

Contributions towards the comparative Morphology and Phylogeny of the Mesostigmata. IV.

On the *Celaenopsidae* and *Euzerconidae*.

By

IVAR TRÄGÅRDH.

R. Swedish Institute of experimental forestry. Experimentalfältet.

Last summer a mite was collected in the galleries of a bark-beetle, *Pityogenes chalcographus*, on twigs of a dead spruce at Bjurfors, Dalecarlia. The species in question of which males, females and nymphæ were found, is undoubtedly *Anoplocelaeno austriaca* Vitzthum, described (1926, p. 438—444, figs. 16, 17) by V. from Austria where it was found on *Scolytus laevis* by H. Wichmann, Vienna. On account of the shape of the ventri-anal shield V. suggested that it should form a separate subgenus of *Anoplocelaeno*, which he called *Pleuronectocelaeno* and subsequently he made it a genus.

Anoplocelaeno was created by Berlese (1910, p. 246) as a subgenus of *Celaenopsis* and characterized in the following way: »Abest scutum rectangulum ad ventrem postonale inter scuta ventris marginalia. Species typica: *C. A. ovata* Berl.» Subsequently Berlese, Kramer, Oudemans and Sellnick have described a great number of species, all agreeing with the diagnosis given by Berlese in so far as that the ventral shield is fused with the anal shield and extends to the posterior margin of the body. And to judge from the detailed descriptions accompanied by drawings given by Oudemans (1928, p. 43—52, figg. 16, 20, 33 & 38) of *A. indica* Oudms. and *A. tropica* Oudms. as well as by Sellnick of *A. sulcata* Selln. (1938, p. 65, fig. 4) the ventral shields conform with the type of the *Celaenopsidae* as interpreted and formulated by me (1938, p. 139—141, fig. 21.¹

The most essential features of the fam. *Celaenopsidae* are the following: »Metasternal shields separate and distinct but greatly reduced in size and interposed between the posterior margin of the sternal shield and the anterior edge of the the real lateral shields, which at their

¹ Sellnick does not delineate the minute metasternal shields, obviously because they were concealed beneath the anterior edge of the lateral shields.

posterior end embrace the small epigynial shield. Lateral shields with two pairs of hairs, epigynial shield without hairs.» This diagnosis agrees as regards the shape of the genital aperture with that of Berlese (l. c. p. 50) with the exception that Berlese speaks of genital valves, the term »lateral shields» having been introduced by me as late as in 1937 (p. 6). Berlese gives the following diagnosis of the female genital shields of the family (l. c. p. 50): »Scuta ventralia plura, ex quibus in feminis, sternale inter secundis paris coxas extensum, genitale valvis duabus lateralibus consistutum satis a scutulo cetero medii ventris distinctum.» In a more detailed description (l. c. p. 51) he writes: »Ita si videas foeminam supinam, scutum aparebit sternale transversum, inter coxas secundi paris insitum, trapezoideum. Deinde subtus adest scutum genitale valvis duabus lateralibus compositum. Inter scutum genitale et sternale, nonnulla apparent etiam scutula minora, quamvis minus bene, quod a scutulo genitali obtecta. Rima foeminae genitalis longitudinalis videtur.»

Berlese's drawings differ in some important details and this tends to confirm the impression one gathers from his description, viz. that he has not been able to see the shields distinctly, which is after all not astonishing, considering the early time of the publication. Besides at that time nobody guessed the importance of studying the number and position of the sternal hairs, which have now proved to be indispensable for the understanding of the true nature of the sternal and genital shields.

It is, however, obvious that Berlese's conception of two genital shields in *Celaenopsis*, flanking a longitudinal genital aperture, has been accepted by all subsequent acarologists including myself, who judged the features of the whole family on the basis of the organisation of the genus *Anoplocelaeno* and, as a consequence, conceived all the genera of the family except the *Euzerconidae* as having greatly reduced metasternal shields and a v-shaped genital fissure, flanked by two lateral shields.

The minute investigation of the genera *Celaenopsis* Berl. and *Pleuronectocelaeno* Vitz. has, however, revealed the astonishing fact, that the so-called genital valves of these genera and those of *Anoplocelaeno* are quite different structures. In the two former genera and in *Euzercon* they consist of the great metasternal shields, which are contiguous in the middle where they are separated by a thin longitudinal strip of soft cuticle. The genital aperture is not a longitudinal but a transverse fissure.

