Ber. nat.-med. Verein Innsbruck	Suppl. 10	S. 129 – 131	Innsbruck, April 1992

8th International Congress of Myriapodology, Innsbruck, Austria, July 15 - 20, 1990

Anamorphic Stadia in Sphaerotheriida

(Diplopoda, Oniscomorpha)

by

Wolfgang DOHLE

Freie Universität Berlin, Fachbereich Biologie, Institut für Zoologie,
Königin-Luise-Straße 1 - 3, D-1000 Berlin 33

Abstract: Juvenile specimens of *Cyliosoma* sp. have been collected on the North Island of New Zealand. They represent a nearly complete series of anamorphic stadia. They are compared with hitherto described anamorphic stadia of Glomerida.

1. Introduction:

No published information is available on the post-embryonic development of the Sphaerotheriida. During a stay in New Zealand in 1989 I collected some anamorphic stadia of a species of *Cyliosoma*. The stadia are briefly described and are compared with the anamorphic stadia of the Glomerida. Some conclusions regarding diplosegmentation and the correlation between sternite and tergite formation are drawn.

2. Material:

The material consists of 18 specimens of different anamorphic stadia (Tab. 1) and a number of epimorphic stadia of *Cyliosoma* sp. In addition, 1 egg and 2 pupoid stages were found. The material was collected in February 1989 under rotten logs near a track called Hinehopu track. This track links two lakes (Lake Rotoiti and Lake Rotoehu) near Rotorua/North Island of New Zealand.

Table 1: Anamorphic stadia of *Cyliosoma*. In the number of tergites the large anal shield is included.

tergites	leg-pairs	increment of leg-pairs	number of specimens
7	5	.	3
8	8	3	7
9	10/11	2 - 3	2
10	13	2 - 3	1
11	16	3	2
12	18	2	1
13	20/21	2 - 3	2
13	♀ 21	0 - 1	.
13	♂ 23	2 - 3	.

3. Results:

The egg is slightly oval, 1.12 x 1.27 mm. It is surrounded by small particles of rotten wood which glue to the chorion. A part of the whitish chorion was not covered by particles so that the egg could be detected. The chorion is very tough and brittle.

In the pupoid stage the chorion is split. The pupoid is – as in *Glomeris* – surrounded by a transparent blastodermic cuticle. The embryonic cuticle (or pupoid cuticle) is thick, slightly granular. The antennae and first 3 leg-pairs form very short outpouchings. As in the egg the chorion is covered by particles of rotten wood. Therefore, it can be excluded than an egg-capsule is built like in the Glomerida.

The youngest free stadia found have 5 leg-pairs. It is possible that an earlier stadium with 3 leg-pairs exists. Further stadia have 8, 10 or 11, 13, 16, 18 and 20 or 21 leg-pairs (Tab. 2). If this series is complete it would mean that the increment of leg-pairs from one moult to the other is 3, 2 - 3, 2 - 3, 3, 2, 2 - 3; finally 0 - 1 pair is added to give the full number of 21 leg-pairs in the female, or 2 - 3 to give the full number of 23 leg-pairs in the male.

Table 2: Comparison of anamorphic stadia of female Glomerida with those of *Cyliosoma*. In the number of tergites the anal shield is included.

Glomerida: *Glomeris*, *Spelaeoglomeris*, *Trachysphaera*								
Tergites		8	8	9	10	11	12	12
Leg-pairs	*Glomeris*	3	8	10	11	12, 13	15	17
	Spelaeoglomeris	3	6	8	11	13	15, 16	17
	Trachysphaera	3	6	8	11	14	16	17
Cyliosoma								
Tergites		7	8	9	10	11	12	13
Leg-pairs		5	8	10, 11	13	16	18	20, 21

Data for *Glomeris* and *Cyliosoma*: own investigations; *Spelaeoglomeris*: JUBERTHIE-JUPEAU (1967, 1969); *Trachysphaera* (= *Gervaisia*): TABACARU (1963).

The youngest free stadia found have 7 tergites. The collum is counted as the first tergite, the large anal shield is included in the count. 1 tergite is added at each moult until a stadium with 20 or 21 leg-pairs is attained. The adults of all Sphaerotheriida have invariably 13 tergites.

There are 2 specimens with 9 tergites. One specimen has 10 leg-pairs, the other has 11 leg-pairs. Both of these look quite normal. There are 2 specimens with 13 tergites which do not have the final number of legs (21 in the female and 23 in the male). One of these specimens has 20 leg-pairs; the other has 20 legs on the left and 21 legs on the right side. This does not seem to be the result of an injury.

