

Notes on the spinning apparatus of the spiders *Hyptiotes paradoxus* C.L.K., 1834, and *Uloborus walckenaerius* Latr., 1806 (Araneae: Uloboridae)

par
Jaromir Hajer

Summary: The postembryonic development of the spinning organs in the spiders *Hyptiotes paradoxus* and *Uloborus walckenaerius* was studied. The spinning apparatus of the first instar nymph is formed by three pairs of segmented spinnerets with differentiated spigots and functioning glands attached to them. Cribellum and calamistrum are not present yet, but only primary colulus. Development of cribellum and calamistrum at the stage of 2nd instar nymph is always accompanied by a parallel development of the median spinnerets glands, that produce construction elements of capture threads.

1. INTRODUCTION

The postembryonic development and morphology of the spinning apparatus of spiders *Hyptiotes paradoxus* and *Uloborus walckenaerius* was studied. In addition to three pairs of spinnerets these spiders are equipped with a cribellum producing a secretion that covers those parts of the web which serve to catch the prey. This production is accomplished with the assistance of the calamistrum, an organ formed by a row of hairs on the metatarsus of the fourth pair of legs.

2. MATERIAL AND METHODS

Material was collected at localities with large populations, observed and bred under laboratory conditions. The stage, instar, fertilization and age were clearly defi-

nable. All these parameters are important for the evaluation of the postembryonic development of the spinning apparatus and its secretive ability.

3. RESULTS

The genera *Uloborus* and *Hyptiotes* carry eight types of silk glands: glandulae ampullaceae major and minor, gl. piriformes, gl. cribelli and gl. paracribelli (KOVOOR 1977; PETERS & KOVOOR 1980). The last named glands are connected with the segmented tubes on the surface of the median spinnerets. Similar glands and their outer segmented tubes develop likewise in Dictynidae (HAJER 1988).

The study on the development of spinning apparatus indicates close functional, as well as developmental, relations between median spinnerets, their glands and the cribellum. The larvae spinning apparatus develops as three pairs of non-segmented tubercles without an outer spigots (larvae do not move). For the first instar nymph, it is formed by three pairs of segmented spinnerets with differentiated spigots and functioning spinning glands attached to them. However, the cribellum, paracribellum, calamistrum as well as pseudocalamistrum (*Hyptiotes*) are not present yet. Instead of cribellum, a primary colulus is developed (figure 1).

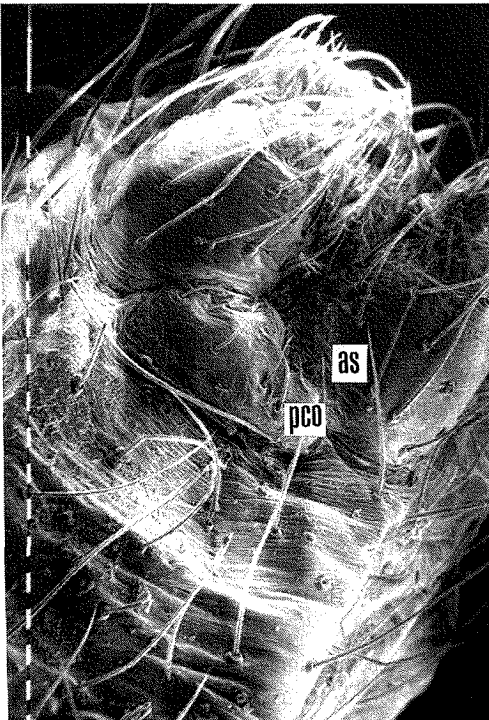


Fig. 1 - The spinning apparatus of first instar nymphs is formed by three pairs segmented with differentiated spigots and functioning spinning glands. In the place of cribellum is primary colulus developed; pco-primary colulus, as-anterior spinneret.

Development of cribellum and calamistrum at 2nd instar stage nymphs is always accompanied by parallel development of the glands of median spinnerets that produce construction elements of capture threads.

The main developmental changes of the spinning apparatus in the ontogenesis of *Hyptiotes paradoxus* and *Uloborus walckenaerius*, expressed in quantitative factors, are shown in the tables I - II.

T A B L E I
The development of spinning apparatus during the ontogenesis of the spider *Hyptiotes paradoxus*.

