, Retezat Mountains and Rodna Mountains). The study is interested in heritage species of Genus *Carabus* named in the Annexe II and IV (modified version 2007) of the "Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora". The paper make an analysis of the romanian carabus species by european community interest in terms of taxonomic observations, geographical distribution, ecology of species, conservation status and the problems due to the bibliographic inconsistencies. These species of European Community interest are examined for their recent taxonomic name and their geographical distribution established from reliable bibliographical data, researches of the authors and the indications of SCI (Site of Community Importance) Natura 2000 for the confirmed sites. *Carabus (Pachystus) hungaricus* Fabricius, 1792 is extremely rare (only one sure station); *Carabus (Hygrocarabus) variolosus* Fabricius, 1787 is more

widespread, especially in mountainous or hilly areas; *Carabus (Morphocarabus) zawadzki seriatissimus* Reitter, 1896 its range has recently specified (see attached map). The global name *Carabus (Morphocarabus) hampei* of the Council Directive 92/43/EEC includes three species: *Carabus (Morphocarabus) rothi comptus* Dejean, 1831; *Carabus (Morphocarabus) rothi incompus* Kraatz, 1880; *Carabus (Morphocarabus) rothi hampei* Kuster, 1846 and the infraspecific diversity are at least 12 taxa spread over the national territory (see map attached). Moreover, the authors attract attention to the need of the Romanian state responsible, to protect the endemic species of the Genus *Carabus*. The paper provides a summary of the personal and bibliographic observations which are in the interest of : the entities which aim to species conservation, the protected area managers, the entomologists interested by the *Carabus* genus species and, we hope, the legislative bodies that have capacity to making decision for the management to protection species that require attention.

Key words: Natura 2000 Network, *carabus*, *hampei*, *hungaricus*, *variolosus*, *zawadzki*, taxonomy, distribution, habitats, inventory mapping.

INTRODUCTION

I. The Network Natura 2000

The European Union has taken various measures so to ensure the biodiversity by the conservation of the natural habitats, of the flora and wild fauna on the territory of the Member States. Among those appears the Directive „Habitats, Fauna Flora” DHFF 92/43 CEE (21 May 1992) creating a common framework of intervention. It defines habitats and species of Community interest allowing the identification of sites of Community importance. (SACs-Special Areas of Conservation or ASCIs-Areas of Special Conservation Interest, known's as SCI) that constitute with Special Protection Areas (SPAs) for birds the Network Natura 2000.

In Romania this network counts 273 SIC covering 17% of the own territory (the highest percentage of the EU) and 3 reserves biospheres: Delta of the Danube, Mounts Retezat, and Mounts Rodna. Each” Standard data form“ of SICs includes as scientific information data on the characteristics of natural habitats, the list of the species of the fauna and flora retained of

community interest, the statute of conservation and must comprise a bibliography of reference.

II Species of the *G. Carabus* in Natura 2000

The annexe I of the DHFF lists the species of Community interest (patrimonial species) which are whether:

- in danger of extinction (red list)
- vulnerable (species may be in danger if the sudden pressures do not decrease)
- rare (widespread species but with low density, very localised species and abundant in their biotopes; species very badly sampled by the traditional methods and met by chance)
- endemic, strictly localised at a particular restricted geographical area.

For Romania, the Annexe II (DHFF) and the forms Natura 2000 mention *C. hungaricus* (3 SIC), *C. hampei* (21 SIC), *C. variolosus* (24 SIC), *C. zawadzskii* (3 SIC). The reasons of this choice are not specified but are justified for *C. hungaricus* and *C. variolosus* disappeared or extremely rare in several European countries.

