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**Speleorcheses, a new genus of saltatorial
Trombidiidæ, which lives in termites'
and ants' nests.**

By

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With 14 Textfigures.

Communicated Mai 12th by CHR. AURIVILLIUS and Y. SJÖSTEDT.

While amongst insects the power of jumping or leaping is by no means uncommon, there are, up to the present time, known only two genera of saltatorial mites. Of these one, *Zetorcheses* BERL. belongs to the Oribatidæ the other *Nanorcheses* TPS. & TRT. to the Trombidiidæ.

The latter genus, of which only one species is known, was found in France, in crevices of the rocks on the shore, within the limits of the tide. It is closely related to the present genus and indeed at first I referred the two species on which it is founded to *Nanorcheses*. But on closer examination of the somewhat meagre diagnosis, which is not accompanied by any figures, I found recorded details enough to enable me to say that they cannot be referred to *Nanorcheses*.

The two species, on which the present genus is founded, were discovered, one, *S. termiophilus*, in a partly deserted termites' nest in Zululand at Entendweni Bush in June 1905, the other, *S. formicorum*, in the nest of *Formica rufa*, not far from the shore. at Arilds läge in Skåne Sweden in June 1907.

Diagnosis of *Speleorchesetes*.

Body elongate, abdomen long and sackshaped, with two distinct, transverse furrows in the anterior half. Cephalothorax distinctly separated from abdomen, short and narrow, anteriorly truncate, with two pairs of long slender, pectinate sense hairs and three pairs of plumose hairs. One pair of small, but prominent eyes. Rostrum large and conical, as long as, or longer than cephalothorax. Mandibles large, chelate, with a portion proximally at the median side detached as a peculiar pear-shaped structure. Palps 5-jointed, with large 2nd joint, 1st, 3rd and 4th joints very short, terminal joint broad at the top and divided into 3—4 short tubercles with one pointed hair each. Body hairs densely hairy, obtuse at the top and accumulated at the posterior end of abdomen. Legs 1—3 5-jointed; legs IV 6-jointed. One claw.

From the diagnosis given above it may be seen at the present genus differs from *Nanorchesetes* in the following respects.

Speleorchesetes

Palps 5-jointed; 5th joint $> 3 + 4$; terminal joint 3—4-lobated with long hairs.

Mandibles large, chelate.

Body elongate; shoulders not projecting.

Nanorchesetes

Palps 4-jointed; 2 $> 3 > 4$; terminal joint with crateriform papilla, surrounded by small, cirriform hairs.

Mandibles little developed, shaped as in *Eyrenetes*, consequently not chelate.

Body squarebuilt, shoulders large and projecting as in *Trombidium holosericeum*.

The present genus is in several respects very interesting. Its features will be discussed more fully after the descriptions of the two species, but I can not omit pointing out here, how extraordinary it seems on first thought that one species lives in white ants nests in South Africa, the other in ants nests in Sweden. Evidently it enjoys a very wide distribution and the fact that it has up to the present time escaped the acaridologists is explained only by its subter-

ranean habits, by its inconspicuous size, as the largest species attains a length of only 348 μ and by the fact that systematic researches of the microarthropods of ants' and termites' nests have only in the last years begun to be carried out.

The ability of jumping which the genus enjoys is in itself very remarkable, but becomes still more interesting when we consider, that both species are subterraneous, and one of them probably termitophilous, the other certainly myrmecophilous. Another feature is also very remarkable, when combined with the subterraneous life viz, the great development of the lenses of the eyes.

As to the systematic position of the genus it is, as far as it is at the present time possible to ascertain, most closely related to the genera *Alichus* and *Monalichus*, as is also *Nanorchestes*. The relationship will be further discussed at the end of this paper.

Speleorchestes formicorum nov. sp.

(Textfigs. 1-8).

Length 348 μ . Length of rostrum and cephalothorax 80 μ , of abdomen 268 μ .

Colour light red, with a lighter median longitudinal band. Under the cuticle of the abdomen there is a layer of small crystals, which render the specimens very obscure, when mounted, and probably are composed by uretic acid, as BERLESE¹ states to be the case with *Monalichus arboriger*. The crystals resemble also those I have found under the cuticle of *Monalichus* sp. from Natal. The cuticle is finely striated. The body is elongate, more than twice as long as it is wide; the greatest width is half way between coxae IV and the hind margin.

