STUDY OF SOME ROMANIAN POPULATIONS OF *C. (EUCARABUS) ULRICHII* GERMAR 1824

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Abstract: *Romanian populations of C. (Eucarabus) ulrichii Germar 1824 were studied for their appurtenance to the subsp. ulrichii type, or to the subsp. fastuosus* Palliardi 1825. *The size of the pronotum did not ensure the distinction, contrary to the relative size, index of the absolute form and secondarily the form of the pronotum rear angles. Three origins linked to fastuosus (Baile Herculane) to superbus* Kraatz 1878 *(Cărbunari-Stinăpari) to arrogans* Schaum 1859, *are exceptions. C. (Eucarabus) ulrichii* Germar 1824 *is a species undoubtedly present throughout the territory of Romania, although less abundant in Maramures and Dobrogea. It occurs rather in plains, but can rise up 900-1100 m. (Monts Poiana Rusca HD, Mont Secuiului AB). This species is found in various natural habitats (grasslands, deciduous forests, steppes, wasteland ...) but also in the crops coming from the refuge areas. In Romania, according to the literature, there is the subsp. ulrichii Germar and subsp. fastuosus Palliardi and the form superbus Kraatz. The various ecological situations have modeled the populations among which various taxa (around 50) are differentiated, the most being invalidated. Morphological criteria ensuring the distinction between the two subsp. vary depending on the authors. The study presented was made on 34 populations originating from Banat, Transylvania and Maramureş, and means to identify the most relevant characters to ensure the determination. Besides, the shape of the pronotum rear angles, a useful character but difficult to use, the analysis has focused on the morphometric data (pronotum shape, relative size of the imago, the index of absolute form), diversity of coloration in populations. The shape of the pronotum, distinguishing criterion for most authors, appears poorly discriminating, contrary to the relative size (important for the subsp. fastuosus) and the index of absolute form, which differentiate both subsp quite well. The populations linked to superbus Kraatz and an origin of subsp. fastuosus (Băile Herculane) are exceptions, having the morphometric criteria of the subsp. ulrichii.*

Key words: *ulrichii, fastuosus, superbus, arrogans, morphological criteria.*

INTRODUCTION

I. Framework of the study

C. (Eucarabus) ulrichii Germar 1824 is a species with a wide range, from the south of Germany to the Black Sea, from Poland to Hungary and throughout the Balkan Peninsula. In Romania, it occurs throughout the country, rather in plains but, exceptionally, it can be found at altitudes up to 900 m. (M. Poiana Rusca), 1100 m. in (M. Trascau, at Piatra Secuiului near Rimetea AB). It is more or less abundant depending on the regions; frequent in Banat (CS) and it seems more rare in Maramureş (BARLOY et all. 2011), but can be found in many habitats (cultivated fields, grasslands and deciduous forests).

Infraspecific classification is not unanimously: 2 subsp. for BREUNING (1932) and DEUVE (2004), 3 for BREZINA (1999), 4 for TURIN *et al.* (2003). A very large number of taxa (at least fifty) have been described, most being invalids.

In Romania, according to the literature, would encounter two to three subsp.: *ulrichii ulrichii* Germar 1824: *ulrichii fastuosus* Palliardi 1825 (described in Mehadia Banat CS) and perhaps and can be *arrogans* Schaum 1859 and his form *superbus* Kraatz 1878.

II. Distinctive features

The criteria taken into account for the distinction of subsp. concern the size of the pronotum, the shape of the rear angles, the elytral sculpture (especially the intervals III), the coloration of the dorsal body. The table below summarizes the characteristics considered most relevant (table 1).

Table 1.

Most relevant characteristics

	ulrichii	***fastuosus***	***arrogans superbus***
Pronotum	Very transverse. At least 2 times wider than long Short backward angles broadly rounded.	Less than two times wider than long. Backward angles with lobes more extended	Idem fastuosus
Sculpture	Intervals III densely wrinkled		Sculpture smooth
Colours	Brown bronze to red copper. Sometimes violet blue or blue violet.	Variable colour often blue-violet	Very bright colours

Study objectives:

The large geographic dispersion of the species in Romania is reflected by the presence of many populations in various ecological situations and sometimes with morphological differences from whence the creation of many taxa.

The work done aims to clarify whether the morphological criteria considered relevant are enabling to ensure the distinction in subsp. among Romanian populations of *C. (Eucarabus) ulrichii* Germ., knowing that the Banat is founding the type *fastuosus* Pall. and *superbus* Kraatz.

