ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

(MINISTERIE VAN CULTUUR, RECREATIE EN MAATSCHAPPELIJK WERK)

Deel 46 no. 9 28 februari 1973

SOME REMARKS ON THE SYSTEMATICS OF THE *MITOSTOMA CHRYSOMELAS*-GROUP (ARACHNIDA, OPILIONIDA, NEMASTOMATIDAE)

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With 6 figures

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1. INTRODUCTION

Many authors (Roewer, 1923, 1951; Šilhavý, 1939; Rambla, 1956; and Spoek, 1963) have described one or more species and subspecies of the *Mitostoma chrysomelas*-group. While studying extensive material of apparently one species collected in one particular area practically all characters used in literature for distinguishing the species and subspecies of this group proved to be liable to considerable variation.

The material studied consisted of 24 males, 59 females and 14 juveniles.

All these specimens were caught between June 1968 and October 1970 in formalin-filled pitfall-traps in the Westpolder near Zoutkamp, province of Groningen, The Netherlands. Ecological data pertaining to these catches will be published elsewhere (Meijer, 1972).

2. The characters used in literature compared with those of the Westpolder-material

Many of the taxa belonging to the *Mitostoma chrysomelas*-group were described on the basis of one or a few animals, so that little is known about the variability of the characters of these taxa. Moreover Roewer (1923, 1951) and Šilhavý (1939) illustrated their descriptions with diagrammatic drawings. Spoek (1963) mentioned the need of a sound basis for the description of new taxa.

Various characters, such as denticles on the dorsal surface, the colour pattern, and the number of pseudo-articulations of femora and tibiae have been used in distinguishing taxa. These characters will be discussed below on the basis of the Westpolder material.

2.1. Denticles of the dorsal surface

In *Mitostoma chrysomelas* three types of denticles may occur:

(i) strongly T-shaped denticles mostly forming rows, or occurring incidentally on the sides of the scutum (figs. 1 and 2a);

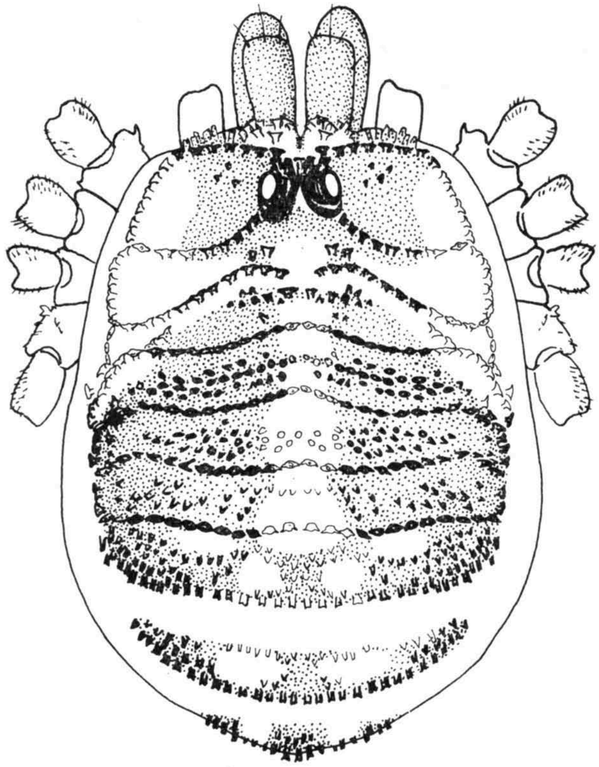
(ii) slightly furcate denticles which may form rows of separate denticles, as for instance along the posterior borders of the free tergites (figs. 1 and 2b);

(iii) simple small tubercles that may occur in great numbers both between the rows of denticles and elsewhere on the body (fig. 1).

The T-shaped denticles may be distributed in a number of ways on the dorsal surface of the animal (fig. 3). Various parts of this pattern of rows have been used as a diagnostic character. Goodnight & Goodnight (1953) remark in this context: "While again it is true that the pattern of the spines and tubercles is a valid character to use for the designation of species, much variation must be admitted".

2.1.1. The number of transverse rows of continuous denticles

Five to eight transverse rows may be present on the scutum in the *M. chrysomelas*-group. In *M. cancellatum* (Roewer) there are five rows, while there are eight in *M. chrysomelas* (Hermann) and *M. silhavyi* Roewer. In all other species of this group seven transverse rows occur.