The examination of available data to establish the geographical distribution led to the following remarks:

1. Insufficiency of reliable and recent references on the geographical localization. Contrary, for example to the superabundant and brought up to date phyto-geographical data, species of Genus *Carabus* have a distribution badly known (insufficiency of collection) or based on old or sometimes erroneous references.
2. Specificity of research, because of their night and seasonal activity, the detection of the presence of species of Genus *Carabus* implies a capturing according to suitable techniques during the often short exit of the imagos or their research in the site/sites of hibernation (specific studies based on biological and behavioural knowledge).
3. Insertion of old names in modern taxonomy and useful extension of the biodiversity for the infraspecific level. The biodiversity does not relate to only the species but should take into account the infraspecific diversity for the most characteristic populations. Indeed although the proof is difficult, some isolated populations can be genetically different, due to isolation or adaptation to the medium. For the patrimonial species covered by the DHFF, it is the case for *Carabus hampei* meets on a vast territory (HU, RO, UA) (cf. will infra).
4. For the old data (before 1932) or recent of Hungarian origin, the difficulty in identifying the current Romanian localities starting from German or Hungarian designations, related to the history.

The study which follows proposes for the species of the Genus *Carabus* protected in Romania, their taxonomic position, their geographical distribution and preferential habitats when those are sufficiently characteristic.

MATERIALS AND METHODS

The work is based to the studies made in the last ten years to the *Carabus* genus in Romania and to the scientific bibliographical studies. In the field observations the *Carabus* species was captured using the Barber pitfalls mainly in the Natural and National Parks or in the interesting sites for *Carabus* species quoted in literature work.

RESULTS AND DISCUSSIONS

III. Species of Genus *Carabus* protected in Romania- taxonomy, distribution, habitats.

A. *Carabus (Pachystus) hungaricus* Fabricius 1792

1. Taxonomy arrangements

Carabus hungaricus en Europe has three subspecies: *hungaricus* Fabricius 1792 for the European form; *mingens* Quensel 1806 for the Russian Plain and Caucasus; and *scythus* Motschulsky 1847 present in E Ukraine and middle Volga region. In the Pannonian Region besides the typical species were described two taxons: *hungaricus viennensis* Kraatz 1877 spread in the Vienna Basin (Austria) and South of Moravia (Czech Republic) and *hungaricus frivaldskyanus* Breuning 1933 spread in Serbian and Romanian Banat. The specimens collected by Breuning in Romania and in Serbia (Deliblat) were considered different, caused the characteristics of primary foveae considered quite large and very strong. This name is considered unavailable in the most of catalogues.

2. Geographical distribution in Romania

Currently, the only recent data for Romania relates to the localities of Jamu Mare and Latunas from Banat (CS), to the Valée Semița in xerophytic meadow LIE 1994, 1995. This author sought this species at Mașloc and Remetea Mică, places quoted by Breuning 1933 (a specimen present in the Breuning collection preserved by the University of Amsterdam). The periods of imagos activity are contingent of summer and autumnal pluviometry. (figure 1)

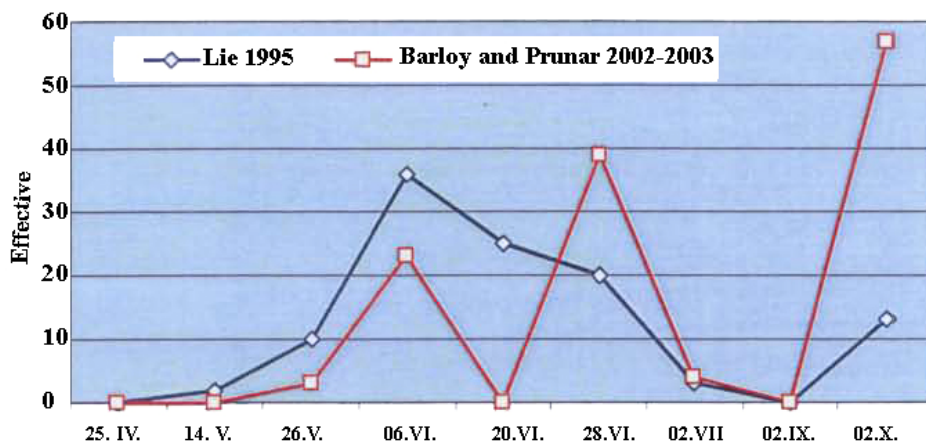


Figure 1. Seasonal evolution of *C. (Pachystus) hungaricus* Fabricius 1792 at Janu Mare

In Natura 2000, *C. hungaricus* Fabricius 1792 is quoted of Ciuperceni-Desa, Coridorul Jiului and Silvostepa Olteniei according to the observations of Ienistea (personal communication E. Nitu); no research confirms the current existence of the species. The quotation of SCI Mlaștina Satchinez (TM) seems erroneous to us.