MATERIALS AND METHODS

The study is based on the 36 populations coming from three regions (Banat, Central of Transylvania and Maramures) and collected for three years at the same locations. This layout allowed collecting a sufficient number of individuals to achieve sufficient accuracy of measurement (60 to 100 specimens) and to reduce the possible interannual variability. The criteria used to differentiate the subsp. are the following (see figure 1.):

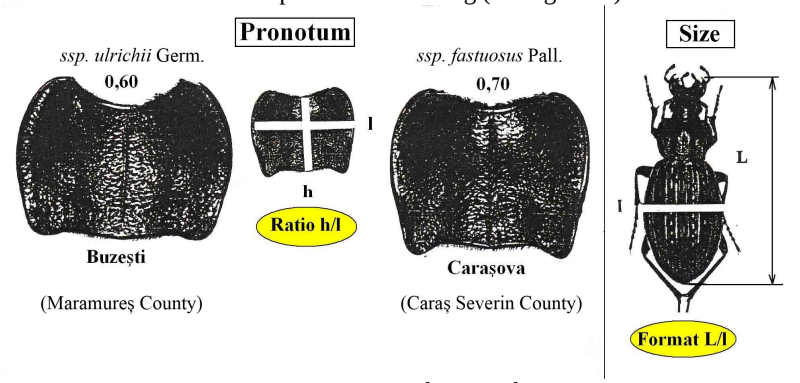

Figure 1. Distinctive features of size

-pronotum- ratio width / height (measured with micrometer)
-shape of the rear angles
-size of the imago-relative size: ratio length / width (measured with micrometer)

-index of absolute form (CAVAZUTI 1989) corresponding to the product of the ratio height / length by the relative size and named Fa.

- staining of the population.

The morphometric results are presented in table 1, the appurtenance of the *ulrichii* and *fastuosus* species being established with the help of the rear angle shape.

RESULTS AND DISCUSSIONS

a. Pronotum

Shape of the rear angles. The shape of the rear angles usually ensures the separation between the two *subsp*. but it proves a limited usage.

Size criterion. The size L/l barely distinguishes the *ulrichii* populations, by the shape of the rear angles, from those pertaining to *fastuosus* (1.54 versus 1.56). The findings for *ulrichii* (1.53-1.58) are very far from the multiple of two, often quoted in literature as a distinctive criterion. Also, a population of *fastuosus* (Băile Herculane, power plant) and the origins of *superbus* (Cărbunari, Stinăpari) presents the ratios which classifying them in the group *ulrichii*.

