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Studies on the morphology of larval stages of water mites (*Hydracarina*).

1. Descriptions of three species of the genera *Protzia* PIERSIG and *Sperchon* KRAMER

[With 3 Tables and 26 Text-figures]

Abstract. The larval stages of *Protzia eximia* PROTZ, *Sperchon setiger* THOR and *Sperchon glandulosus* KOENIKE are described and illustrated. Moreover, some questions concerning the classification of *Hydryphantoidea*, especially the systematic position of the family *Protziidae*, are discussed.

Protzia eximia PROTZ, 1896

(Figs. 1-8, 26A)

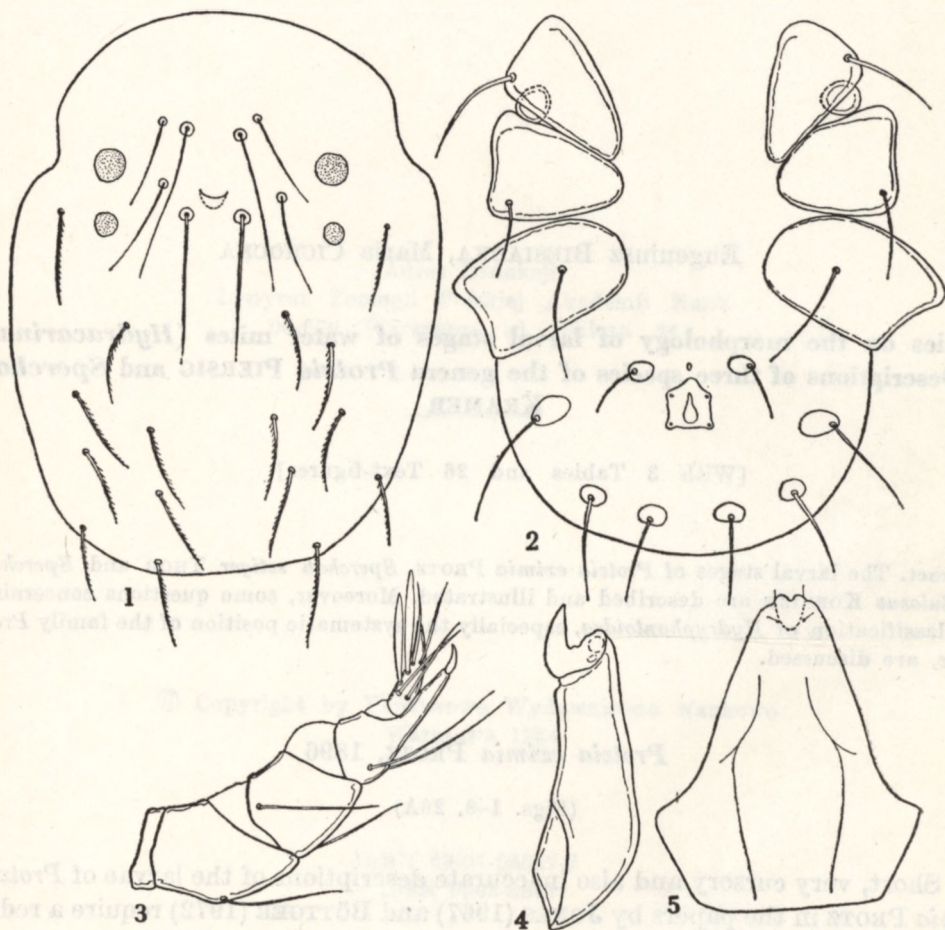
Short, very cursory and also inaccurate descriptions of the larvae of *Protzia eximia* PROTZ in the papers by JONES (1967) and BÖTTGER (1972) require a re-description.

Idiosoma broadly oval in outline, with a slight emargination at the height of first eyes pair. Its maximal length, in two measured individuals, being 208 μm and 254 μm , the maximal width 166 μm and 202 μm , respectively. Dorsal plate absent. Frontal organ present. On the dorsal side of idiosoma there are 12 pairs of setae (Fig. 1). Three pairs of setae situated in the region of frontal organ are thin and not ciliated, their bases distinctly greater than those of other setae. Remaining setae are more heavy.

Epimeral field occupying nearly two thirds the ventral surface of idiosoma; its length reaches up to 158 μm , and width 200 μm . The shape of epimeres,

and the number and location of setae are very similar to those found in other *Hydryphantoidea*. Larval organ in form of round depressions lying between epimeres of I and II pair.