3. Habitat

The European form has a xero-termophilic preferring the sandy steppe at Jamu Mare station the species is spread along a slope and prefer: the shelter cords or clumps of shrubs mainly *Prunus spinosa* and *Crataegus monogyna*; lower and upper lip-edge of flat areas along the contour, where humidity resulting in precipitation is kept longer; ravines along the slope, formed by rainwater especially if it finds there vegetation and shrubs. We found this species with a high abundance and dominance in Serbia to the sandy steppe at Deliblat (Susara) and a population quite well represented but in a very small area distributed in characteristic places (areas shaded by shrubs, depressions or channels that retain soil moisture).

B. *Carabus (Morphocarabus) hampei* Kuster 1846

While referring to the specialized bibliography and our references of field observations the global name *C. hampei* of the Sites Natura 2000 and the localities appearing in the reference 2012 (Species Fact Sheets) include three species:

- *C. (Morphocarabus) rothi comptus* Dejean 1831 (2 taxa).
- *C. (Morphocarabus) rothi incompus* Kraatz 1880.
- *C. (Morphocarabus) hampei* Kuster 1846 (9 taxa).

The distinction between these species is not always easy to nonspecialists and their genetic bond is incompletely established. The linking of some taxa varies and remain partly discussed. Because of difficulty of identification, the regrouping under the global designation of *C. hampei* can be justified it marks nevertheless a great biological diversity.

Among the morphological criteria of identification:

- *C. (Morphocarabus) rothi comptus* present 4 primary intervals.
- *C. (Morphocarabus) rothi hampei* typically holds 5 primary intervals, identifiable by the particular shape of the foveae. In absence of the duplication of the intervals, the four primary are easily identifiable, the fifth being detectable when the number of intervals reaches 20. However LAPOUGE (1916) mentions the great variability of the number of these intervals.
- *C. (Morphocarabus) rothi incompus*, morphologically similar to previous (elytra shorter and broader, foveas indistinct), is identified by the shape of the endophallus.

a. *C. (Morphocarabus) rothi comptus* Dejean 1831

Taxonomy, geographical distribution

This species undoubtedly endemic of Romania (uncertain presence in the UK) includes two taxa being distinguishing by the size and the altitudinal localization. (figure 2.)

- The typical form *comptus comptus* measures 18-22 mm and occurs in the mountains.
 - **Apuseni Mountains:** Padiș at superior basin of Crișul Pietros, (TEODOREANU 1981) and surroundings Top Buteasa 1792 m. (Natura 2000); superior course of Someșul Rece River 900-1300 m., Someșul Cald, (BIELZ 1845 BITRTHLER 1886)
 - **Poiana Ruscă Mountains:** meadow *Vaccinium* sp. 1885m. (BARLOY and PRUNAR 2005-2006)
 - **Țarcu Mountains** at various locations: Top Țarcu in meadow 1900-2000 m. (LIE 1994), Top Mătania 2160 m., (BUDKA 2008), Top Nedeia 2000 m. (KYNKA 2008); Muntele Mic (CSIKI 1908, BARLOY et al. 2012) with the form *szoerenyensis* variously colored (brown bronze, red gilded, green, violet), in meadow 1500 m. (LIE 1994); also at the foot of the mountains in edge of the Sebeș River, colony formed by the water entrainment (BARLOY and PRUNAR 2007, 2008)
 - **Retezat Mountains,** CSIKI, PETRI (Narozsu), not found by LIE 1997.