Glands	S t a g e						adult. ♂
	N.I	N.II	N.III.	N.IV.	adult. ♀		
anterior spinnerets	2	1	1	1	1	1	1
gl. ampullaceae major	6	8	22	38	71	36	36
gl. piriformes	8	9	23	39	72	37	37
Total for each spinneret	16	18	46	78	144	74	74
Total for both spinnerets							
median spinnerets	0	1	1	1	1	1	1
gl. ampullaceae minor	0	1	1	1	1	1	1
gl. tubuliformes	4	6	12	17	28	19	19
gl. aciniformes	0	6	18	22	26	0	0
gl. paracribelli	4	15	33	42	57	20	20
Total for each spinneret	8	30	66	84	114	40	40
Total for both spinnerets							
posterior spinnerets	0	1	1	1	1	1	0
gl. pseudoflagelliformes	-	10	-	-	-	-	4
gl. tubuliformes	8	8	24	46	90	44	44
gl. aciniformes	8	11	25	47	95	44	44
Total for each spinneret	16	22	50	94	190	88	88
Total for both spinnerets							
Spinning apparatus total	40	70	162	256	448	202	202

T A B L E II

The spinning apparatus of the spider *Uloborus walckenaerius*.

Stage	Spinning glands	S p i n n e r e t s		
		anterior	median	posterior
adult females (adult males)	1. Gl. ampullaceae			
	a) major	1(1)	0(0)	0(0)
	b) minor	0(0)	1(1)	0(0)
	2. Gl. piriformes	73(42)	0(0)	0(0)
	3. Gl. aciniformes	0(0)	51(36)	108(62)
	4. Gl. tubuliformes	0(0)	2(2)	4(0)
	5. Gl. pseudoflagelliformes	0(0)	0(0)	1(0)
	6. Gl. paracribelli	0(0)	32(0)	0(0)
	Total for each spinneret	74(43)	86(39)	113(62)
Total for both spinnerets	148(86)	172(78)	226(124)	
Total for spinning apparatus	546 = adult female - cribelum present (288 = adult male) - without cribelum			
N.II (I) Nymphal stages	1. Gl. ampullaceae			
	a) major	1(2)	0(0)	0(0)
	b) minor	0(0)	1(0)	0(0)
	2. Gl. piriformes	8(6)	0(0)	0(0)
	3. Gl. aciniformes	0(0)	6(4)	19(14)
	4. Gl. tubuliformes	0(0)	2(0)	0(0)
	5. Gl. pseudoflagelliformes	0(0)	0(0)	1(0)
	6. Gl. paracribelli	0(0)	9(0)	0(0)
	Total for each spinneret	9(8)	18(4)	20(14)
Total for both spinnerets	18(16)	36(8)	40(28)	
Total for spinning apparatus	94 = N.II - cribellum present (52 = N.I) - without cribellum			

The maximum development and capability of functioning of the spinning apparatus is achieved, for the females, after reaching sexual maturity.

In adult males, some parts of the spinning apparatus become reduced. Cribellum becomes obsolete as a functioning organ. The terminal part becomes sclerotized and it forms a compact whole. In comparison with others cribellate spiders (HAJER 1988), I have not found any hairs reminding of colular ones (excepting genus *Titanoeca*).

The reduction and functional changes of spinning apparatus are manifested in various degrees in the respective spinnerets. The most retained and longest functioning are anterior spinnerets and their glands (gl. ampullaceae and gl. piriformes), which produce drag lines and attachment discs.

The spinning ability of adult males is comparable with the 1st instar nymph. Their silk is primary ecribellate (N.I.) and secondary ecribellate (adult males), without any adhesive property.

REFERENCES

- HAJER, J. - (1988). The postembryonic development of the spinning apparatus in cribellatae spiders, and its utilizing in solving phylogenetic problems. *TUB-Dokumentation, Berlin*, 38: 77-88.
- KOVOOR, J. - (1977). L'appareil séricigène dans le genre *Uloborus* Latr. (Araneae, Uloboridae). *Revue Arachnologique*, 1(3): 89-102.
- PETERS, M.H. & KOVOOR, J. - (1980). Un complément à l'appareil séricigène des Uloboridae (Araneae): le paracribellum et ses glandes. *Zoomorphology*, 96: 91-102.
- STROHMENGER, T. & NENTWIG, W. - (1987). Adhesive and trapping properties of silk from different spider species, *Zool. Anz.* 218, 1/2, S. 9-11.

Jaromir HAJER

Department of Biology, University of Usti nad Labem
CSSP 2529/8, CS-40012 USTI NAD LABEM