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On a new distinguishing feature of the species *Trechus obtusus* and *Trechus quadristriatus* (Coleoptera: Carabidae)

With 3 textfigures

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Zusammenfassung

Die Carabiden *Trechus obtusus* ERICHSON 1837 und *Trechus quadristriatus* (SCHRANK 1781) sind weit verbreitete Arten unserer Kulturlandschaft, die zwar im direkten Vergleich voneinander zu unterscheiden, bei Vorliegen nur einer Art aber sehr schwer einzuordnen sind. Mit der vorliegenden Untersuchung wird ein objektiv zu ermittelndes Merkmal zur Unterscheidung der beiden Spezies vorgestellt.

Abstract

The carabid species *Trechus obtusus* ERICHSON 1837 and *Trechus quadristriatus* (SCHRANK 1781) are, in their outward appearance, very similar to each other. A new distinguishing feature is submitted.

Introduction

The carabids *T. obtusus* and *T. quadristriatus* are widely distributed and common in Central Europe. The males are easily separated after investigation of the aedoeagus. Quite the contrary is the case in the females, which can't be reliably identified without a considerable amount of experience. For this reason, the females in current literature are often listed as *T. obtusus* / *quadristriatus*, the species thus not being exactly defined.

Determination is possible when the two species can be directly compared, but is very difficult if only one species is present. The elytra of *T. quadristriatus* are "mostly a little flatter and more parallel" and "the elytral striae are a little deeper and more clearly delimited" than in *T. obtusus*. There is no difference in colour (LOMPE 1976). The eyes are "somewhat smaller and flatter" and "the anterior supra-orbital puncture is more distantly removed from the eye" in *T. obtusus* (LINDROTH 1974). The head of *T. quadristriatus* is "more or less darker than the elytra". *T. obtusus* is (in Fennoscandia) more uniformly greyish brown. In *T. quadristriatus*, the margins of the pronotum are less rounded and the hind-angles are more evident (LINDROTH 1985).

Both species are dimorphic concerning the construction of their hind-wings. In Central Europe, the

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hind-wings of *T. quadristriatus* are constantly full, while both brachypterous and macropterous forms of *T. obtusus* exist. During the investigation of vegetated flat roofs in the city of Osnabrück, northern Germany (HIRSCHFELDER 1991), both species occurred in the pitfall-traps, so that a (non-comparative) distinguishing character was required.

Materials and methods

There were enough individuals of *T. obtusus* available in the study mentioned above. Additional individuals of the other species were placed at our disposal by Mrs. Dipl.-Biol. B. BALKENHOL, Mr. Dipl.-Biol. J. FLISSE and Mrs. Dipl.-Biol. M. MÜLLER-BARNA (Osnabrück). One hundred animals of each species, males and females, were measured under the stereomicroscope (Zeiss), magnification 32 times. In a 32fold magnification, one graduation mark in the measuring ocular used was 0.0312 mm.

Results

The ventral view, as shown in Fig. 1, reveals, that the metasternum of *T. obtusus* is shorter than that of *T. quadristriatus*. The diameter of the meso-coxal's cavity in the longitudinal axis (Fig. 2, A) is in *T. obtusus* longer than the length of the metasternum's basisternum underneath the meso-coxa (Fig. 2, B). In *T. quadristriatus*, it is shorter.

To A: The diameter of the meso-coxal's cavity is to be measured, not the diameter of the coxa, so it's not necessary to remove the coxa.

To B: The distance from lower margin of the meso-coxal's cavity (parallel to the longitudinal axis) to the sternocostal suture is to be measured.

The quotient of the two intervals (diameter of coxal's cavity/length of basisternum below coxa) is named Q_{AB} . Example: The diameter of the meso-coxal's cavity is 9 graduation marks in a specimen of *T. quadristriatus* ($= 9 \times 0.0312$ mm, thus 0.28 mm).

The length of the basisternum is 12 graduation marks ($= 0.37$ mm). The quotient is 0.75.