Below the epimeral plates is situated a five-sided anal plate with a pear-shaped central foramen, and with two pairs of shortened setae (Fig. 2). One



Figs. 1-5. Larva of *Protzia eximia* Protz: 1 - dorsal view, 2 - ventral view, 3 - capitulum, 4 - chelicera, 5 - palp.

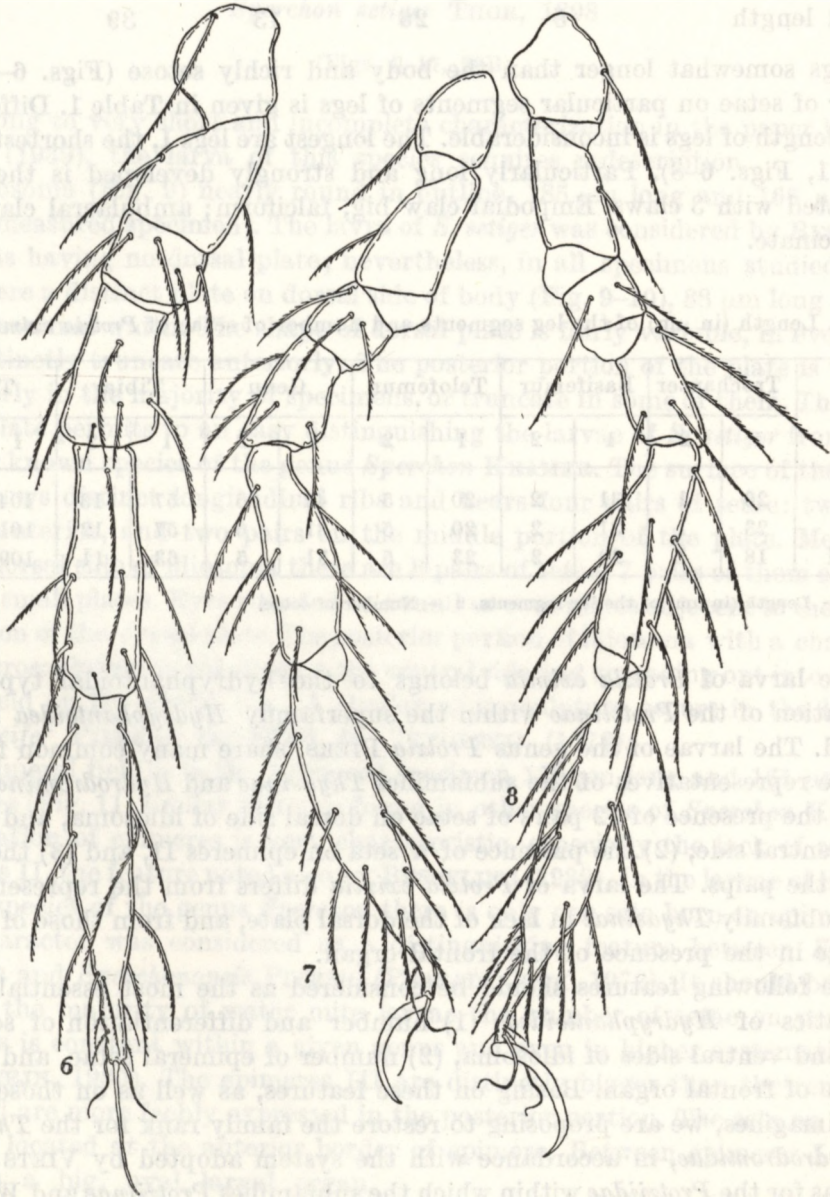
pair of ciliated setae with broad bases lies above the plate. Another three pairs of similar but longer setae are situated in the posterior ventral side of idiosoma.

Gnathosoma triangular and somewhat rounded in its anterior portion (Fig. 3). In one individual, measuring 208 μm , the length of gnathosoma is 75 μm , and its width 55 μm .

Chelicerae (Fig. 4) consisting of two parts, similarly as in other *Hydry-*

phantoidea. The movable joint with two subapical teeth. Length of chelicerae in one individual measuring 208 μm is 68 μm .

Palps (Fig. 5) consisting of 5 segments. P. II is the longest and bears one ciliated seta. P. III is a little shorter and provided with two setae (one of them is ciliated). P. IV is elongate and bears two long setae and two long claws. P. V



Figs. 6-8. Larva of *Protzia eximia* PROTZ: 6 - leg I, 7 - leg II, 8 - leg III.

is situated on ventral side of P. IV and has a solenidium and 7 setae, two of them, lying ventrally, are broad, depressed, and with ciliated edges (Fig. 5).