In *Anoplocelaeno*, on the other hand, the metasternal shields are, although distinct, very small and interposed between the posterior margin of the sternal shield and the anterior margin of the two lateral shields, between which the genital aperture appears as a T-shaped fissure.

This discovery makes it necessary to revise all the genera hitherto referred to the family *Celaenopsidae*, because it is evident that it con-

tains a very heterogeneous mixture owing to the confusion of the »genital valves» with the metasternal shields. This confusion is due to the great authority which Berlese enjoyed. And already in 1892, viz. six years after he had created *Celanopsis*, Berlese rejected G. Canestrini's genus *Diplogynium* from S. America (1889) on the ground that it was synonymous with *Celanopsis*. It is worth while to quote Berlese's statement regarding *Diplogynium* (1892, p. 199): »De hoc genere (*Diplogynium*) dicit Canestrini haec tantum:» Questo genere e affine ai generi *Celanopsis* e *Antennophorus*, dai quali differisce perche nella femina la placca genitale e divisa in due valvi poste l'una a canto dell'altra come i due battenti di una porta.» Berlese continues: »Berlese iam dixerat: Genitalia . . . foeminae . . . rima longitudinali, valvisque duabus lateralibus protecta. Unde ergo discrepantia? Plures sunt immo characteres qui animalculum Canestrinii (forsam mea *Celanopsis ovata* vel *subincisa*) *Celanopsidi cuspidatae* approximant, ut facile a descriptionibus specierum a me comperatum apparebit.»

The truth is, however, that Canestrini's description of the two lateral shields of *Diplogynium* is excellent. From his drawing of *Diplogynium acuminatum* (fig. 1, pl. X) it is evident that the structure of the ventral shields is the same as in *Anoplocelaeno*. Thus it is easy to distinguish the characteristic outlines of the lateral shields, especially their posterior angles, between which the epigynial shield is situated. Moreover, the animal delineated by Canestrini contains some large eggs of the same shape and size as those often found in *Anoplocelaeno*.

For these reasons *Anoplocelaeno* Berl. is synonymous with *Diplogynium* Can. which latter name is valid.

How great the influence of Berlese was is evident from the writings of P. Kramer, who had described the species *Gamasus cuspidatus* on which B. founded the genus *Celanopsis*. K. accepted Berlese's identification but paid so little attention to the shields surrounding the genital aperture, that he afterwards described a typical *Anoplocelaeno* as belonging to *Celanopsis*.

Before I proceed it is necessary to give a detailed description of the sternal and genital shields of *Celanopsis cuspidata* (Kramer) and *Pleuronectocelaeno austriaca* Vitzthum.

Celanopsis cuspidata (Kr.) (fig. 1). The sternal shield has the anterolateral angles cut off obliquely, the postero-lateral angles being very long and acute, ending between coxae II and III. The posterior margin is concave and there is a fine, curved line running across the shield immediately in front of pores II. Hairs I inserted at the anterior margin, projecting backwards a little beyond pores II; hairs II and III near the posterior margin in a transverse row. Pores I large, slit-shaped, placed a little outside hairs I but further backwards. Pores II circular, closely behind the transverse line and almost on a level between hairs II and III.

Metasternal shields distinct, large, almost quadrangular, separated by a very narrow strip of soft cuticle from the sternal shield and from one another by a somewhat broader, longitudinal strip of soft cuticle. Metasternal hairs very small, placed close to the oblique lateral margin; metasternal pores small, round, a little in front of and outside the hairs. These shields are typical metasternal shield homologous with those of *Pergamasus*, *Trachytes* and *Euzercon*.

But the shield behind the transverse genital fissure is very peculiar; there is no distinct epigynial shield and to all appearance the ventral shield continues forwards to the genital fissure. The anterior edge is

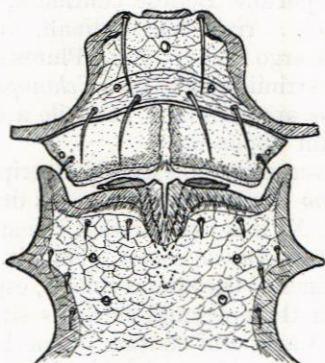


Fig. 1. *Celaenopsis cuspidata* (Kr.) ♀. Sternal, metasternal and anterior part of ventral shield. Original.

thickened and projects into two strong lateral teeth which together with the lateral angles of the sternal and metasternal shields form part of the rim of the coxal cavity III. In the middle of the anterior edge there is a longitudinal incision. The surface of the shield has a polygonal texture and close to the anterior edge there is a row of four small hairs and further backwards two big pores.