The cephalothorax (Fig. 1) is narrow, only half as wide as the abdomen and shorter than it is wide. It is separated from the abdomen by a distinct, straight and transverse furrow.

The sides widen a little behind the eyes, but narrow again towards the posterior margin. The anterior margin is slightly concave near the sides, but rises in the middle to a short rounded projection which has a distinct transverse line at

¹ Acari nuovi. Redia. vol. 2. fasc. 1. 1904.

its base. This projection is probably homologous with the socalled pseudocapitulum of *Rhagidia* a. o., but has, contrary to that, no sense hairs; at least I have been unable to see any even by an amplification of 812×1 ; on the upper side of the cephalothorax there are two pairs of long, slender tactile hairs, inserted in comparatively small pores.

The *anterior pair* is slightly shorter than the posterior one, inserted near the median line, half way between the middle and the anterior margin, and points obliquely forwards and outwards.

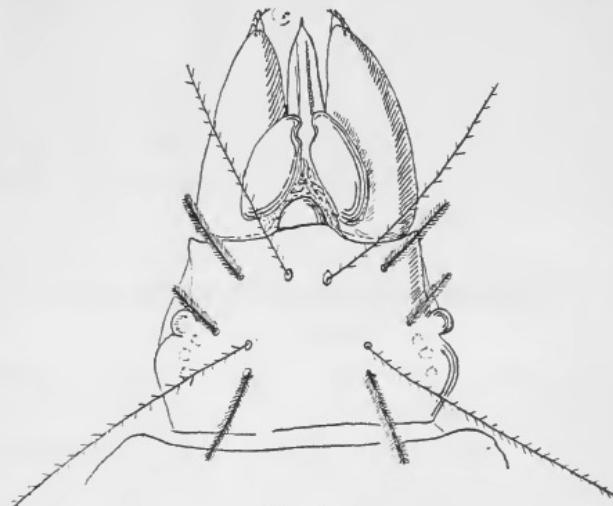


Fig. 1.

Fig. 1. Rostrum and cephalothorax of *S. formicorum*, dorsal view.

The *posterior pair* is inserted close behind the middle, further laterally the anterior one, about halfway between the median line and the sides.

Besides the tactile hairs there are 3 pairs of very characteristic, rather stout, straight and densely plumose bristles which are of even width throughout and blunt at the top.

Of these the median pair is only a little more than half as long as the other two which are of equal length. Their position is shown in textfig. 1.

The *eyes* are very prominent and spherical. The swollen portion behind the eyes seems to be a *sense organ* of some kind. It is possible to discern through the skin 3—4 light-refracting bodies or crystals which recall statocysts.

The *mouthparts* are in several respects very remarkable, and exhibit some structures not met with in the *Trombidiidae*.

When examined from above, they exhibit, between the mandibles and projecting forwards to a level with their tips, a narrow ensiform projection, the base of which is concealed between the basal portions of the mandibles. On dissecting the mouthparts we perceive however, that it is curved at a right angle in the middle, so that the basal half is almost vertical, the distal half horizontal (Fig. 2. ep.). Owing to the extreme minuteness of the mouthparts I have not been

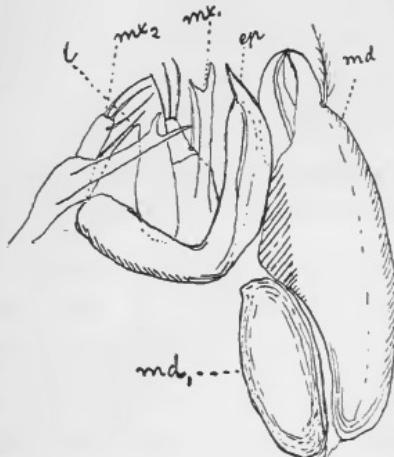


Fig. 2.



Fig. 3.