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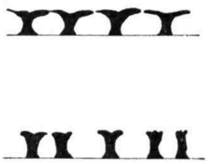
a



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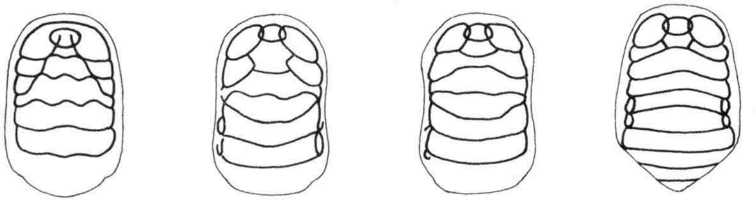

a b c d

3

Figs. 1-2. *Mitostoma chrysomelas* (Hermann). 1, female, dorsal view; 2a, denticles (type 1) of the anterior rows on the body, lateral view; 2b, do., (type 2) of the posterior rows (fig. 2 after Spoek, 1963). Fig. 3. Patterns of the rows of continuous denticles in *Mitostoma*. a, *M. olgae* (Šilhavý); b, *M. chrysomelas* (Hermann) sensu Spoek; c, *M. chrysomelas confusum* Spoek; d, *M. silhavyi* Roewer. (*a* from Šilhavý, 1939, *b* and *c* from Spoek, 1963 and *d* from Roewer, 1951).

In the studied material seven rows were consistently present. Any row of denticles is explicitly continuous or not. In literature, too, there is no obscurity about this character, and therefore I consider it to have great diagnostic value.

2.1.2. The row of denticles along the border of the scutum

In many cases the transverse rows of continuous denticles pass into the lateral row by way of a number of denticles arranged in a circular row (fig. 1). On the basis of this character Roewer (1951) separated the species *M. cancellatum* (Roewer), *M. hadzii* Roewer and *M. omalosum* Roewer from other species with seven transverse rows of continuous denticles, in spite of Hnatewytsch's figure (in Kaestner, 1928, fig. 25) which shows that in *M. saxonicum* (Hnatewytsch) the fourth and sixth transverse rows end roughly circularly. The diagnosis of *M. silhavyi* Roewer, too, is partly based on this character.

This character proves to be very variable. In the animals from the Westpolder the rows end in a group of irregularly placed denticles in which in many cases a circle can be distinguished. These circles may occur from the first up to the seventh transverse row. Mostly there are only four or five circles in all located on the left and right sides of the fourth, fifth or sixth transverse row.

Spoek (1963) mentioned this variability as did Rambla (1956). Nevertheless this character, among others, led Rambla to the description of *M. vosagorum*.

2.1.3. Denticles in front of the ocularium

In the Westpolder animals the row of continuous denticles along the border of the scutum is normally interrupted in front of the ocularium. Still about 20% of the animals show a number of more or less strongly developed denticles in front of the ocularium, sometimes occurring as clearly T-shaped denticles, sometimes as simple tubercles. When T-shaped denticles are present, the marginal row of denticles seems to skirt the ocularium instead of running backwards across it in two rows.

From literature it appears that there has been a lot of confusion about this character. *M. saxonicum* (Hnatewytsch, 1928) and *M. spinosum* (Hnatewytsch, 1929) are objective synonyms as shown by Spoek (1963). According to Roewer (1951) the row of denticles in front of the ocularium is interrupted in *M. spinosum,* but not in *M. saxonicum.* From Kaestner's (1928) figure 25, indeed, it appears that this row of denticles is not interrupted in *M. saxonicum.*

2.1.4. Interruptions of the transverse rows of denticles

In about 25% of the animals from the Westpolder such interruptions of the transverse rows occur (figs. 1, 4e and 4f). In most cases such an interruption is caused by the disappearance of a single denticle in the third row. Interruptions of the fourth and following rows hardly, if ever, occur.

Rambla (1956) described five specimens she collected in the Vosges as *M. vosagorum*, basing the species on, among others, this character. Her figure (1956, fig. 6) shows that the interruption (again) is caused by the lack of only one denticle in the third transverse row.

2.1.5. The number of areas on the cephalothorax

The number of "areas" on the cephalothorax is determined by the path of the rows of denticles and the occurrence of connections between these rows. From the literature it appears that in the *M. chrysomelas*-group this number may be six (fig. 3a), five (figs. 3b and d) or four (fig. 3c). This

