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A RE-EVALUATION OF THE MICROGYNIOIDEA,
WITH A DESCRIPTION OF A NEW SPECIES
OF MICROGYNIUM (ACARINA : MESOSTIGMATA) 1

BY

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TRÄGÅRDH (1942) erected the Cohort Microgyniina and two new families to accommodate two new species of mesostigmatid mites discovered in Sweden, the females of which were observed to have an exposed genital opening. He designated Microgynium rectangulatum Trägårdh as the type of the family Microgyniidae, and Microsejus trunicola Trägårdh as the type of the family Microsejidae. The two families were separated by TRÄGÅRDH on the basis of the extent of dorsal shield division and on the condition of the epigynial shield. Because of the genital morphology and sternal shield fragmentation, TRÄGÅRDH postulated that the Microgyniidae and the Microsejidae were related to the Liroaspididae. However, differences in epigynial shield structure, position of the female genital aperture, and relative size and position of the male genital opening led him to create the Cohort Microgyniina. He characterized the Cohort as follows:

"Male genital aperture small, not closed by an operculum, placed far back. Female aperture a small, transverse fissure, placed far back, without any connection with either sternal or epigynial shields. Three or four dorsal shields. Peritremata short. Tarsi I without peduncle."

The families Microgyniidae and Microsejidae were separated by TRÄGÅRDH in the following manner:

"Dorsal side covered by three shields. Epigynial shield divided into two shields...

Fam. Microgyniidae

Dorsal shield side covered by four shields. Epigynial shield not divided........

Fam. Microsejidae"

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In their revision of the Mesostigmata, CAMIN and GORIROSSI (1955) relegated the Microgyniina to superfamilial status in the Cohort Liroaspina, primarily to expand the limits of the higher subordinal categories. The abovementioned authors gave the following diagnosis for the Liroaspina:

"Epigynial shield, when functional, with many setae; when reduced and non-functional, with a single pair of genital setae. Sternal shields relatively independent; two to five plates; sternal plates II and III never coalesced with each other. Two to six dorsal shields plus marginal platelets. Hyphopharyngeal and salivary styli lacking; chelicerae chelate and unornamented in both sexes. Median apodeme extending posteriorly from epistome, forming a median, posterior brace to the subcheliceral plate."

In September of 1959 a new species of Microgynium was found in a sample of hemlock litter from a forested area near Oakridge, Oregon. Contrary to Tragârdh's diagnosis of Microgynium, the species has an undivided epigynial shield which covers the genital opening. Inasmuch as this variation tends to make a superfamilial separation for the families Microgyniidae and Microsejidae untenable, and since the microsejids are separated from the microgyniids primarily by the divided condition of the epigynial shield in M. rectangulatum, it was felt that a re-examination of Tragârdh's species would be advisable. Paratypes of Microsejus trunicola and Microgynium rectangulatum were procured through the Statens Skogsforskningsinstitut, Stockholm, for this purpose.

Only one female specimen of M. rectangulatum was available for study, the other specimens being males and nymphs. Because of the somewhat distorted condition of the specimen, it was necessary to separate the dorsal and ventral portions so that weakly defined structures could be more easily discerned. The female was cleared in lactophenol, dissected, cleaned in 70% ethyl alcohol, and mounted in Hoyer's solution. Further clearing was accomplished by heating the slide preparation in an oven at 55°C for twenty-four hours. A Spencer phase contrast system was used in determining the structures herein described.

It was found that the sclerotized portion of the epigynial shield of M. rectangulatum is surrounded by an unstriated area, the borders of which appear to mark the true position of the shield (fig. 9). Anteriorly, the shield is provided with a membranous extension which probably serves to cover the genital aperture. Because of the distorted appearance of the specimen examined, the identity of various genital and perigenital structures could not be established. It appears, however, that the genital opening is a sclerotized slit which lies internal to, and slightly behind, a reniform unsclerotized vestibule (fig. 9, V). This chamber, an unsclerotized infolding of the body wall, apparently is capable of considerable expansion, being strongly folded laterally and anteriorly. Its function is unknown, but it is possible that it serves as a spermatheca. A similar structure is found in other liroaspires, but it has not been seen either in Microsejus trunicola or in the new species of Microgynium.

The sclerotized portion of the epigynial shield appears to consist of a single element, the lateral portions of which are delimited as lobes. The lateral lobes
undoubtedly correspond to the two elements considered by Trägårdh to be separate parts of the epigynial shield. The entire condition of the shield in *M. rectangulatum* and in the species to be described negates Trägårdh's character of shield separation in his diagnoses of microgynioid families.