Fig. 2. Right mandible, maxillæ and epistom-like structure, dorsal view. $^{812}/_1$, md_1 mandible; md_1 detached portion of mandible; ep , epistom-like projection; mx_1 , lateral appendage of maxillæ; mx_2 , median appendage; l , lingua.

Fig. 3. Right mandible, seen from the inner side. $^{812}/_1$.

able to ascertain its exact relation to the other mouthparts. I am not aware of any similar structure having been found in the *Trombidiidae*. Its function seems to be partly the same as the epistoma of the *Parasitidae* viz. to form the roof of the mouth, but its shape suggests that it possibly is used as a piercing organ.

The *mandibles* (Figs. 2 & 3) are large and conical; they attain the length of the cephalothorax. The chela is well developed, but edentate. The upper jaw is rather narrow with comparatively long terminal tooth, and has on its upper side, near the base, a plumose hair, inserted on a low tubercle,

which projects forwards to a level with the top of the jaw. The lower jaw is broader and shorter than the upper one and on lateral view triangular.

Near the base of the lower jaw, on the inner (median) side, there is inserted a narrow, slightly *S*-curved appendage, which is of even width throughout and obtuse at the top; it projects forwards to a level with the top of the upper jaw.

Along the median side of the mandibles, in the proximal half there is an ovoid cushion-shaped portion detached, the function of which seems highly mysterious, as it is nowhere else met with in the *Trombidiidae*.

The *maxillary palps* (Fig. 4) are 5-jointed and attached so far ventrally that they are not visible on dorsal view. The 1st, 3rd and 4th joints are very short and of subequal length. The 2nd one is the largest, twice as long as it is high, almost rectangular on lateral view, with slightly convex ventral margin, and anteriorly a little wider than posteriorly. It has one dorsal pectinate hair, inserted a little behind the middle.



Fig. 4. Palp, 2-5 joints, lateral view. ^{sl2/1.}

The 3rd joint is as high as the 2nd one but narrows anteriorly; it is very short, only half as long as it is high at the base; it has one hair-like hair dorsally, near the posterior margin. The 4th joint narrows also towards its top, so that the articulation between the 4th and 5th joints is the narrowest part of the palp; it has one dorsal hair in the middle.

The 5th joint widens from a narrow base towards the broadly rounded top, which is divided into 4 short and blunt tubercles.

It has 6 comparatively large and sharply pointed hairs, two of which are dorsal, three terminal and one ventral and sub-terminal; of the three terminal hairs, which are all inserted on the top of the tubercles, and slightly *S*-curved, the uppermost one points straight forward, whereas the other two point obliquely upward.

The *maxillæ* (Fig. 2) resemble to a certain extent those of *Alichus*, and exhibit a still greater development of the remarkable features of that genus. The result is that they show an astonishing conformity with those of the *Parasitidæ*.

Thus we have a median triangular mucro, flanked by two pairs of appendages. The median mucro is evidently the lingua; the two appendages recall vividly the maxillary lobes and maxillary plates. And since it is difficult to conceive how structures so similar should have developed independently in two so different groups, it seems highly probable that the two appendages of *Speleorcheses* and *Alichus* are really homologous with the maxillary lobes and plates of the Parasitidæ. In this respect these two genera would consequently have preserved an old phylogenetic character.

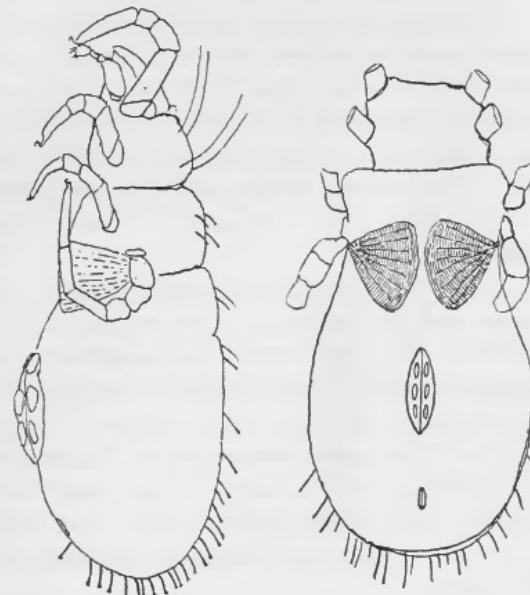


Fig. 5.