The form *C. (Morphocarabus) rothi comptus ulrichhoffmanni* Lie 1982, size 25-27 mm., occurs in hilly area of Poiana Ruscă Mountains 300-400 m. Known places: Nădrag Valley at Gosta 350-400 m. forest (LIE 1981), Căvăran in forest edge 360 m., Borlova into a wet ravine 380 m. named Ogașul Nicoară, Bouțari in a forest 600 m. to Micota Valley, (LIE 1982, 1994, 1999). The form *borlovensis* present an activity over a short period – from the end of May to the mid of June (figure 3).

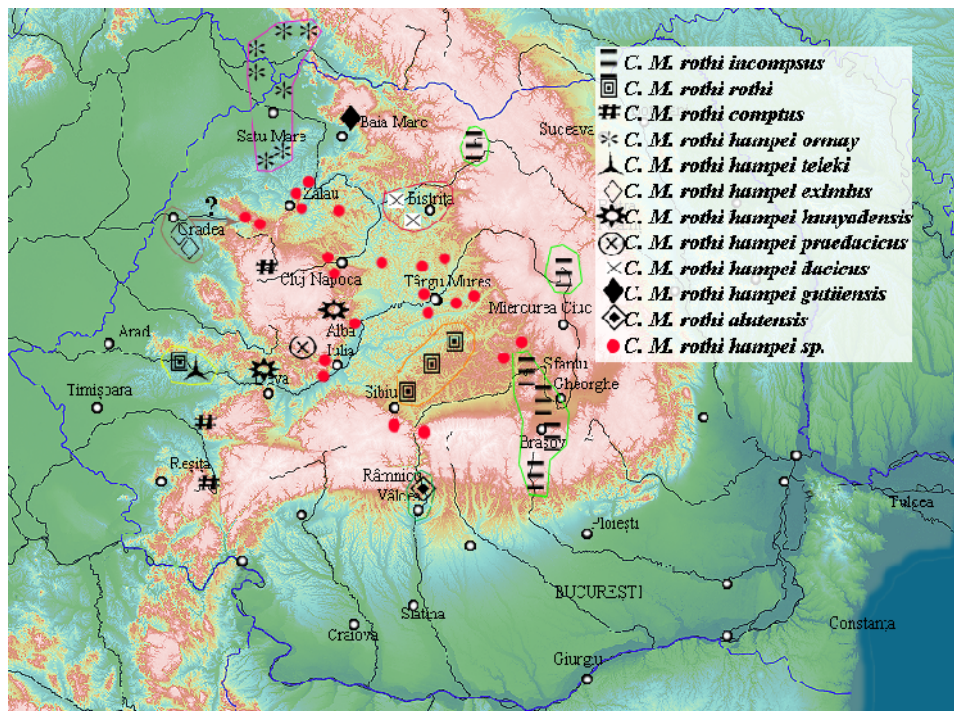


Figure 2. Distribution of group *Morphocarabus rothi* Dej. species in Romania

b. *C. (Morphocarabus) rothi incompsus* Kratz 1880

Morphologically close to *hampei* (but elytron with narrow intervals, the primaries interrupted by some very shallow dimples), the surest identification rests on the form of the endophallus. Specimens of the mentioned localities cf. above, not all were subjected to this control; the oldest references come from famous carabologists (Bielz, Csiki...) however. The recent researches among taxa of the species *hampei* have, for example, allowed to attach the form *mendax* Csiki 1906 present in Ukraine (Mainly Mounts) at the species *incompsus*.