Examination of dissected female paratypes of *Microsejus trunicola* revealed that the genital aperture of this species actually is covered by the anterior portion of the epigynial shield (fig. 10). The obvious differences between Trägårdh's illustrations (Trägårdh 1942) and the appearance of specimens in his paratype series suggest that the form and position of the sternal and epigynial shields may vary, or that these structures may become distorted due to long periods of immersion in preservatives.

With the relegation of the position and structure of the epigynial shield to a more or less secondary position in the classification of the Microgynioidea, separation of the Micrognidae and Microsejidae must be based upon other morphological characters. Of these, the variation in the number of dorsal shields is the most obvious. *Microgynium rectangulatum* has three dorsal shields and *Microsejus trunicola* has four. Nymphs of both species, however, have four shields, as does the nymph of the species to be described. This similarity may be indicative of a relationship on a level below that of family. However the presence of a ventral integumental suture behind coxae IV in *M. rectangulatum*, as well as lateral idiosomal constrictions between dorsal shields I and II, are features not found in *Microsejus trunicola*. The latter species possesses a single lacinal extension on the tritosternum, while both species of *Microgynium* have a bipartite tritosternum. The author feels that, in spite of the abovementioned differences, the strong similarities between the two genera suggest an intrafamilial relationship.

The size and setation of the epigynial shield, and the position of the male genital aperture, are the two major characters separating the Liroaspoidea and the Microgynioidea. The author prefers to consider these variations as family differences, since the shield structure and gnathosomal morphology of the Liroaspidae and Microgynioidea are so similar. The following classification of the Liroaspina illustrates the emendations noted above.

**Cohort LIROASPINA** Trägårdh 1946.

Epigynial shield covering the genital opening; with one or several pairs of genital setae; sternal shields II and III never coalesced with each other; with or without a transverse suture behind coxae IV. With one to seven dorsal shields plus marginal platelets. Hypopharyngeal and salivary styli lacking; chelicerae chelate in both sexes. Male genital aperture between coxae II, or in the vicinity of coxae III or IV. Median apodeme extending posteriorly from epistome, forming a median posterior brace to the subcheliceral shelf.
Superfamily Liroaspoidea Trägårdh 1946.

1. With one pair of genital setae; male genital opening behind coxae II. .......... Fam. Microgyniidae 4.
   — With more than one pair of genital setae; male genital opening between coxae II.
2. Epigynial shield large, covering portions of sternal shield II; with one to four dorsal shields. .......... 3.
   — Epigynial shield not covering sternal shield II; with two to seven dorsal shields.

Fam. Liroaspidae

3. Both sexes with a pair of large median subequal dorsal shields and a pair of smaller lateral shields; female with large metapodal shields; male with holoventral shield. .......... Fam. Uropodellidae
   — Female with a large propodosomal shield and a small pygidial shield; male with dorsal shield entire; metapodal shields of female strongly reduced; male with a separate ventri-anal shield. .......... Genus Asternolaelaps Berlese 1.

4. With a transverse integumental suture behind coxae IV; idiosoma distinctly constricted behind the anterior dorsal shield; tritosternum bipartite. .......... Genus Microgynium Trägårdh 5.
   — Without a transverse suture behind coxae IV; idiosomal constriction absent; tritosternum with a single lacinal extension. ....... Genus Microsejus Trägårdh

5. Anterior dorsal shield without anterolateral incisions; male with ventral sclerotization weak or absent. .......... Microgynium rectangulatum Trägårdh.
   — Anterior dorsal shield in both sexes with a pair of anterolateral incisions (fig. 1); male with distinct sternal and ventri-anal shields. ....... Microgynium incisum n. sp.

Microgynium incisum n. sp.

Female (figs. 1-5). Length of idiosoma = 412-495 μ, with a mean average of 415 μ; width between coxae II-III = 181-237 μ, with a mean average of 210 μ. Dorsum with three median strongly sclerotized shields, the anterior of which is the largest; anterior dorsal shield fused anteriorly to lateral peritrematal components; with seven pairs of median dorsal setae, including the strong pectinate vertex setae (fig. 2); median setae simple or weakly pectinate; with a pair of distinct lateral incisions on a level between dorsal median setae III and IV, extending to a point just laterad of the insertions of these setae; with a pair of strong plumose shoulder setae just anterolateral of the shield incisions; posterior lateral setae short and weakly pectinate, except for the most posterior pair which is similar to the vertex setae in size and ornamentation. Anterior peritrematal component fused to anterior dorsal shield forward of lateral incisions. Dorsal shield II rectangular, concave posteriorly; with three pairs of median and two pairs of lateral pectinate setae; lateromedian setae short, pectinate, and variable in number (three or four pairs). Dorsal shield III sub-triangular, convex anteriorly; fused posteriorly with the ventri-anal shield; setal pattern as illustrated (fig. 2).