Dimensions (in μm) of particular joints of palp in the individual measuring 208 μm in length are as follows:

	P.I	P.II	P.III	P.IV	P.V
Dorsal length	5	36	21	39	21
Ventral length	5	26	13	39	21

Legs somewhat longer than the body and richly setose (Figs. 6–8). The number of setae on particular segments of legs is given in Table 1. Differentiation in length of legs is inconsiderable. The longest are legs I, the shortest legs II (Table 1, Figs. 6–8). Particularly long and strongly developed is the tarsus terminated with 3 claws. Empodial claw big, falciform; ambulacral claws thin and uncinat.

Table 1. Length (in μm) of the leg segments and number of setae of *Protzia eximia* PROTZ

	Trochanter		Basifemur		Telfemur		Genu		Tibia		Tarsus	
	1	2	1	2	1	2	1	2	1	2	1	2
leg I	26	1	31	2	20	5	42	6	57	13	104	22
leg II	23	1	31	2	20	5	31	6	57	12	101	21
leg III	18	1	29	2	23	5	31	5	63	11	109	20

1 — Length (in μm) of the leg segments. 2 — Number of setae.

The larva of *Protzia eximia* belongs to the hydraphantoidal type, thus the location of the *Protziinae* within the superfamily *Hydryphantoidea* is fully justified. The larvae of the genus *Protzia* PIERS. share many common features with the representatives of the subfamilies *Thyasinae* and *Hydrodrominae*; they are: (1) the presence of 12 pairs of setae on dorsal side of idiosoma, and 4 pairs on its ventral side, (2) the presence of a seta on epimeres II, and (3) the structure of the palps. The larva of *Protzia eximia* differs from the representatives of the subfamily *Thyasinae* in lack of the dorsal plate, and from those of *Hydrodromidae* in the presence of the frontal organ.

The following features should be considered as the most essential to the systematics of *Hydryphantoidea*: (1) number and differentiation of setae on dorsal and ventral sides of idiosoma, (2) number of epimeral setae, and (3) the presence of frontal organ. Basing on these features, as well as on those shown by the imagines, we are proposing to restore the family rank for the *Thyasidae* and *Hydrodromidae*, in accordance with the system adopted by VIETS (1956), as well as for the *Protziidae* within which the subfamilies *Protziinae* and *Wandesiinae* can be distinguished.

Material. The larvae have been obtained by rearing:

3 ♀♀, Poland, vicinity of Olsztyn, stony current section of the lower tributary of Łyna near Gutkowo, 11 IV 1980; oviposition 14 IV, 28 IV, 12 VI (together 30 eggs); only 3 larvae hatched (incubation period lasted 30–46 days)

Sperchon setiger THOR, 1898

(Figs. 9–17, 26B)

Owing to very short and incomplete characterization in the paper by BESSELING (1939), the larva of this species requires redescription.