Fig. 6.

Fig. 5. *S. formicorum*, side view. $^{233/1}$.

Fig. 6. Cephalothorax and abdomen of same, ventral view. $^{233/1}$.

The *lateral appendages* (Fig. 2 mx_1) are attached to the outer side of the base of the median ones. Whether they are articulated (as is the case with the max. lobes of the Parasitidæ) or not, I have not been able to ascertain; they are narrow, straight and of equal width till at the top where they widen slightly and are bifurcate, resembling a chela.

The *median appendages* (Fig. 2 mx_2) are shorter and to all appearance biarticulated. The basal joint is broad and conical, with convex sides; the terminal joint is narrow, cylindri-

cal, about twice as long as it is wide and truncated at the top; it has three fine terminal hairs, which are a little longer than the joint, and one similar exteriorly near the base.

The *lingua* (Fig. 2 *l*) is rather blunt and as long as the median appendages.

The *abdomen* (Figs. 5 & 6) is, as above stated, separated from the cephalothorax by a distinct, rather deep furrow. It is anteriorly truncated, posteriorly rounded, narrows towards coxae IV, and widens from thence gradually towards the middle of the distance between coxae IV and the posterior margin, where it attains its greatest width.

The dorsal side is far less convex than the ventral one. It shows two distinct transverse furrows in the anterior half, one on a level with coxae IV, the other further backwards, twice as far from the anterior margin of the abdomen as the first one. The former furrow is deeper and extends down the sides to near coxae IV; the latter is clearly visible only on the dorsal side.



Fig. 7. Hair from abdo-
men. ^{812/1.}

The *hairs* are of a peculiar shape, densely plumose and the plumulæ increase gradually in length towards the top, where the exterior rows are the longest, and in consequence the hairs seem to be truncated. In the two anterior $\frac{1}{3}$ of the abdomen the hairs are scarce and arranged in 2—4 longitudinal rows, but in the posterior $\frac{1}{3}$ and behind the anal aperture on the ventral side there are numerous hairs all standing out perpendicularly.

It seems very likely that this feature, viz. the extraordinary accumulation of hairs at the posterior end of the body, is in some way connected with the ability of leaping; possibly it serves the mite as a mean of defence against getting hurt when dashing against the walls of the ants' nests, as it is liable to do when leaping in the subterranean galleries.

The *ventral side* is as above stated more convex than the dorsal one.

The *genital aperture* is large as in *Alichus*, with 3 pairs of suckers; the *anal aperture* is small and placed close to the posterior margin.

The *legs* (Fig. 5) are slender but short, and even the 4th

pair, which is the longest, is not half as long as the body (resp. 4 and 9). They are placed remarkably far forwards, almost in the anterior $\frac{1}{3}$ of the body and not two and two close together, as is usually the case, but are almost equidistant. The 1st and 4th pair are placed further from the median line than the 2nd and 3rd one, so far indeed that on lateral view they are inserted as far from the ventral as the dorsal outline.

Legs I—III 5-jointed, legs IV 6-jointed.

Legs I; coxa very short, trochanter + femur (= 2nd joint) three times as long as they are wide, genu half as long, tibia half as long as genu, tarsus nearly as long as trochanter + femur.

Legs II and III of subequal length, shorter than legs I. The relative length of the joints is the same as in legs I, with one exception, that genu and tibia are of almost equal length.

Legs IV longer than legs I; coxae clubshaped and slightly longer than trochanter and femur which are of equal length; genu and tibia of equal length, as long as trochanter and femur together; tarsus slightly longer.

Where the coxa is articulated to the epimeron there is a distinct fold of the cuticle. The epimera IV are enormously developed, triangular plates which all but meet in the middle. Below the cuticle of the epimera we notice numerous bundles of muscles, radiating from the place where the coxae IV are articulated.

One slender claw, curved like a hook.

From the description of the legs, given above, it is evident, that the ability of leaping is due to the great development of the epimera of the 4th pair of legs and their musculature.