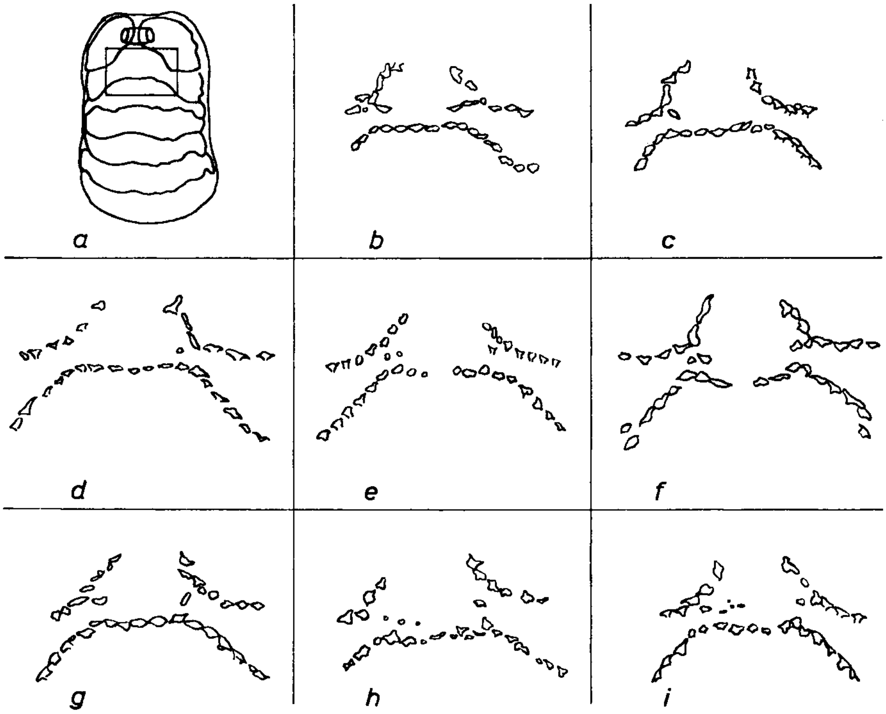

Fig. 4. *Mitostoma chrysomelas* (Hermann). Variation in the rows of continuous denticles behind the ocularium (*a-c* males, *d-i* females; *a* shows the position of the parts concerned of the pattern).

character has been used in separating some subspecies. Roewer (1951) used it, along with a difference in colour pattern, to differentiate *M. chrysomelas chrysomelas* (Hermann) from *M. chrysomelas alpinum* (Hadzi). Spoek (1963) distinguished on the basis of this character *M. chrysomelas chrysomelas* (Hermann) and *M. chrysomelas confusum* Spoek.

This character is as variable as those discussed in sections 2.1.2. and 2.1.4. Figure 4 shows a number of examples of the pattern of the rows immediately behind the ocularium. All these examples were found in the Westpolder material. The rows of denticles never show a pattern completely identical to the diagrams (figs. 2b, c, after Spoek, 1963). The row of denticles in front of the ocularium as well as the arrangement of the denticles in circular rows along the border of the scutum vary in much the same way as the patterns depicted in figure 4. It is obvious that these characters can easily be misinterpreted.

2.1.6. Isolated denticles

In the animals from the Westpolder denticles may occur anywhere on the scutum, especially on the sides (fig. 1). In many cases these denticles are strongly T-shaped like those placed in continuous rows. For the rest this character again is subject to variation. Some animals are densely covered with denticles between the rows, whereas others only show denticles arranged in rows. This character is less variable in males than in females.

According to Spoek (1963) especially females of *M. chrysomelas* (Hermann) non sensu Roewer show these extra denticles. In *M. chrysomelas confusum* Spoek practically no extra denticles occur.

2.2. Colour pattern

On the dorsal side of *M. chrysomelas* a distinct pattern of light gold or silver-coloured spots occurs on a light or dark brown background. In the animals from the Westpolder this basic pattern consists of a light band around the cephalothorax at some distance from the ocularium, together with a median light band across the abdomen. The latter consists of a number of spots on the last part of the scutum and the free tergites. More posteriorly these spots grow larger and are divided into three spots on each tergite (see fig. 1). This division mostly occurs in the third area of the scutum, sometimes only in the fourth or fifth. Due to these spots each free tergite has a narrow light band along its front border. This band extends in females when the abdomen is filled with eggs.

Practically all species of the *M. chrysomelas*-group show this pattern or parts of it. *M. omalosum* Roewer, a cave-dwelling species that is entirely pale-yellow, forms an exception.

According to Goodnight & Goodnight (1953) a colour variation should never be a reason for the description of a new species, whereas the overall picture of the colour pattern must hold for all individuals of one species.

2.3. Limbs

In every description of a *Mitostoma* species the length of the legs and the number of pseudo-articulations in the femora are mentioned. Table I shows that the legs of the males are longer than those of the females, whereas the length of the palpi in males exceeds that in females. Rambla (1956), too, mentioned this phenomenon.