1. The genus Asternolaelaps (= Ichthyostomatogaster Sellnick 1953) may represent a separate family, or a second genus in the family Uropodellidae.
**Microgynium incisum** n. sp.

Fig. 1. Venter of female. — Fig. 2. Dorsum of female. — Fig. 3. Leg I of female.
With four pairs of *marginal platelets* flanking the anterior dorsal shield and nine pairs flanking dorsal shields II and III; each platelet with a strong pectinate seta. *Posterior peritrematal shield* (fig. 5) situated lateroventrally, completely free anteriorly of anterior peritrematal component and free laterally of the anterior dorsal shield; *stigma* situated between coxa III and IV; *peritreme* extending anteriorly to the middle of coxa II.

*Tritosternum* bipartite; laciniae divided distally and inserted in a spinose ring basally; tritosternal base cone-shaped. *Sternal shield* divided between sternal setae II and III. Anterior sternal portion rectangular, broader posteriorly than anteriorly; anterior and lateral areas weakly sclerotized. Posterior portion of sternal shield concave anteriorly, strongly narrowed posteriorly; sternal setae IV mediad of and posterior to sternal setae III; posterior tip of shield lying anterior to the genital aperture and covering the membranous anterior portion of the epignyinal shield (figs. 1, 5); with an internal longitudinal apodeme beginning mediad of sternal setae IV and terminating posteriorly at the tip of the shield. Sternal setae simple. *Epignyinal shield* sclerotized centrally, extending anterolaterally to the anterior edges of coxae IV, and posteriorly to a point beyond coxae IV; with a single pair of genital setae inserted laterally on the sclerotized portion of the shield, and a pair of prominent pores located behind it. Ventral area separated from sternal and epignyinal elements by a strong transverse integumental suture lying behind coxae IV, the suture marking the posterior border of the unsclerotized portion of the epignyinal shield. Ventral region with a transverse row of six setae, which are flanked laterally by a pair of large *metapodal shields* (fig. 5); with two additional pairs of setae inserted behind and laterad of the setal row. *Ventral-shield* similar to dorsal shield III in shape and size; anal opening with a short postanal seta and a series of preanal and lateral setae (fig. 1); posteriorly with three pairs of long distally pectinate setae.

*Tectum* (fig. 4) with a smooth median anterior protuberance and spined lateral elements. *Chelicera* similar to that illustrated for male in fig. 7, strongly chelate; movable digit with four teeth, the most proximal being the largest; with two weak setal brushes ventrally; fixed digit with seven teeth, and a simple seta dorsally. *Corniculi* short, not extending to the distal margin of the palpal trochanter; anterior and lateral hypostomal setae noticeably pectinate, posterior pair long, whip-like and simple; deutosternal setae pectinate. *Palpi* with five free segments; with two well-developed tines on the palpal claw. *Legs* (fig. 3) ornamented with numerous simple and pectinate setae inserted on wart-like projections; legs I with claws but without caruncles; legs II-IV with caruncles and claws.

**Male** (figs. 6-7). Length of idiosoma = 373-412 μ, with a mean average of 390 μ; width between coxae II-III = 181-198 μ, with mean average of 191 μ. Dorsum similar to that of female. *Sternal shield* divided as in female; with the genital aperture arising mediad of sternal setae III and coxae III and covered
by a posteriorly hinged rectangular flap; anterior portion of opening with a narrow flap hinged to the anterior border of sternal shield II. With a discrete rectangular area behind sternal shield II which resembles the epigynial shield of the female; centrally with a weakly sclerotized, anteriorly divided "epigynial"

_Microgynium incisum_ n. sp.

_Fig. 4._ Tectum of female. — _Fig. 5._ Lateroventral aspect of female, with sternal shield II displaced. — _Fig. 6._ Venter of male. — _Fig. 7._ Chelicera of male.
portion, each half with a lateral seta; pores in unsclerotized posterior portion prominent as in female; central sclerotized area flanked by a pair of narrow anteri­
orly folded entities. Ventri-anal shield (fig. 6) large, fused anterolaterally with
the metapodal shields; setae as illustrated. Tectum, palpi, legs, and chelicerae
(fig. 7) similar to those of female.