But the concentrating of the legs far forward, the lateral position of legs I and IV and the hook-shaped claws are obviously also connected with this mode of locomotion.

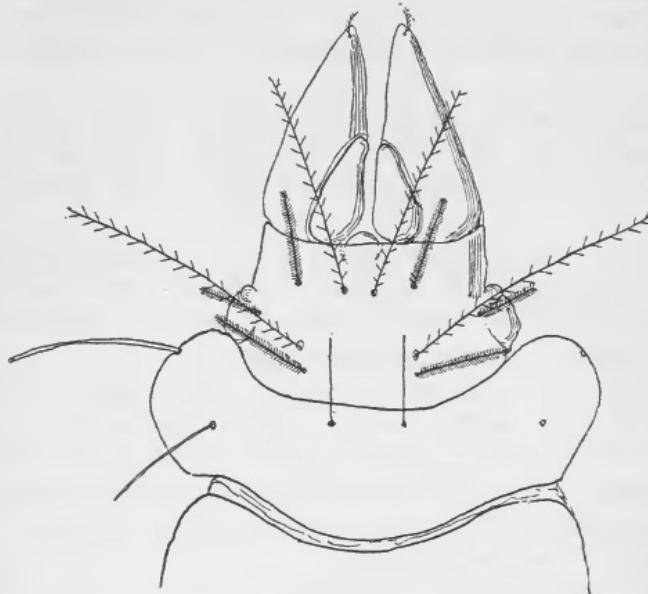
Locality: In the nest of *Formica rufa* at Arilds läge, not far from the shore. June 1907. 2 specimens.



Fig. 8. Top
of tarsus
with claw.
812/1.

S. termitophilus nov. sp.

(Textfigs. 9—14.)

Length (incl. rostrum) 280μ . *Length of abdomen* 172μ .*Colour* light yellowish-red, but probably a little faded through the influence of the alkohol.*Cuticle* finely striated.*General shape* the same as in *S. formicorum*, but the shoulders are more projecting.Fig. 9. Cephalothorax, rostrum and anterior part of abdomen. $386/1$.

The *cephalothorax* (Fig. 9) widens posteriorly more than in the other species; the anterior margin is slightly concave, the posterior one is convex and the posterior angles are concealed by the projecting angles of the abdomen.

The small *pseudocapitulum* is constricted at the base and for the greater part covered by the anterior edge of the cephalothorax; it has no sense hairs.

The two pairs of *sense hairs* are shaped as in the other species; the posterior pair is however placed further backwards.

Three pairs of *plumose hairs*, the median one of which is the shortest, as in the other species; they are placed as in the other species.

The *eyes* are small but very prominent; behind the eyes the cephalothorax widens to two low cushion-shaped projections which are much more distinctly set off than in the other species. These structures resemble very much those I have found in *Alichus rostratus* TGDH and seem to be some kind of sense organs.

The mouthparts.

I have not been able to find any projecting between the mandibles, as was the case with the other species. This



Fig. 10.



Fig. 11.

Fig. 10. Mandibles, $\frac{3}{4}$ side view. $8\frac{1}{2}/1$.
 Fig. 11. Maxillary palp. $8\frac{1}{2}/1$.

may however depend on that its is shorter and bent downwards, so as to become difficult to see.

The *mandibles* (Fig. 10) are comparatively longer than in *S. formicarum*, with straighter lateral side. Along the median side, at the base, there is detached a low pear-shaped portion detached, as in the other species. The shape of the chela is extremely difficult to make out. In textfig. 10. both mandibles are delineated, in $\frac{3}{4}$ side view. We notice at the base of the upper jaw a short unipectinated hair. The upper jaw itself seems to be shaped as an oval, very thin blade, the ventral edge of which is not visible on account of the chela being closed.

The lower jaw is much narrower than the upper one and curved near the top, where it tapers gradually; it has exactly in the curve, ventrally a narrow finger-shaped appendage, which curves obliquely forwards and upwards parallel to the top of the jaw. This appendage is most probably homologous with the appendage found in *S. formicorum*, although in that species it is somewhat differently placed.