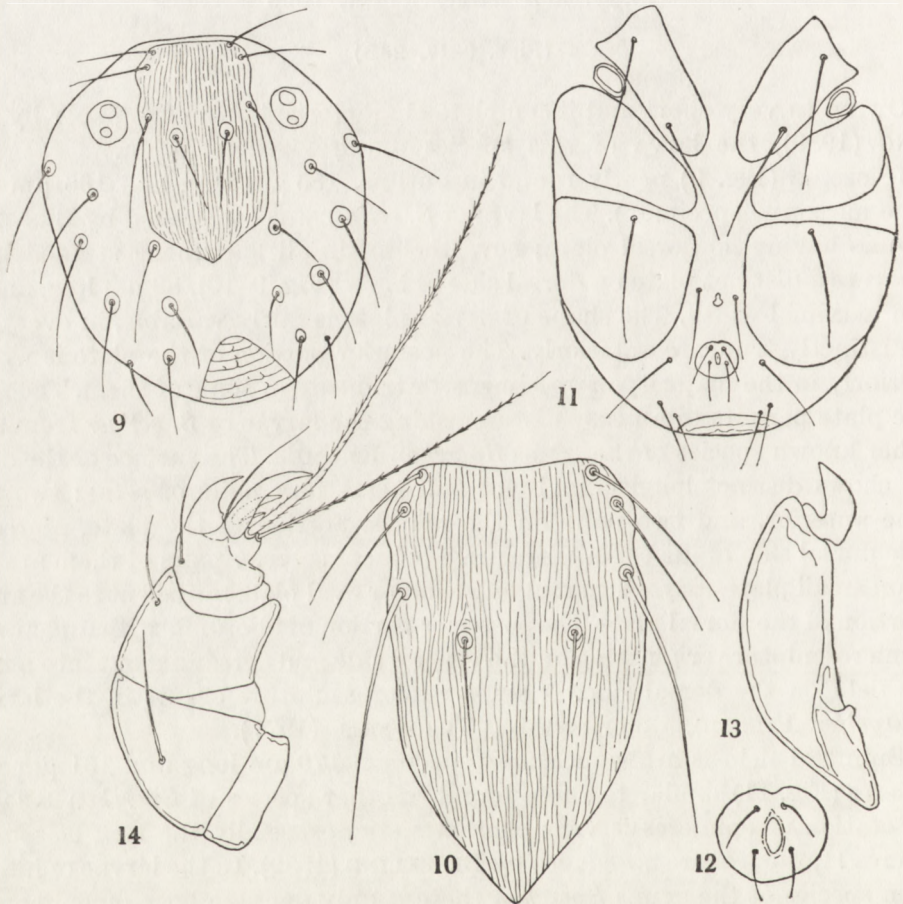
Idiosoma (Fig. 9) nearly round in outline, 185 μm long and 166 μm wide (in one measured specimen). The larva of *S. setiger* was considered by BESSELING (1939) as having no dorsal plate; nevertheless, in all specimens studied by us there were a distinct plate on dorsal side of body (Fig. 9–10), 88 μm long and 68 μm in maximal width. The shape of dorsal plate is fairly variable, in every case it is distinctly truncate anteriorly. The posterior portion of the plate is wedged posteriorly in the majority of specimens, or truncate in some of them. The shape of the plate permits to an easy distinguishing the larvae of *S. setiger* from those of other known species of the genus *Sperchon* KRAMER. The surface of the dorsal plate shows distinct longitudinal ribs and bears four pairs of setae: two pairs on the anterior, and two pairs on the middle portion of the plate. Moreover, on the dorsal side of idiosoma there are 8 pairs of setae, 7 pairs of them are situated on small plates. Eyes situated on round or oval plates adjacent to the anterior portion of the dorsal plate. The posterior portion of idiosoma with a characteristic microsculpture originating on the ventral side and spreading out into a triangular field on the dorsal side. A similar microsculpture occurs in the larva of *S. clupeiifer* PIERSIG, described by TUZOVSKIJ (1977).

Epimeral field is in the measured specimen 179 μm long and 161 μm wide. Epimeres (Fig. 11) similar to those found in other species of *Sperchon* KRAMER. The setation of epimeres is very characteristic, especially the lack of setae on epimeres II, the feature noted also by BESSELING (1939). In the larvae of hitherto known species of the genus *Sperchon* there is only one seta born on epimeres II. This character was considered as a distinguishing feature between *Sperchon* KRAMER and *Sperchonopsis* PIERSIG (PRASAD, COOK, 1972). It should be added that in the majority of water mite larvae the number of setae on particular epimeres is constant within a given genus and even in higher systematic units (VAJNŠTEJN, 1980). The epimeres III are distinctly bigger than the remaining ones and are more feebly expressed in the posterior portion. The seta on each of them is located at the anterior border of epimere. Between epimeres I and II there is a big, oval larval organ.

Anal plate (Fig. 12) nearly round, with a slight emargination at the anterior margin. There are two pairs of setae, one pair of longer setae is situated

at the sides of plate. Before the anal plate there is a small sclerite, at the sides of it are born two setae. In the posterior portion of idiosoma, at the bases of the microsculpture field, there are two pairs of setae.

Gnathosoma rounded in outline, 86 μm long and 62 μm wide. Chelicerae



Figs. 9-14. Larva of *Sperchon setiger* THOR: 9 - dorsal view, 10 - dorsal plate, 11 - ventral view, 12 - anal plate, 13 - chelicera, 14 - palp.