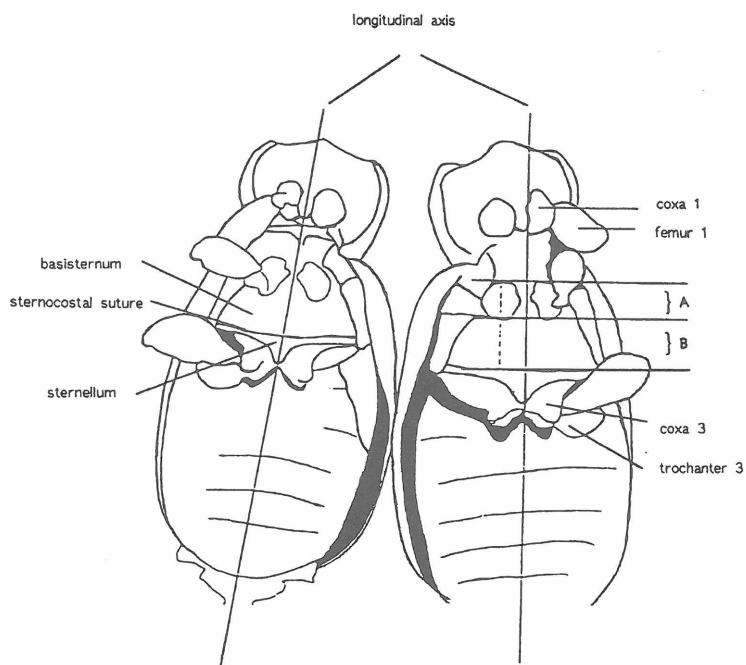
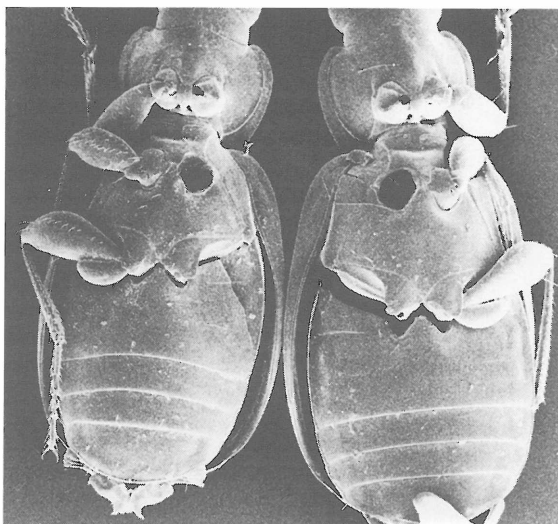
Fig. 3 shows the frequency distribution of the quotients Q_{AB} calculated for the two species of *Trechus*. The lowest value determined was 0.71 for *T. quadristriatus*, the maximal value was 1.43 for *T. obtusus*. As reduction position (freely selected starting-point of the formation of classes, WEBER 1986) 0.7 was chosen, so that with division into 15 classes with a class latitude of 0.05 the whole spectrum of measurement is included. Thus the chosen number of classes conforms to a basic rule of statistics whereby the following is valid (WEBER 1986):

$$\text{Number of classes} \approx \sqrt{\text{Number of data}}$$

Because of the relatively high number of classes a good solution of the graphic representation is obtained, by which it can be seen that there is no overlap between the two frequency classes. Therefore a significance test is unnecessary. All ascertained values for *T. quadristriatus* are within the classes 1-5, whereby the maximum of 61 % is found in class 3. For *T. obtusus*, on the other hand, all ascertained values are to be found in the classes 8-15, the maximum being found in class 11 and being likewise 61 %.

In the classes 6 and 7 there are no data. In this interval of 0.96 to 1.05 appears the value 1, which means that for all animals of the species *T. quadristriatus* measured, Q_{AB} is smaller than 1, and for all individuals measured of the species *T. obtusus*, greater than 1.

Therefore the quotient Q_{AB} is a practicable morphological indicator for the distinction between the two species.



A = diameter of meso-coxal's cavity in the longitudinal axis
B = length of metasternum's basisternum underneath meso-coxa

Fig. 1: *Trechus obtusus* (left) and *T. quadristriatus* in ventral view. Meta-sternit's coxae removed at one side. Scanning electron microscope: Cambridge.- Fig. 2: Illustration to Fig. 1

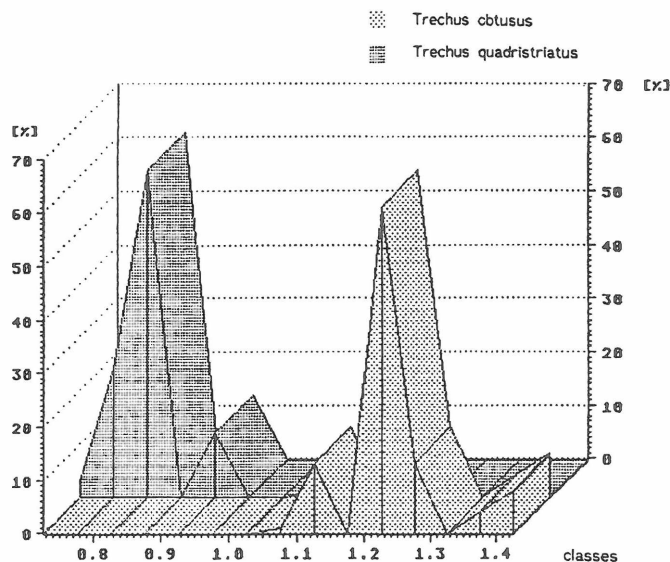


Fig. 3: Frequency distribution of the quotients Q_{AB} for the species *Trechus obtusus* and *Trechus quadristriatus*

Discussion

The distinguishing feature described has been clearly recognizable in the 200 specimens measured. Whether there are cases, in which the quotient is 1.0, can only be proved by a more extensive random test. The examination of *Trechus* - populations from different geographical regions is of great interest because of the potential variation of the morphological characters.

The investigation of some specimens from Kiel (northern Germany) and Trier (southern Germany) confirmed the results presented.

As a matter of principle, the examination of new morphological distinguishing features seems to be necessary even in such a wellknown taxon as the Carabidae. In the authors' experience, the species *T. obtusus* is often listed as *T. quadristriatus* and therefore it is possibly more widely distributed than accepted.

When faunistic investigations are carried out and their allied habitats are assessed, great importance must be given to the separation of closely related species, one from another, because it is just these closely related species that may differ substantially in their ecological demands.

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