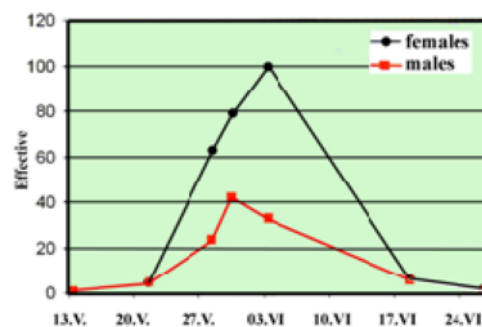


Figure 3. Seasonal activity example of species *C. (M.) rothi comptus ulrichoffmanni* Lie 1982,

The typical form can be found from Azuga-Bușteni to Odorheiu Secuiesc-Vlăhița: Azuga-Sinaia-Bușteni (FLECK 1904, MONTADON 1906). In PETRI (1912): Brașov, Predeal Pass, Crizbav, Vâlcele, Măieruș, Știuca, Mont Cristianul Mare. In LIE (2001): Timișu de Sus, Tâmpa 900 m.. BARLOY and PRUNAR collected at Poiana Brașov (1030 m.), Bogata Forest (600 m.). Specimens measure 27-30 mm. (600 m.), Top Vârghiș 720-820 m. (MATHE 2007).

• Two alpin forms are attached to *incompus*:

- *spectabilis* Csiki 1906 of Rodna Mountains, Ineu Peak (2280 m.), Coronghiș (1500-1800 m.), LIE 1992-Vatra Dornei (1500 m.). Size 26-27 mm.
- *mehelyanus* Csiki 1906 of Hășmaș Mountains and Țarcăului (HOLDHAUS 1910): Bălan, Ecem, Hășmașu Mare (1793 m), Piatra Singuratică (1648 m), Piatra Tarcaului (1463 m), Munticelul (1000 m). Small size 20-22 mm.

The rare form *rareulensis* (Born 1907) of Rarău Mountains is attached to the previous.

c. C. (*Morphocarabus*) *rothi hampei* Kuster 1846.

This species, present in the North-West and the Centre-West of Romania, does not exceed in the East the Carpathian arc and crosses the territorial limits to the extreme NNW on the limited areas in Hungary and Ukraine.

In the zone of Romanian distribution, the species largely represented (considered as eudominant PRUNAR et al. 2007, 2009) are quoted in many localities; undoubtedly not being identified.

In this vast territory, it forms many populations sometimes distinguished on the infraspecific level. The most typical, accepted in taxonomy are distinguish by their size, their colour, the number of intervals but especially geographical localization, sometimes being the only one (example *gutiiensis* TAKACS and LIE 1992), found only in the forest of the Bodi Lakes (MM). Many others, less distinct are arranged in the standard species.

For the accepted forms on the infraspecific level, the table 1 above provides some components ensuring the morphological distinction. Others, less characterized, in spite of some attempts of nominations, are attached to the standard form.

Table 1.

Morphological features of *C. (Morphocarabus) rothi hampei*

Taxa	Dimensions (1)		Number of intervals	Dominant color	Notes
	L mm	l mm			
<i>hunyadensis</i> Csiki 1906	34-37	12,7-13,5	18-20	black	♀ L 38-39 mm. indistinct foveae
<i>gutiiensis</i> Takacs and Lie 1992	34-36	12,9-13,7	20-24	brownish black	♀ l 14-15 mm
<i>dacicus</i> Csiki 1906	31-34	11,7-12,7	22-24	black dark blue	♀ L 35-36 mm. raised intervals
<i>teleki</i> Csiki 1987	30-31	11,1-11,4	18-21	variable	intervals rather salient
<i>hampei</i> Kuster 1846	27-30	9,7-10,3	18-19	diverse	small foveae
<i>praedacicus</i> Lie 1992	28-29	10,6-10,7	18-22	black	intervals rather salient
<i>ormayi</i> Reitter 1896	27-30	-	-	diverse	-
<i>eximius</i> Csiki 1906	22-25	-	18-19	blue	-
<i>zilahiensis</i> Csiki 1906	24-26	9,2-9,7	18-19	violet blue	foveae large, deep

(1) Dimensions: ♂ then ♀

Localisation

- *hunyadensis* Csiki 1906 : Săcărâmb (800-900 m), Metaliferi Mountains ; Poiana Aiudului, Trascău Mountains, (Szel 2007) ; only known localities
- *gutiiensis* Takacs and Lie 1992: forests surrounding the two Bodi Lakes, Gutai Mountains 500-700 m., single known station