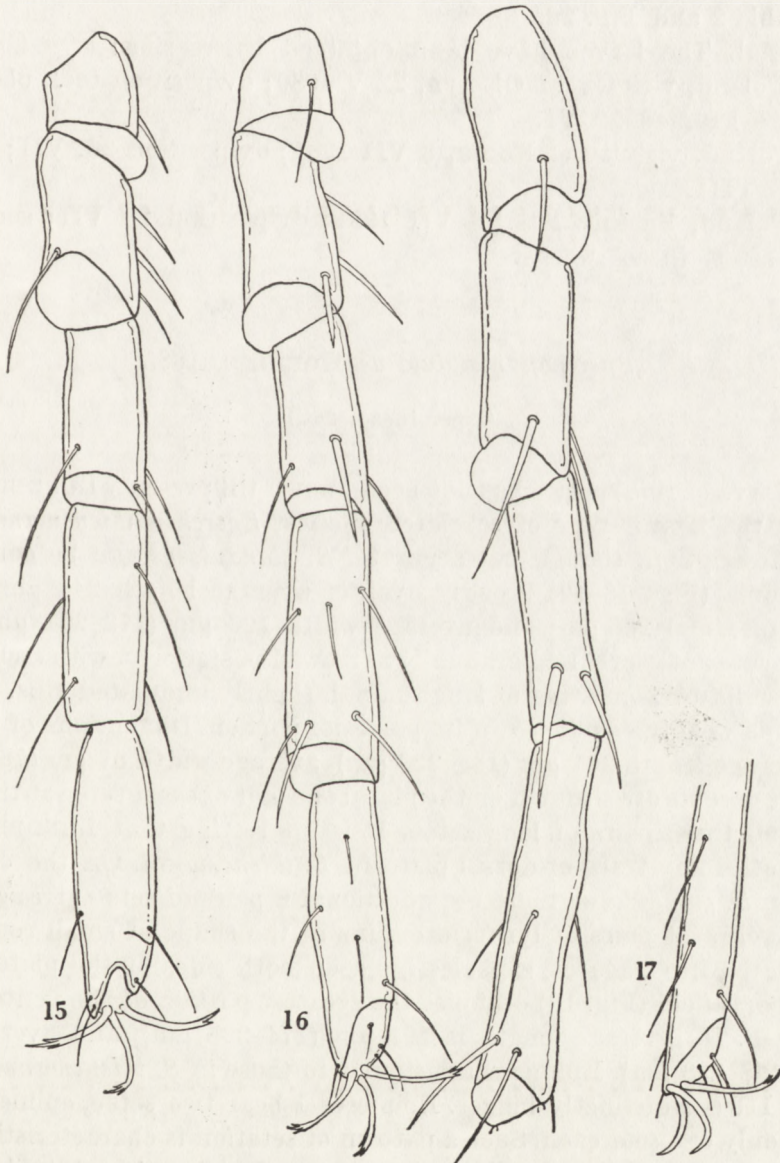
(Fig. 13) consisting of two parts, similarly as in other species of *Sperchon*, 83 μm long (together with the movable joint which is 31 μm long).

Palps (Fig. 14) are solid. The most strongly developed P.II and P.III bear one bristle each. P.V. terminated with a claw-like projection with a small basal tooth. P. V with three, characteristic for the species, short and thick setae and two long ciliated setae. Length of the longest seta exceeds 100 μm .

Below are given dimensions (in μm) of particular joints of palps:

	P.I	P.II	P.III	P.IV	P.V
Dorsal length	10	47	29	29	29
Ventral length	10	21	21	29	29

Legs (Figs 15–17) comparatively long, with a characteristic microsculpture consisting of longitudinal ribs, and terminating with 3 tripartite claws. Tarsi I



Figs. 15–17. Larva of *Sperchon setiger* THOR: 15 – leg I, 16 – leg II, 17 – leg III.

Table 2. Length (in μm) of the leg segments of *Sperchon setiger* THOR

	Trochanter	Femur	Genu	Tibia	Tarsus
leg I	26	36	44	54	65
leg II	31	52	57	65	73
leg III	42	57	75	81	91

and II ended with the acanthoids. Lengths of particular segments of legs are given in Table 2 and Fig. 26.

Material. The larvae have been obtained by rearing:

1 ♀, Poland, vicinity of Olsztyn, 22 V 1980; oviposition took place 27. V; four larvae hatched 12 VI.

1 ♀, Poland, vicinity of Konin, 8 VII 1981; oviposition 26. VII; 10 larvae hatched 3 VIII.

1 ♀, Poland, Pieniny Mts., 8 VII 1981; oviposition 20 VII; some larvae hatched after three weeks.