The *palps* (Fig. 11) resemble much those of *S. formicorum*; the 1st, 3rd and 4th joints are very small; the 2nd joint widens gradually towards the top, where it is cut off obliquely; it has a dorsal pectinate hair behind the middle; the 3rd joint has two straight, finely pointed hairs, one dorsal posteriorly, the other ventrally and anteriorly; the 4th joint has one dorsal hair close to the posterior margin;

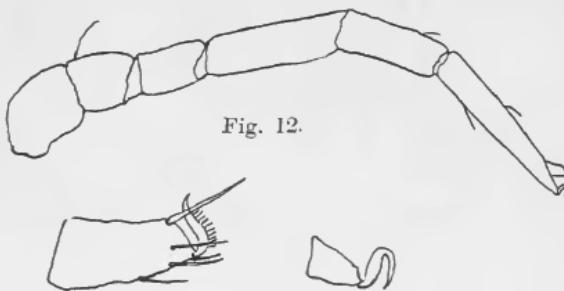


Fig. 12. 4th leg. $\frac{620}{1}$.
 Fig. 13. Top of tarsus I, with claw. $\frac{812}{1}$.
 Fig. 14. Top of tarsus IV with claw. $\frac{812}{1}$.

the 5th joint is comparatively longer and narrower than in the other species, but has the same number of hairs viz. 6, which moreover are of quite similar shape and placed in the same way as in *S. formicorum*, the terminal ones being inserted on low tubercles. The shape of the maxillæ I have not been able to see.

The *abdomen* (Fig. 9) exhibits a remarkable feature, in so far as that the first transverse furrow is much deeper than in the other species, and the portion which it separates from the rest of the abdomen is wider, with strongly projecting rounded sides and in consequence has all the appearance of being a veritable segment.

This portion is deeply concave anteriorly and embraces the base of the cephalothorax; the posterior margin is con-

vex; it has three pairs of hairs, one short anterior, near the median line, the other two laterally, one anteriorly, at the margin, the other behind the middle, submarginally.

In all other respects the abdomen agrees with *S. formicorum*.

The legs are shaped essentially as in the other species. In legs IV however the coxae is comparatively shorter and broader and the genu is longer than the tibia.

The claws of leg I (and II?) are shaped differently from those of the other legs, as they are slightly S-curved shorter and hairy at the ventral side; those of legs III and IV are curved at an acute angle.

Locality. In a partly deserted nest of a termite, about $\frac{1}{2}$ m. below the surface. Entendweni Bush. Zululand. June 1905.

Summary.

From the descriptions given above it is evident that *Speleorcheses* presents some very striking features, the interpreting of which is by no means easy to give. From the close affinity to *Alichus* and *Monalichus*, which is beyond all doubts, and the fact that in these two genera the mandibles are of typical shape and no epistome-like structure exists, we may however infer, that these features in *Speleorcheses* are recently acquired characters, not of an old phylogenetic value.

As to the maxillæ however the case seems to be different, since the same feature viz. two pairs of appendages, also occurs in *Alichus* (and *Monalichus*) a genus which has another feature of an evidently old phylogenetic value, viz. a segmented abdomen. Hence it seems highly probable that the maxillæ of these two genera present a primitive feature which has more or less dissappeared in the other Trombidiidæ.

The prominent eyes are another feature of considerable interest, taking into consideration that both species live underground, thus in absolute darkness.

One would naturally suppose that this mode of life would involve the eyes becoming more or less reduced. But, on the contrary, the eyes are much more developed and pro-

minent than in *Alichus*, and show an adaption for seeing in the dark, quite analogous to the telescopic eyes of many deep-sea animals.

Finally the ability of leaping is a very remarkable feature in an animal which lives underground. Possibly it is acquired in connection with the symphylosous habits, as a mean of escaping the ants resp. termites in case of danger. The ability is, as above stated, due to the great development of the epimera JV and their musculature: but the concentrating of the legs for forward, the accumulation of the body hairs at the posterior end of the abdomen, as well as the lateral position of legs I and IV and the shape of the claws are also undoubtly characters connected with this mode of locomotion. The lateral position of legs IV may however be a direct result of the development of the epimera.

Upsala Mai 11th 1905.



Tryckt den 12 oktober 1909.