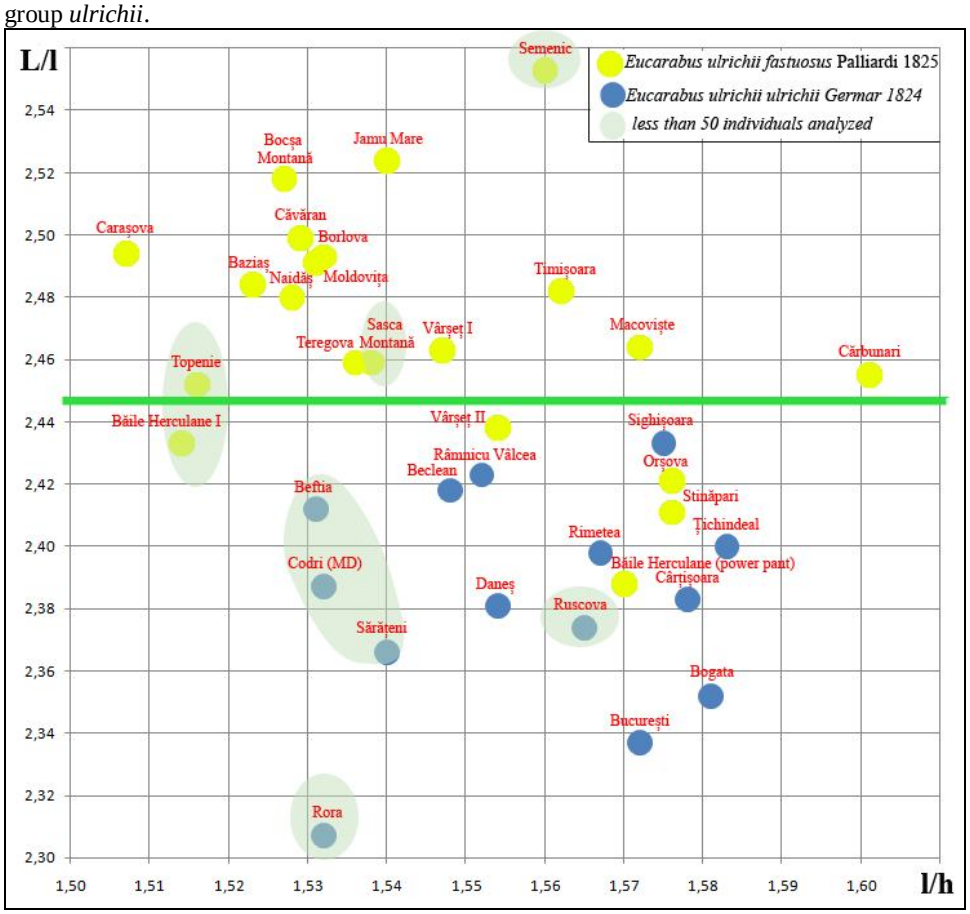

Figure 2. Graph with pronotum size criterion

b. The relative size of the imago

The relative size L/l varies greatly among populations (at 2.31 to 2.55). In general, it is lower for the populations of *ulrichii* (2.38) than for those of *fastuosus* (2.47). Generally, *ulrichii* is shorter and wider than *fastuosus*.

The relative size (figure 2.) ensures a fairly exact distinction between the *ulrichii* and *fastuosus subsp*. (except for the above mentioned pronotum characteristics).

The observed dimensions of the studied populations have the following range:

subsp. fastuosus: L♂: 25.9-29.9 mm, l: 10.5-11.8 mm.
L♀: 28.2-31.5 mm, l: 11.6-12.9 mm.

subsp. ulrichii: L♂: 25.4-27.7 mm, l: 10.8-11.5 mm.
L♀ : 26.8-30.5 mm, l : 11.2-12.9 mm.

c. Refer to the index of absolute form

The index itself has no preceise significance but:

- it provides a good separation between *ulrichii* (Fa=1.48-1.56) and *fastuosus* (1.59-1.65), excepting for the origins; Băile Herculane (power plant), Cărbunari, Ştinăpari, Orşova.
- regarding the relative size Fa/(L/l), (figure 3), it can isolate *ulrichii* from *fastuosus.*