- *dacicus* Csiki 1906 : surroundings Beclean, Gherla, Nasaud, (CSIKI, BIELZ, TAKACS), Beclenut, wood edge of Someşul Mare River 300 m., (BARLOY and PRUNAR 2008), Arcalia 600 m. (RUICĂNESCU).
- *teleki* Csiki 1937 left bank of Mureş River at Nemeşesti, Margina, Pojoga, Icuil Coşteiului (LIE 1991), Căprioara Ilteu, Pojoga (BARLOY and PRUNAR 2008). Forest and meadow: SZEL et al. (2007) attach this taxon to *C. Morphocarabus rothi rothi* Dejean 1829 due to the absence of the fifth primary. LAPOUGE 1926 reports this frequent case for *hampei*. Moreover the largest individuals females of *teleki* have 5 primary intervals.
- *hampei hampei* Kuster 1846. Many localities are attached to the type species. The collect operated by SZEL et al. 2007 quote: Aiud, Alba Iulia, Cerghid, Chinari, Cristuru Secuiesc, Gheorgheni, Iernut, Ilia-Bacea, Mircurea Nirajului, Reghin, Rimetea, Ruganesti, Sebot, Şincai, Sovata, Targu Mureş, Târnăveni, Troiţa, Valişoara. TAKACS (2003), mentions Jibou, Buzesti, (wood near Ardasat), Someş Odorhei, Gărdani (edge of Someş River), Rupea. BARLOY and PRUNAR 2010 add Cislădioara, Turnu Rosu Pass, Sărăţeni. Lie (2001) mention Sărmaşu (supposed place of the type of Kuster) and designates three central regions: region Cristuru Secuiesc-Sighişoara (300-400 m), region Târgu Mureş with the taxon *fraternus* Csiki 1906, region Ilia-Sibot. Ruicanescu adds Ciucea-Valea Drăganului 770 m. (1993), Scăriţa-Belioara 700 m. (1994).
- *praedacicus* Lie 1992. Described by 5 specimens Valea Mare (400-600 m. near Zlatna). Found in mass (BARLOY and PRUNAR 2008, 2009) in forest edge and in meadow (road Zlatna-Almasu Mare).
- *ormayi* Reitter 1896. Well represented in Hungary (NE extreme) and in Ukraine, this taxon appears at NNW of Romania: Micula, (TAKACS 2000), Moiad, Noroieni, Sărmaşag, (SZEL et al. 2007). While approaching at Zalău, the distinction is less clear. LIE 2001 indicates Jibou. A polychrome small size population with rather heterogeneous of colour (L:22-25 mm, l:8-10,5 mm. is in forest Firminiş 2006-2011).
- *eximius* and *zilhaniensis* Csiki 1906. These two taxa, morphologically similar (distinctive general form, shape of the pronotum, intervals interruptions), occupy separate territories.
 - *eximius* Csiki 1906 Băile Felix, Hididşelu de Sus, Hididşelu de Jos, Beftia, Sinteu (BARLOY and PRUNAR 2009) 22-28 mm.
 - *zilhaniensis* Csiki 1906 Monts Meseş, Zalău, Crişeni (TAKACS et al. 2003).

The geographical distribution of these 2 forms requires verification.

- *diffinis* Csiki 1906. The position of this taxon is discussed LOBL et al. 2003 arrange it under the subspecies *comptus* in spite of the presence of 5 primary intervals (Fuss 1871, Birthler 1886 considered him *comptus*). It resemble to *eximius* by the size (23-28 mm), and the colour, but the surface of the elytra presents a silky reflection (net at ♂♂). Gilău Mounts (PETRI 1910), Cluj (Csiki 1906), Hill Hoia Cluj (TEODOREANU 1959). Quoted at Someşul Rece River (confusion with *comptus*?). Wood close to route 103K near to Gârbău (BARLOY and PRUNAR 2007-2009).