Table I

Mean length of the legs in *Mitostoma chrysomelas* from the Westpolder material.

legs	males	females
I	10.5 mm	9.0 mm
II	17.3	14.6
III	10.9	9.3
IV	14.9	13.0
Palp	4.1	4.8

The number of pseudo-articulations in the tibia of the second leg is very variable. Some animals lack them altogether, whereas others show up to thirteen of these pseudo-articulations. The absence of pseudo-articulations in the tibia of the second leg is one of the characters of *M. atticum* (Roewer) (Šilhavý, 1939).

2.4. Chelicerae

Šilhavý (1967) discussed the diagnostic value of the dorsal apophysis on the basal joint of the male chelicerae (fig. 5). The animals from the Westpolder are uniform with regard to this character and identical to those described by Rambla (1956, fig. 5) and Spoek (1963, fig. 3j). Their drawings leave no doubt. A comparison with the other species of the *M. chrysomelas*-group raises more difficulties because Roewer (1951) and Šilhavý (1939) only present rough sketches of the apophysis. *M. chrysomelas* (Hermann) sensu Roewer possibly has an apophysis as occurs in the Westpolder animals. From the figure given by Šilhavý (1939, fig. 12) it appears that *M. olgae* (Šylhavý), in contrast to the other species, has a rounded, short and stout apophysis.

In the females of my material the outside of the basal joint of the chelicerae shows more or less distinct denticles. Such denticles also occur in *M. olgae kratochvilli* (Šilhavý, 1939) and *M. vosagorum* Rambla, 1956.

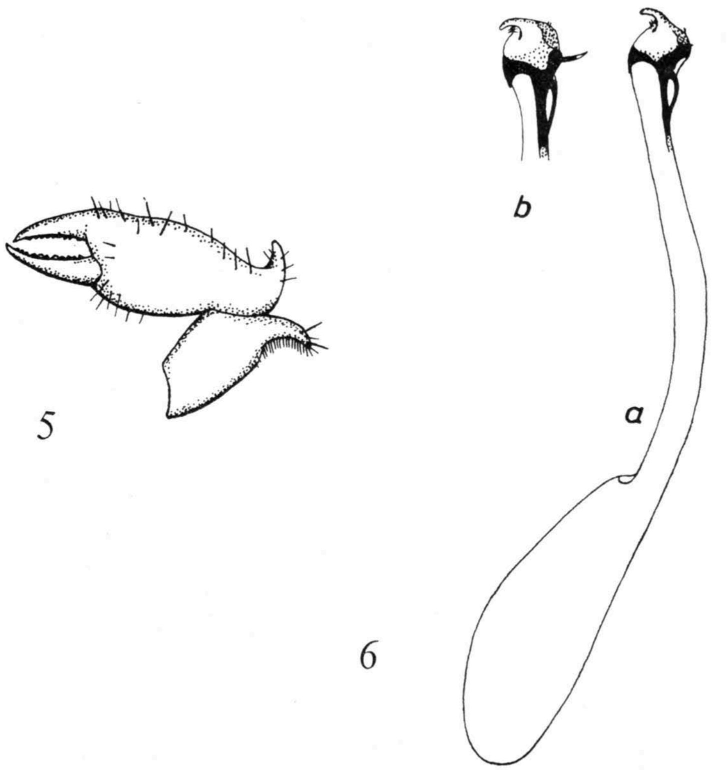

Fig. 5-6. *Mitostoma chrysomelas* (Hermann). 5, chelicera of the male; 6a, lateral view of the glans penis showing the ventral protuberance; 6b, lateral view of the penis with retracted protuberance (fig. 6 after Spoek, 1963).

2.5. Copulatory organ

Virtually no variation in the morphology of the male genital apparatus (fig. 6) can be found. This agrees with Spoek's (1963) observation for *M. chrysomelas chrysomelas* (Hermann) sensu Spoek. According to the data given by Šilhavý (1966, fig. 22) the same holds for *M. olgae* (Šilhavý) and *M. chrysomelas* (Hermann) sensu Roewer and according to Rambla (1956) also for *M. vosagorum* Rambla.

3. Identity of the Westpolder Mitostoma

The Dutch material studied by Spoek (1963) falls within the limits of variation of the animals from the Westpolder. According to Spoek (l.c.) the material described by him corresponds with *M. silhavyi* Roewer, a species identical to *M. chrysomelas* (Hermann) (Spoek, l.c.). Still, this identification seems to be unsatisfactory. Figures 3b and c show that the animals studied by Spoek (l.c.) have only seven transverse rows of continuous denticles. However, in *M. chrysomelas chrysomelas* (Hermann) sensu Roewer eight, and in *M. silhavyi* Roewer even ten of these transverse rows occur, as in the last-named species the first three tergites also have a row of continuous denticles.