Sperchon glandulosus KOENIKE, 1885

(Figs. 18–25, 26C)

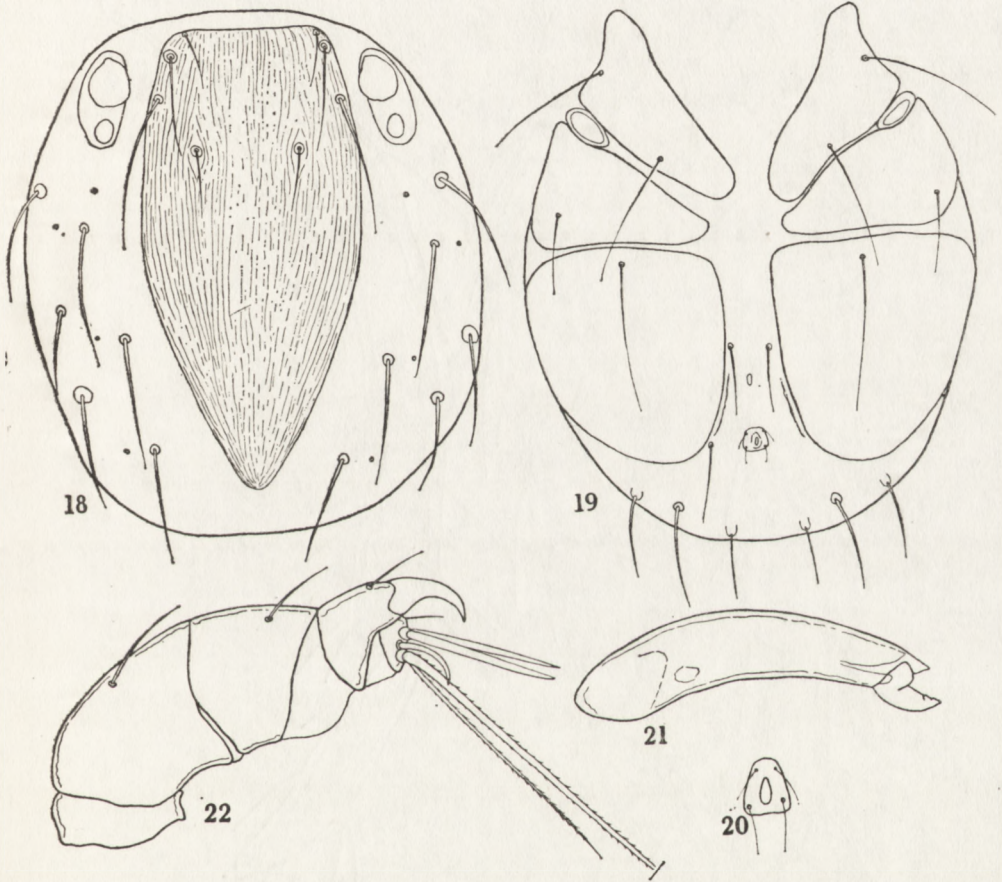
The larva of this species has not been known till present. LUNDBLAD (1927) published the larval stage of a related species, *Sperchon thienemanni* KOEN.; with its description, though not accurate, *S. glandulosus* can be compared.

Idiosoma (Figs 18–19) broadly oval, of average length 243 μm (minimal 208 μm , maximal 286 μm) and average width 196 μm (172–221 μm). Dorsal plate truncate anteriorly and gradually narrowed posteriorly, with a characteristic microsculpture consisting of longitudinal, slightly undulated ribs. The plate boundary is weakly developed in its posterior portion. Dimensions of the dorsal plate: average length 201 μm (189–226 μm), average width 87 μm (78–104 μm). Four pairs of setae are situated on the plate: one pair of short setae at the anterior margin and three pairs of long setae. It is interesting that LUNDBLAD (1927) did not notice any trace of dorsal plate in *S. thienemanni*. On the dorsal side of body in *S. glandulosus* there are additional 6 pairs of setae arranged in two rows, as well as 4 pairs of lyriform organs in the shape of small round pores. Eyes situated in elongated capsules lying on both sides of the plate.

Epimeral field (Fig. 19) occupies the greatest portion of the ventral surface of idiosoma. Its average length is 191 μm (174–205 μm), and average width 177 μm (168–198 μm). Epimeres are similar to those in *S. thienemanni*, only the epimeres III are distinctly bigger. Epimeres I bear two setae, epimeres II and III have only one seta each. Such a pattern of setation is characteristic for most species of the genus *Sperchon* KRAMER, except for *S. setiger* described above.

At the median margins of the epimeres III there are distinct longitudinal folds.