4. Discussion:

Whereas 1 tergite is added during each moult in *Cyliosoma*, sometimes 2 and sometimes 3 leg-pairs are added. Therefore, we find anamorphic stadia with odd and with even numbers. The same is true for different Glomerida (Tab. 2). This means that no rule of anamorphosis is valid in the Oniscomorpha. It also means that the ventral side is not governed by a diplosegmentation, as the sternites are not always differentiated in pairs.

There is a slight variability in the increment of leg-pairs. There are 2 specimens with 9 tergites; one has 10 and the other has 11 leg-pairs. I also found 2 specimens which had 13 tergites as the

adults, but had not the final number of 21 or 23 leg-pairs. This variability points to the conclusion that the differentiation of sternites and leg-pairs on the ventral side is governed by a gradient which must surpass a certain threshold in order to result in well-differentiated ventral structures after the next moult. Normally, there is a stereotyped and species-specific number of leg-pairs in each stadium. But in some cases one leg-pair more or less can be formed without affecting the further development and the final segment number.

A comparison with the Glomerida (Tab. 2) strongly corroborates this conclu-sion. There is intraspecific as well as interspecific variability in the number of leg-pairs in corresponding stadia. In a large sample of *Glomeris marginata* (VILLERS, 1788) from Harpford Wood, Devon (England), collected by J.G. Blower, most specimens of stadium IV have 13 leg-pairs, but some have 12. Whereas in this sample all specimens of stadium III have 10 leg-pairs many authors report 11 leg-pairs for stadium III (LATZEL 1884, VOM RATH 1891, HENNINGS 1904, CHALANDE 1905). Stadium V in *Glomeris marginata* has 15 leg-pairs. In contrast, the same stadium V in *Spelaeoglomeris* has 13 leg-pairs and in *Trachysphaera* 14 leg-pairs.

Regarding the specimen of *Cyliosoma* with 20 legs on the left and 21 legs on the right side it can be deduced that there must be a certain autonomy in the differentiation of the two ventral halves. A similar phenomenon was reported by JUBERTHIE-JUPEAU (1969) in *Spelaeoglomeris doderoi* SILVESTRI. She found specimens with 15 legs on one side and 16 legs on the other side.

A comparison with different Glomerida (Tab. 2) reveals that in Oniscomorpha there is no close correlation between the number of leg-pairs and the number of tergites. Whereas stadia with 8 tergites and 8 leg-pairs agree very well in *Glomeris* and in *Cyliosoma,* stadia with 8 tergites in *Spelaeoglomeris* and in *Trachysphaera* have only 6 pairs of legs. There must be two different gradients or two different mechanisms which govern the increment of sternites and leg-pairs on one side and of pleurites and tergites on the other side. These two mechanisms must be independent to a certain degree and cannot be linked in a hierarchical manner. Either they work in an autonomous way or they can easily be uncoupled.

5. Literature:

CHALANDE, J. (1905): Recherches biologiques et anatomiques sur les Myriapodes du Sud-Ouest de la France. – Bull. Soc. Hist. nat. Toulouse **38:** 46 -150.

HENNINGS, C. (1904): Zur Biologie der Myriopoden II. a) Bemerkungen über *Glomeris marginata* VILLERS. – Biol. Centralbl. **24:** 251 - 256.

JUBERTHIE-JUPEAU, L. (1967): Ponte et développement larvaire de *Spelaeoglomeris doderoi* SILVESTRI (Myriapode, Diplopode). – Ann. Spéléologie **22:** 147 - 166.

– (1969): Acquisition de la maturité sexuelle chez un Glomeride cavernicole *Spelaeoglomeris doderoi* SILVESTRI (Myriapode – Diplopode). – Ann. Spél. **24:** 439 - 453.

LATZEL, R. (1884): Die Myriopoden der Österreichisch-Ungarischen Monarchie. 2. Die Symphylen, Pauropoden und Diplopoden. – Hölder, Wien: xii, 1 - 414, Taf. 1 - 16.

TABACARU, I. (1963): Dezvoltarea postembrionara le specii cavernicole de *Gervaisia* (Diplopoda, Gervaisiidae). – Lucr. Inst. Speologie **1/2:** 341 -399.

VOM RATH, O. (1891): Über die Fortpflanzung der Diplopoden (Chilognathen). – Ber. naturforsch. Ges. Freiburg **5:** 1 - 28.