On the other hand *M. vosagorum* Rambla undoubtedly falls within the variability of the Westpolder material. The same applies to a number of species described or redescribed by Roewer (1951), viz., *M. saxonicum* (Hnatewytsch), *M. spinosum* (Hnatewytsch) and *M. hadzii* Roewer.

This means that the last mentioned species have unjustly been described as seperate species. The great variability of the material leads to the conclusion that all these taxa belong to one species, for which the name *Mitostoma chrysomelas* (Hermann, 1804) has priority. The species described anew in section 4 has the following synonyms (part of them have already been mentioned by Spoek, 1963):

M. chrysomelas chrysomelas (Hermann) sensu Spoek, 1963
M. chrysomelas confusum Spoek, 1963
M. hadzii Roewer, 1951
M. saxonicum (Hnatewytsch) (in Kaestner, 1928, and Roewer, 1951)
M. spinosum (Hnatewytsch) (in Roewer, 1951)
M. vosagorum Rambla, 1956

4. Description of Mitostoma chrysomelas (Hermann, 1804)

Length of the male 1.7-2.5 mm; length of the female 2.0-3.5 mm. The colour of the body is dark to yellowish brown with a variable pattern of light spots. Figure 1 shows the pattern of spots in its most complete form. The dorsal surface is provided with three types of denticles. Denticles of the first type are T-shaped in lateral view; they form continuous rows and may occur isolated (figs. 1 and 2a). The second type is only slightly furcate and may be found in rows of separate denticles (figs. 1 and 2b). The third type consists of small denticles (tubercles) of normal size and shape. These are especially abundant in the female and may occur in great numbers on the dorsal surface, mostly rather laterally. The dorsal surface of the cephalothorax is divided into a number of areas surrounded by rows of continuous denticles. Due to variation in the pattern of these rows there may be 4 or 5 areas (figs. 3 and 4). The areas I, II, III and IV of the scutum are also bordered by rows of continuous denticles of type 1 (fig. 1). The posterior borders of the scutum and the tergites, however, bear rows of separate denticles (type 2). Sometimes the lateral borders of areas I, II, III and IV consist of circular rows of continuous denticles. The number of these circular rows may vary from zero to eight.

Ocularium black, with two longitudinal rows of continuous denticles; in front of the ocularium the row of continuous denticles along the anterior border of the cephalothorax is more often than not interrupted. Supracheliceral laminae with irregularly serrate lamellae.

Ventrally the abdomen is yellowish; especially in the male the last three sternites bear rows of normal denticles (type 3).

Chelicerae black-brown, covered with a few long hairs. The outside of the first joint of the chelicerae in the female may bear some denticles (type 3). The first and second joint of the male chelicerae each bear an apophysis (fig. 5). The apophysis of the first joint is situated on the distal part of the joint; this apophysis is rather slender and points upwards. Its posterior surface is densely covered with hairs. Immediately behind the apophysis the dorsal surface of the chelicerae is slightly depressed. There is no trace of an aperture of a cheliceral gland.

Length of the palp 3-5 mm; those of the male are shorter than those of the female. All joints are brown and, especially the distal joints, covered with clavate hairs.

Coxae of the legs with two longitudinal rows of continuous denticles; the proximal part usually is brown and the distal part pale. Trochanteres dark brown with a light dorsal and ventral median part. The other joints of the legs are brown or pale brown; femora pale at both ends, with pale pseudo-articulations. Tibia II may have pseudo-articulations, which, as in the femora, occur in the middle of the joint. Patellae and tibiae with small black, pointed denticles, metatarsi and tarsi with short hairs. Number of pseudo-articulations of femora: I, 4-10; II, 6-16; III, 4-9; IV, 5-11; of tibia II, 0-13.

Length of the legs (without coxa and trochanter): I, 7.5-11.5; II, 12.5-19.5; III, 9.2-11.7; IV, 8.2-14.0 mm. The legs of the male longer and more slender than those of the female. Tibia II $^{l}/_{d}$ (ratio: length/diameter) at narrowest point about 40 in the male and about 35 in the female.

Penis swollen at base; glans with a retractable protuberance (fig. 6).

5. Acknowledgements

The study was supported financially by the Netherlands Organisation for the Advancement of Pure Research (Z.W.O.). The author acknowledges the kindness of Dr. J. Martens and Dr. V. Šilhavý to read the manuscript. He is grateful to Dr. G. L. Spoek and Prof. Dr. L. Vlijm for their stimulating help in preparing this paper and wishes to thank Mr. G. W. H. van den Berg for preparing the figures.

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