This list does not include taxa corresponding to individual forms of colour (*aurosericus* Kraatz 1880; *liebli* Dietl 1897; *zoppai* Kratz 1900), effective or dimensions of intervals (*bokori* Csiki 1927; *fraternus* Csiki 1906; *marusi* Ormay 1890).

***C. C. (Morphocarabus) scheidleri seriatissimus* Reitter 1896**

This species of big size (L : 33-37 mm, l : 12,1-12,9 mm) with individuals reaching 38 to 40 mm., has four primary intervals, and streaks formed by lines of points arranged on the

matte black elytra, is found in Ukraine (Maramureş Mountains) and in Romania in the Maramureş and Bistrița Năsăud districts.

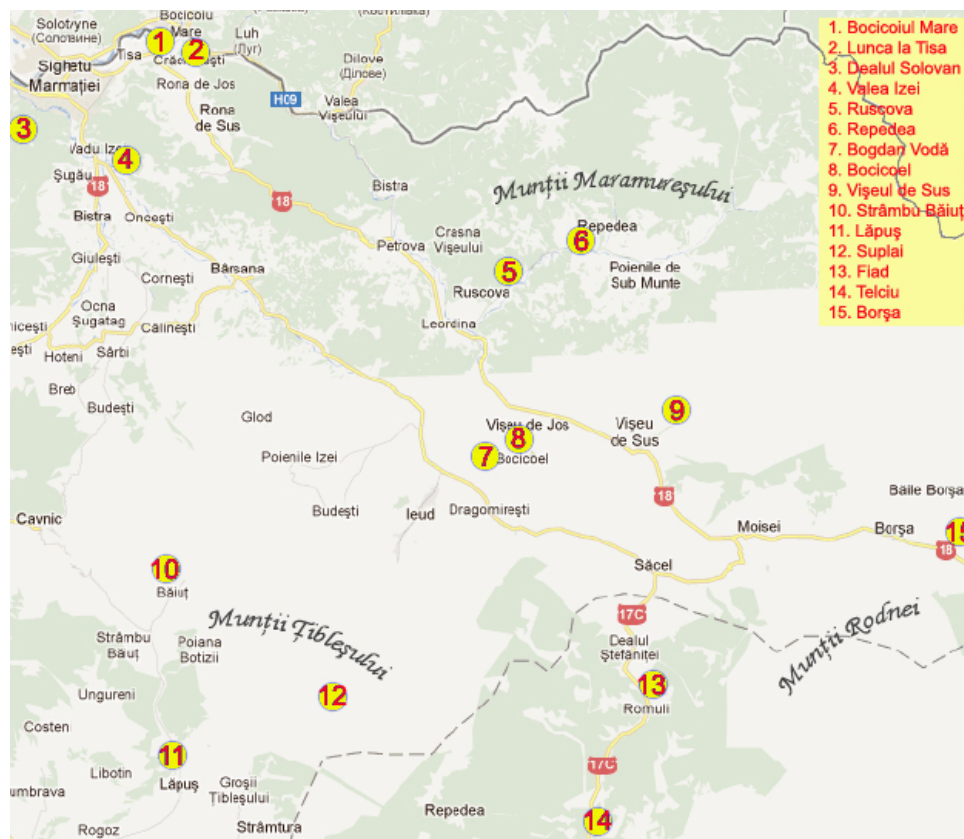


Figure 4. Distribution of *C. (Morphocarabus) scheidleri seriatissimus* Reitter 1896

1. Localization (figure 4)

Maramureş : Lăpuș-Suplai (FUSS 1873); Sighetu Marmăției-Bocicoiul Mare 300m. (KINGA et al. 2003 and MERKL 2008) ; Lunca la Tisa along the river Tisa (BARLOY and PRUNAR 2007-2011), Vișeu de Sus (Kinga et al. 2003) Ruscova, Repedea in the Maramureş Mountains 500 m., Bogdan Voda 480 m., Borsa 920 m. (BARLOY and PRUNAR 2011)

Bistrița Năsăud : western edge of Rodnei Mountains: Fiad, Telciu, 440 m (BARLOY and PRUNAR 2007-2011).