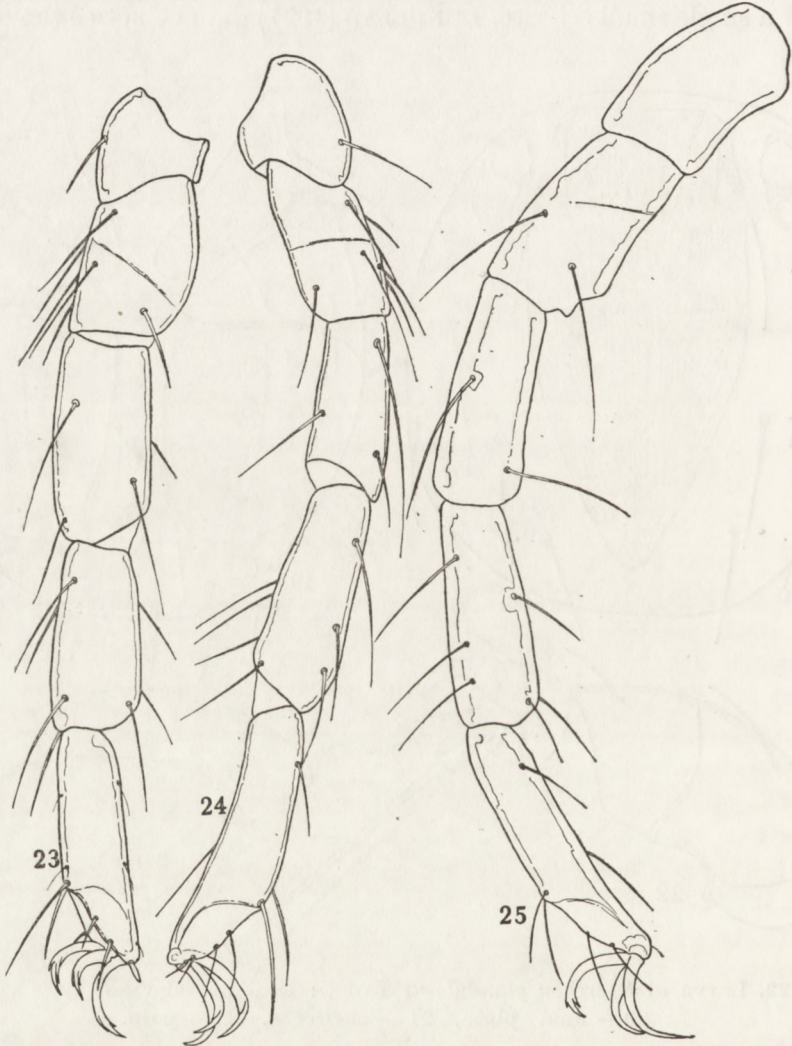
Anal plate (Fig. 20) of nearly quadrangular outline. It is situated between the epimeres III, and bears two pairs of minute setae. On both sides of the anal plate there is a pair of thick setae, and before the plate a pair of similar setae and a single small sclerite. LUNDBLAD (1927) did not notice the occurrence



Figs. 18–22. Larva of *Sperchon glandulosus* KOEN.: 18 – dorsal view, 19 – ventral view, 20 – anal plate, 21 – chelicera, 22 – palp.

of the anal plate in *S. thienemanni*; he apparently overlooked this delicate structure. Excretory pore in the last species was then situated outside the epimeral field, and the location of the two pairs of setae lying on the sides and before the anal plate was different. Moreover, three other pairs of big setae are located on the posterior portion of idiosoma. Between the central setae there is a small, feebly separated microsculptural field consisting of cuticular corrugated wrinkles.

Gnathosoma triangular, with average length 84 μm (70–104 μm), and average width 59 μm (47–68 μm). Chelicerae (Fig. 21) divided, of slightly semi-lunar shape. The movable joint slightly bent, the antychela short. Chelicerae in three measured specimens are up to 70 μm long and 16 μm wide.



Figs. 23–25. Larva of *Sperchon glandulosus* KOEN.: 23 – leg I, 24 – leg II, 25 – leg III.

Palps (Fig. 22) a little more elongated than in *S. thienemanni*. The setation, especially of P. V is similar to that in *S. thienemanni*.

Dimensions (in μm) of particular joints of palps are given below:

	P.I	P.II	P.III	P.IV	P.V
Dorsal length	12	41	25	40	11
Ventral length	6	17	17	40	111

Legs (Figs. 23–25) devoid of microsculpture which is characteristic for *S. setiger* and *S. thienemanni*. They are shorter than in *S. setiger*. Legs I shorter, legs II slightly longer than idiosoma. In *S. setiger* all legs are distinctly longer than idiosoma. Tarsi terminated with 3 tripartite claws. Lengths of particular segments of legs are given in Table 3 and Fig. 26.