How is this shield to be interpreted? Is it a primitive feature or have previously existing epigynial and lateral shields coalesced so completely as to leave no traces in the shape of sutures. This question will be considered after the description of the other genera.

Between the posterior margin of the metasternal shields and the anterior edge of the ventral shield we notice a pair of transverse bars which at their median end bend backwards and converge.¹ It has not been possible to see their exact shape, the material not been great enough to permit any dissection.

¹ It is these bars which Berlese mentions in his description and has delineated in fig. 7, pl. 62, which drawing seems to have been made after a macerated specimen.

Pleuronectocelaeno (fig. 2). The sternal shield has three pairs of hairs and two pairs of pores, resembling very much those of *Celaenopsis*. The metasternal shields are more triangular and contiguous in the middle, being separated only by a very narrow, longitudinal strip of soft cuticle. Their posterior edge is straight in the middle but has further laterally a semicircular incision. The hairs are small, placed laterally near the anterior margin as are also the pores which are half-way between the hairs and the lateral tips of the shield.

The anterior part of the ventral shield resembles that of *Celaenopsis cuspidata*; thus the antero-lateral angles project sharply filling together

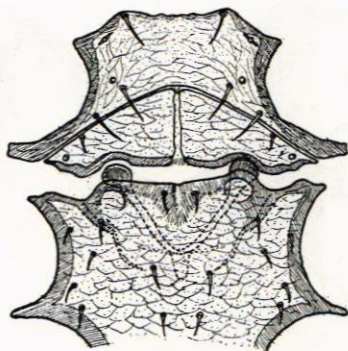


Fig. 2. *Pleuronectocelaeno austriaca* Vitz. ♀. Sternal, metasternal, and anterior part of ventral shield. Original.

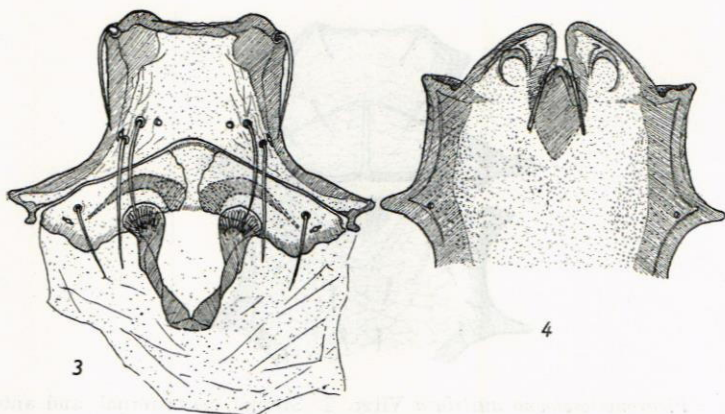
with the corresponding angles of the sternal and metasternal shields the corner between coxae II and III. The anterior margin of the shield has a median, narrow incision and is convex exactly opposite the incision of the posterior margin of the metasternal shield. Close to the edge of this lobe there is a circular area where the cuticle is very thin. These structures together seem to form a kind of groove for the reception of the almost globular, finely striated heads of a pair of drumstick-shaped bars which converge backwards, forming a V-shaped structure. From the bottom of the incisions at the anterior edge of the ventral shield two faint lines run obliquely backwards and inwards parallel with the bars, disappearing without meeting one another. The structure described above seems to serve the purpose of enabling the mite to close and lock the genital aperture firmly.

The texture of the shield is polygonal and there is one pair of fine hairs near the anterior edge, close to the median incision and two pairs on the oblique lines mentioned above.

From this description it is evident, that there is no distinct epigynial shield. But, on the other hand, there are the two lines which possibly

are traces of a fusion of two lateral shields, somewhat similar to those of *Diplogynium*. If this interpretation is true then the epigynial shield must have been greatly reduced and possibly hidden by the coalesced shields, as was assumed to be the case with *Syngynaspis* (comp. Trägårdh 1938, fig. 20).

Euzercon (figg. 3 & 4). The main features of the female ventral shields of this genus have already been described by the author (l. c. p. 136—137, figg. 17 & 18). The most interesting points of the structure are that the ventral shield is divided into two lobes, which meet in the middle and completely embrace the small epigynial shield. The two



Euzercon sp. ♀.