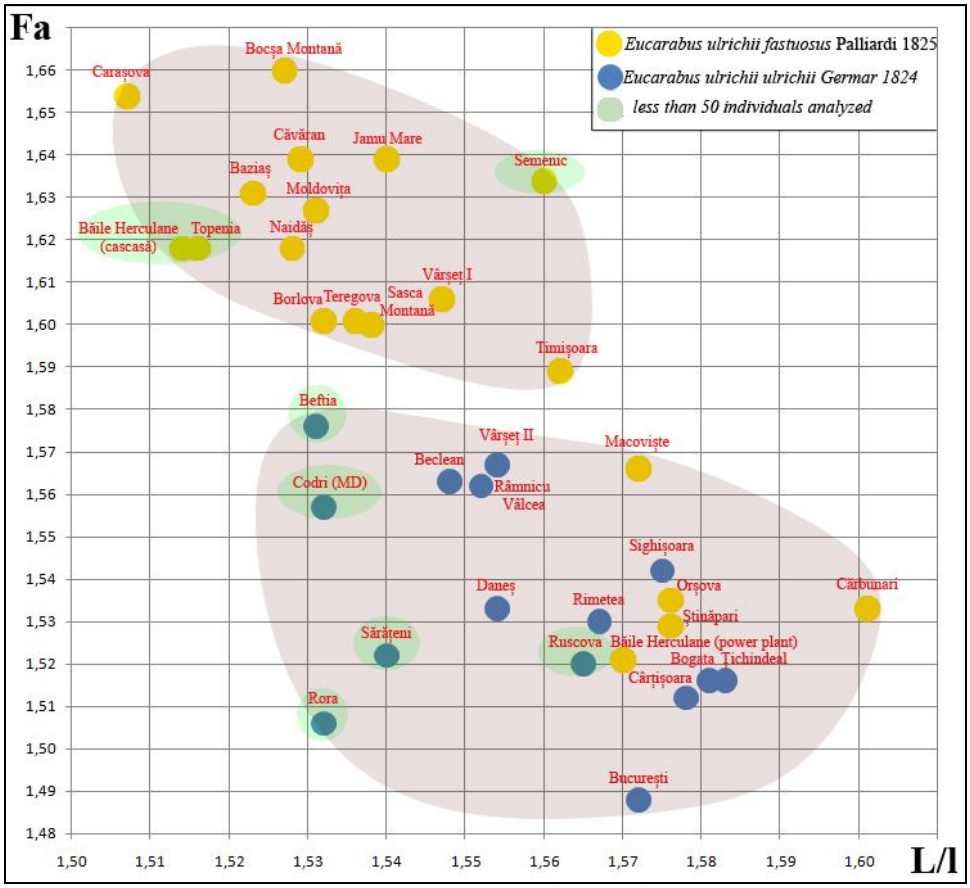

Figure 3. Graph with index of absolute form

d. The hue of the populations

First recorded by KRAATZ (1878) as individual hues, the polychromy is found quite often in the *fastuosus subsp.*, without becoming the rule, and it characterises te populations (non-variable annual percentage). In most cases, we find cyanised individuals: violet blue, greenish blue, except for the Cărbunari-Ştinăpari to Orşova and Băile Herculane (power plant) areas. The *ulrichii subsp.* rarely shows polychromy (except for Bucharest – 20% of the population belonging to the *comanensis* Born 1902 taxon).

Table 2.

Polychromy[(1)] of *subsp. fastuosus* populations from Banat

Băile HerculaneP[(2)]	Bocşa Colţan	Semenic (Brebu Nou)	Alion Orşova	Căvăran	Cărbunari, Moldoviţa, tinăpari	Radimna	Jamu Mare	Naidăş	Baziaş	Sasca Montană	Caraşova	Armeniş	Borlova – Nădrag-Vâre	Timi oara	Topleni –Baile Herculane (waterfall) Mecovi te
93,2	55,1	30,4	21,9	21,5	18,1	17,8	4,2	3,3	2,3	2,6	0,5	0,3	0,2	0,1	0

[(1)] all individuals with a color other than red brown or red copper gold is accounted for as polychrome.
[(2)] population located in the Domogled foothills near of the power plant

e. The case of populations from the South of Banat

Statistical data and the observations of graphs (figure 1., 2.) isolated three population groups, typical for fastuosus but categorised as *ulrichii*:

-place of origin in the neighbourhood of Orsova (MH), viewed by some (Lie 1996) as *arrogans* Schaum

-populations originating from the Stinăpari-Cărbunari area, viewed as *superbus* Kraatz

-the population from Băile Herculane (power plant area), near the health resort, which could effectively be the one described by Palliardi as *fastuosus*.

All these populations are heavily and variously colored, the color palette being more developed than for *fastuosus* originating from other areas, mainly the forms of cyanised individuals (blue violet, blue green, more or less dark).

The degree of polychrome individuals from Baile Herculane (power plant) is exceptional, but the colors are different from those of the *superbus* group. (table 3).

Table 3.

Percentage of polychrome individuals from Băile Herculane and Cărbunari-Stinăpari area

	Băile Herculane	**Cărbunari and Stinăpari**
	%	%
bright red	-	72
two-coloured red / green,	-	20
blue green	-	5
green	42	2
yellow tanned	7	0
violet dark blue	51	1

The case of the Herculane (power plant area) population is particularly interesting because of the mophometric and the polychromic features, which are very different from the neighbouring populations. The *fastuosus* individuals originating from this area have a superior size compared to all other fastuosus collecting areas. This species should be analysed with the help of other criteria (for instance that of molecular biology). The considerable size also characterises the *superbus* group.

CONCLUSIONS

For the Romanian studied populations of *C. (Eucarabus) ulrichii* Germ.:

-the best criteria for distinguishing between *subsp. ulrichii* (population of NW) and *subsp. fastuosus* appear, besides the shape of the rear angles of the pronotum, sometimes difficult to use, to be the relative size of the imago and the index of absolute form Fa. The dimensions of the pronotum (ratio l / h), despite some tendency (value slightly higher for the *subsp. ulrichi)* does not provide a clear separation. The ratio is also, very far from the conventional criterion (2 times wider than long).

- the *superbus* taxon, localised in a very limited area, can easily be identified by its color diversity and the brilliance of the elytral color. It possesses the morphometric characteristics of the *ulrichii* group, however having the pronotal rear angles of the *fastuosus* group.

- the examined characters does not distinguish the many taxa described from populations of *subsp fastuosus* (including those described by LIE 1996), excepting individual forms without interest.

- in the western part of the study area, the geographical separation between the northern *ulrichii* and the southern *fastuosus* is roughly at the level of the Mures river.

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