**Nymph** (fig. 8). Length of idiosoma = 363-376 μ, with a mean average of
368 μ; width between coxae II-III = 155-181 μ, with a mean average of 170 μ.
Dorsally with four shields, the most anterior of which is the largest; setal pattern
of anterior shield similar to that of adults; dorsal shield II divided longitudinally,
each part carrying two median dorsal and two pairs of lateral setae; dorsal
shield III as in adults. Sternal shield undivided, terminating posteriorly in a
narrow point. With a rectangular striated area posterior to the sternal shield;
rectangular portion separated from ventral area by a suture. Setal pattern of
ventral and ventri-anal areas similar to female, except that the sclerotized ventri-
anal shield is reduced anteriorly. Nymph similar, in other respects, to adults.

**Larva.** — Unknown.

**Type Material.**

Twelve females, six males and five nymphs from hemlock litter, Odell Lake,
28 miles east of Oakridge, Oregon, September 16, 1959 (collected by B. D. Ains­
cough). The holotype female, allotype male, and a paratype nymph will be depo-
sited in the collection of the U. S. National Museum, Washington, D. C. Para-
type specimens will be deposited in the following institutions: Statens Skogs-
forskningsinstitut, Stockholm, Sweden; British Museum (Natural History), Lon-
don, England; Oregon State College, Corvallis, Oregon, U. S. A.

**Discussion.**

The structure in *M. incisum* corresponding to Trägårdh’s definition of genital
aperture in *M. rectangulatum* is, in reality, a part of sternal shield II (fig. 5).
This sclerotized crescentic area is easily identified as a sternal entity in latero-
ventral mounts, where sternal shield II is angled away from the body wall. The
genital opening (fig. 5, G) is a sclerotized crescentic slit with its lateral extremi-
ties oriented posteriorly and lying between two gland-like bodies which may
correspond to the “sammelblasen”, or “collective glands”, of Winkler (1888).
As noted earlier, the reniform vestibule observed in *M. rectangulatum* is absent
in *M. incisum*. In all of the specimens examined, the membranous anterior por-
tion of the epigynial shield covers the genital aperture, which in turn is covered
anteriorly by the posterior tip of sternal shield II. Specimens were examined
in lactophenol clearing solution in order to observe the condition of the sternal-
epigynial region under the stress of internal pressure. Swelling of the idiosoma
caused sternal shield II to bend outward from the hinge between sternal shields I
and II, while the epigynial shield bent outward from the hinge provided by the postcoxal suture. It is conceivable, then, that the division of the sternal shield as seen in the Microgyniidae is a development which allows for easy passage of the egg without sacrifice of ventral support or muscle attachment sites. In

Fig. 8. Microgynium incisum n. sp., dorsum of nymph. — Fig. 9. Microgynium rectangulatum Tryg., genital region of female. — Fig. 10. Microsejus trunicola Tryg., sternitigential region of female.

Liroaspis and related genera, a hinged sternal entity is unnecessary since the epigynial shield is well-developed and in a position to function as a primary genital cover. The sternal shields are primitively fragmented and placed far forward of the genital aperture, the integumental interstices allowing for expansion at the time of egg deposition.
The male venter of *M. incisum* is unusual in that the shield formation is essentially the same as is found in the female (fig. 6). The general lack of sexual dimorphism in this species is reflected in the Liroaspina as a whole.

On the basis of the reduced epigynial shield, fused sternal elements, small size and weak sclerotization, it may be that the Microgyniidae is a degenerate offshoot of the main liroaspine line of evolution. As pointed out by CAMIN and GORIROSSI (1955), however, the true position of the family is obscured by the mixture of primitive and advanced morphological patterns found in it.

While it would be difficult to conceive a scheme of evolution for the Cohort Liroaspina, it is possible to divide the members into a series of types, based upon sternal and epigynial characters. These types are listed below.

1. *Uropodella*-type: sternal shield I deeply incised posteriorly; epigynial shield developed to the point of covering sternal shield II; with many genital setae, some of which are median in insertion.

2. *Liroaspis*-type: sternal shield I divided longitudinally, with each portion secondarily divided transversely, each fragment carrying a sternal seta; sternal shield II considerably broader than long, abutting large, well-developed epigynial shield; with more than one pair of genital setae, none of which are inserted medially.

3. *Epicroseius*-type: sternal shield I entire but somewhat reduced; sternal shield II and epigynial shield as in *Liroaspis*-type.

4. *Microgynium*-type: sternal shield divided into two subequal portions, both of which are weakly sclerotized; epigynial shield weakly sclerotized and with only one pair of genital setae.

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