Fig. 3. Sternal and metasternal shields and vaginal sclerites. Original.

Fig. 4. Anterior lobes of ventral shield and epigynial shield. Original.

lobes of the ventral shield foreshadow the peculiar development in *Diplogynium* (= *Anoplocelaeno*) in which genus the lobes have become detached and hinged along their lateral edges, the epigynial shield having accordingly been greatly reduced in size. Another point of great interest is that these lobes have encroached upon the metasternal shields, the posterior half of which are covered by them. Also in this respect *Euzercon* foreshadows the development in *Diplogynium*.

In the paper quoted above some peculiar structures of the dorsal wall of the vagina were described and delineated (l. c. fig. 18). In order to show these structures more plainly two new drawings are given (figg. 3 & 4). From them it is evident that the genera *Celaenopsis*, *Pleuronectocelaeno* and *Euzercon* all have in common a pair of drumstick-shaped bars which, to judge from the preparation delineated in fig. 3, are attached to the dorsal wall of the vagina. I suggest the term «vaginal sclerites» for these bars. The anterior lobes of the ventral shield, which

correspond with the lateral shields of *Diplogynium* have a pair of thin, oval areas where they are excavated on the dorsal side to give room to the heads of the sclerites when the genital aperture is closed.

Diplogynium (fig. 5). Since in my opinion the genus *Euzercon* links the genera *Celaenopsis* and *Pleuronectoclaeno* together with *Diplogynium* it is necessary to dissect the ventral shields of the latter genus in order to see what structures may be hidden by the lateral shields. Without dissecting one sees in the fissure between the sternal and lateral shields only a small, rounded shield, which is the metasternal shield. If, however, one of the lateral shields is removed, we notice that the metasternal

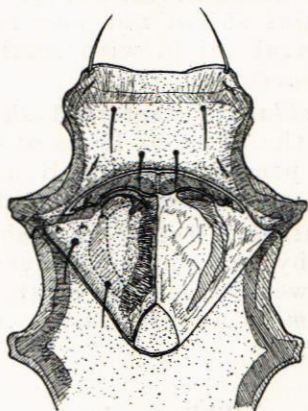


Fig. 5. *Diplogynium* sp. ♀. Sternal, metasternal, lateral and epigynial shield and vaginal sclerites; left lateral shield removed. Original.

shields are larger than what appears without dissecting, appearing as a linear thickened ridge which follows the outline of the anterior margin of the lateral shield and widens a little towards the median line. As regards the gradual decrease in size of the metasternal shields there is thus an unbroken series in the genera: *Celaenopsis*, *Pleuronectoclaeno*, *Euzercon* and *Diplogynium*. On the dorsal side of the wall of the vagina we find the same vaginal sclerites as in the other genera, although of a different shape, more curved and with longer knobs.

Summary.

The present investigations render it necessary to make some alterations in the system of the *Mesostigmata*, proposed by me in 1937 and 1938. The family *Celaenopsidae* must be divided into two families because the genera *Celaenopsis* and *Pleuronectoclaeno* have well developed metasternal shields and no lateral shields, whereas *Diplogynium* has very small metasternal shields and large, detached lateral shields.

The diagnosis of the cohorts *Celaenopsina* must be altered in the following way:

Cohors *Celaenopsina*. Female genital aperture a transverse fissure behind a pair of distinct metasternal shields. Anterior part of ventral shield developed either as a pair of lateral shields or as a pair of lobes embracing the epigynial shield or no such shields present. Dorsal wall of vagina with a pair of pestle-shaped sclerites.

1. *fam. Celaenopsidae*. Metasternal shields well developed, transverse, situated in front of the transversal genital fissure. No epigynial shield nor any lateral shields. Anterior edge of ventral shield with small, median incision: *Celaenopsis*, *Pleuronectocelaeno*.

2. *fam. Euzerconidae*. Metasternal shields distinct, but partly covered by the anterior lobes of the ventral shield. Epigynial shields present but small and surrounded by the anterior lobes of the ventral shield: *Euzercon*.

3. *fam. Diplogyniidae*. Metesternal shields distinct but almost concealed by the anterior edges of the detached lateral shields, between which the small epigynial shield is visible: *Diplogynium* (= *Anoplocelaeno*), *Antennocelaeno*.

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