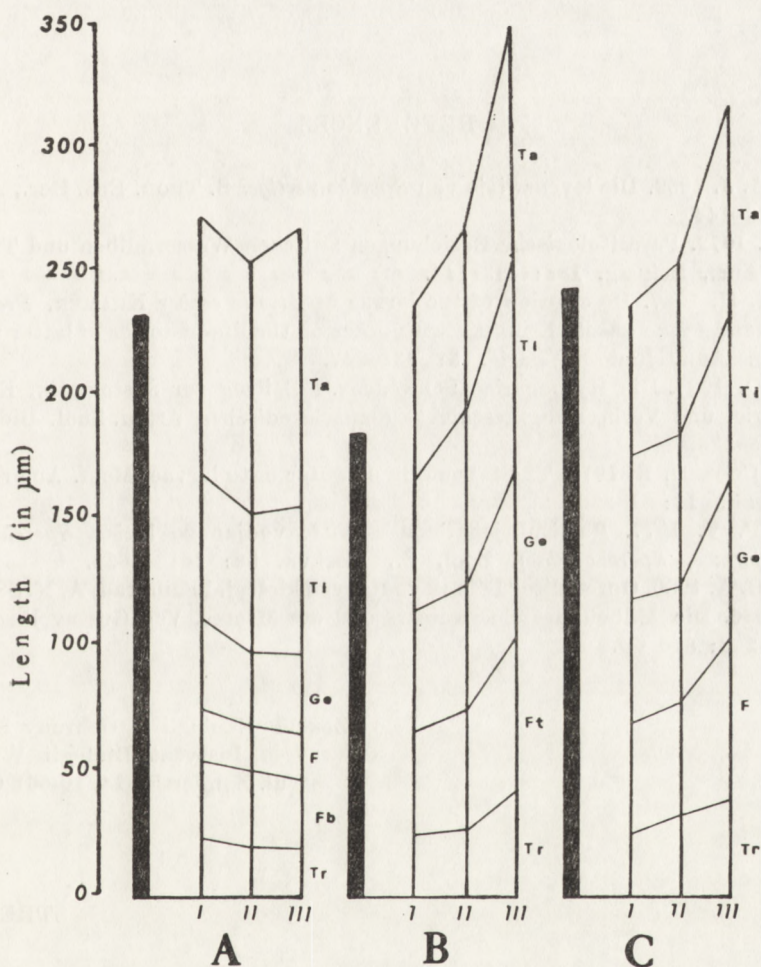


Fig. 26. Comparison of the larval idiosoma and leg dimensions in three species of water mites: A — *Protzia eximia* PROTZ, B — *Sperchon setiger* THOR, C — *Sperchon glandulosus* KOEN. (Tr — trochanter, Fb — basifemur, Ft — telofemur, F — femur, Ge — genu, Ti — tibia, Ta — tarsus).

Material. The larvae have been obtained by rearing:

1 ♀, Poland, Pieniny Mts., 2 VII 1981; oviposition 10 VII; larvae hatched after two weeks.

1 ♀, same locality, 16 VII 1981; oviposition 18 VII; larvae hatched 31 VII.

Table 3. Length (in μm) of the leg segments of *Sperchon glandulosus* KOEN.

	Trochanter	Femur	Genu	Tibia	Tarsus
leg I	22	47	50	54	64
leg II	26	47	50	59	72
leg III	46	57	63	68	80

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STRESZCZENIE

[Tytuł: Badania nad morfologią stadiów larwalnych wodopójek (*Hydracarina*),
1. Opis trzech gatunków z rodzaju *Protzia* PIERSIG i *Sperchon* KRAMER]

Praca zawiera szczegółowe opisy i rysunki larw trzech gatunków: *Protzia eximia* PROTZ, *Sperchon setiger* THOR i *Sperchon glandulosus* KOEN. Ponadto przedyskutowano podstawy systematyki *Hydryphantoidea*, a w szczególności kwestię stanowiska systematycznego rodziny *Protziidae*.

РЕЗЮМЕ

[Заглавие: Изучение морфологии личиночных стадий водяных клещей (*Hydracarina*)

1. Описание трех видов из рода *Protzia* PIERSIG и *Sperchon* KRAMER]

Работа содержит подробные описания и рисунки личинок трех видов: *Protzia eximia* PROTZ, *Sperchon setiger* THOR и *Sperchon glandulosus* KOEN. Обсуждены также основы систематики *Hydryphantoidea*, а в особенности вопрос систематического положения семейства *Protziidae*.

Redaktor pracy — prof. dr A. Riedel