Les sites Natura 2000 : Valea Izei and Dealu Solovan, places close to Sighetu Marmăției confirm the establishment of the species in this zone. The presence in the Secular Forest of Strâmbu Băiut in the Gutâiului Mounts hears towards the south the zone of distribution. However, the simultaneous presence of *C. hampei* and *C. zawadzkii* is strange.

2. Biotopes:

The habitats are either of the clear forests or the forest edges either of the bushes in the limit of meadow in the vicinity of semi-permanent brooks.

D. *Carabus (Hygrocarabus) variolosus* (Fabricius 1787)

This hygrophite species, frequent of multiple wet places in Romania, rather in forest up to 1300 m (Mounts Semenic peat bog), and it meets on all the territory except Dobrogea.

CONCLUSIONS

The foregoing presentation and the context in which it is established, calls several observations:

1. Endemic species, presents only in one state never appear in European texts, their protection is the responsibility of the state that hosts them. Contrary to some European countries, Romania has not yet taken a protective measure for endemic *G. Carabus* except those made by European legislation. If Romania decide this protection, that concerning *C. (Morphocarabus) rothi comptus* Dejean 1831 ; *C. (Morphocarabus) rothi rothi* Dejean and Boisduval 1829 ; *C. (Morphocarabus) rothi alutensis* Săvulescu 1972; *C. (Morphocarabus) kollari* Palliardi 1825, *C. (Morphocarabus) rothi incompus* Kraatz 1880.
2. The patrimonial protected species, present in Romania are well described in the specialized literature up to the infraspecific level for the group of species arranged under name *C. hampei*. At this last level, the identification is in competence of carabologists specialists of which should be surrounded the descriptors of the sites Natura 2000 (problems of competences).
3. The territorial distribution is established as a whole in spite of the heterogeneity of the collection dates. The old data provided by carabologists are invaluable because they delimit a potential surface where the species (taxon) described can be found by thorough research. The presence of certain species is unknown fault of investigations or is described of only one locality: a systematic research makes it possible to fill this gap (example: extension of the distribution surface of *C. (Morphocarabus) rothi alutensis* BARLOY and PRUNAR 2011 and of *C. (Morphocarabus) scheidleri seriatissimus* BARLOY and PRUNAR 2011.
4. The natural habitat, defined by directive DHFF is primarily characterized by the vegetation of the studied site (phytosociology). The description of the vegetal environment is not enough to define the habitat of the genre *Carabus* species. For those, it is about a report of presence, not explaining it. The evaluation of the explanatory biological and abiotic factors, of the populations presence is seldom carried out (because complex) or is limited to a major component such the hydrous supply (for example *hungaricus* rather xerophilous and *variolosus* very hydrophilic). Extensive studies, carried out on *C. hungaricus* (POKLUDA et al. 2012) considered as species of dry steppe show the complexity of the relations with the medium micro localization territorial, difference in behaviour of the ♂♂ and the ♀♀.
5. For the protected species from the genre *Carabus* on the territory of Romania:
 - *C. (Pachystus) hungaricus* remains an extremely rare species, perhaps insufficiently sought; some sites Natura 2000 being doubtful (Satchinez). Disappeared from Republic of Moldova (NECULISEANU et al. 1999), it appears on the red list of the Russian Federation (IVANENKO 1999) and Ukraine (SERBAKA 1994).
 - *C. (Hygrocarabus) variolosus* Fabricius 1787 is frequent, especially in mountainous and hilly zones.
 - *C. (Morphocarabus) scheidleri zawadzki seriatissimus* Reitter 1896 occupies a large area in Maramureş and Bistriţa Năsăud, and not all sites were identified.
 - *C. (Morphocarabus) rothi hampei* Kuster 1846 considered in the broad sense of the Habitats Directive occupies the majority of the territory located at the west of the Carpathic arc,

above the 45⁰ of latitude.

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