A Third Supplementary Note upon the Life Histories of the Polysphinctas (Hym. Ichneum.).

By
E. Nielsen.

In July—August 1933 at Adserbo near Frederiksværk I collected the nests of the spider *Cheiracanthium carnifex* in order to get larvae of *Salius sanguinolentus* F. for rearing. Through this collection I was provided not only with larvae of *Salius* but in addition with developmental stages of 2 other species, the rearing of which brought forward imagines which could be determined as *Zaglyptus varipes* Gr. and *Schizopyga podagrica* Gr. respectively. Of these three species only the two last mentioned will be dealt with in this paper, as *Salius sanguinolentus* will be accounted for later because the investigations of this species are not yet finished.

The collecting of the nests of *Ch. carnifex* did not everywhere result in getting animals infested with parasites. The best results were of course obtained in such places which through several years had remained untouched by man. I found two localities which were especially good, namely a fire-line in Adserbo Plantation with a growth of *Phragmites communis* along the edge of a ditch, and the wide area belonging to Master Baker Reinh. van Hauen. In the last mentioned locality a growth of *Phragmites* was present, too, where *Ch. carnifex* had built its nests in the ears from the preceding year,

and this was also the case in the fire-line. Most parasites were met with in nests applied in the following species of grasses: purple melic *(Molinia coerulea)*, hair-grass

Fig. a. Nest of *Cheiracanthium carnifex* at the top of grass. After E. Nielsen: The Biology of Spiders.

(Deschampsia caespitosa), small reed *(Calamagrostis lanceolata)*, soft grass *(Holcus lanatus)*, whereas the number of parasites was smaller in nests applied at the top of tuft-rush *(Juncus tenuis)*.

Ch. carnifex makes its nest by gathering stalks or spikelets of grass so as to form a spacious globe (fig. a), in which it lives and which it lines with a dense, white

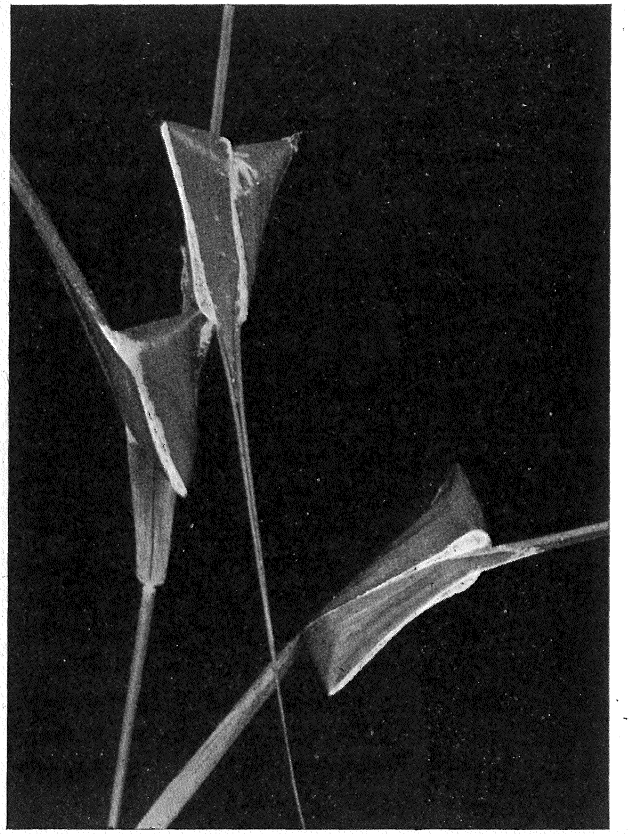

Fig. b. Nests of *Clubiona stagnatilis* in bent leaves of *Phragmites*. After E. Nielsen: The Biology of Spiders.

web, when the time of egg-laying approaches. It is, however, not particular in selecting material for its nest; besides in the abovementioned grasses it thus also applies its nest at the top of heather, amongst green leaves of

birch and loosestrife *(Lysimachia vulgaris)*, which it bends. The majority of the nests collected in 1933 were disposed in ears of *Phragmites*, some of them in a blade of the same plant, which was bent in the same manner as is known in the spider *Clubiona stagnatilis* Kulcz. *(C. grisea* L. Koch) (fig. b).

From July 7th to August 10th I opened the nests at the places where I found them, and carried away those infested with parasites. In this manner several hundreds of nests were examined. As, however, so few of the spiders were infested (with *Schizopyga podagrica*) I spent the remaining two of my holidays exclusively in collecting the nests without wasting time in opening them, by which mode of proceeding I was enabled to search a much larger area, and I carried away to Copenhagen 498 nests for examination. I separated this lot of nests and the following specification gives a view of their contents:

257 nests were empty.
15 „ „ devoid of eggs and young.
7 „ contained shrunk eggs.
70 „ „ eggs which were not yet hatched.
7 „ „ young in the cocoon.
97 „ „ „ released from the cocoon.
11 „ „ pupal cocoons of *Salius sanguinolentus*.
5 „ „ larvae of *Schizopyga podagrica*.
36 „ „ „ and pupae of *Zaglyptus varipes*.

On leaving out of consideration the 257 empty nests, the percentage of infested *Ch. carnifex*, spiders and eggs taken collectively, will be $21._{58}$, 52 nests out of 241 being infested with parasites.

Schizopyga podagrica Gr.

In my first paper on the genus *Polysphincta**) I wrote, that "all Polysphinctae, about whose systematical position

*) E. Nielsen: Contributions to the Life History of the Pimpline Spider Parasites (Polysphincta, Zaglyptus, Tromatobia). Ent. Medd. XIV 1923 p. 137–205.

within the genus no doubt can be raised, and whose hosts are known, are spiders' parasites".

What I wrote in 1923 has now been confirmed as regards *Schizopyga podagrica*, as its larval stage is passed on *Cheiracanthium carnifex*, and it is the only known species of Pimpline parasites, allied to *Polysphincta*, which occurs in a wholly closed nest. As its ovipositor is quite short, it is undoubtedly necessary for it to enter into the nest, and like other species within the genus it must here paralyse the spider before depositing its egg upon it.

With respect to the mode of applying the egg *Schizopyga* differs from those species of *Polysphincta* whose relations to their hosts have been set out. The latter always lay their eggs on the abdomen of the spider, whereas *Sch. podagrica* deposits its egg on the cephalothorax, however, like the other species quite below at the petiole, where the larva is well concealed during its tender stage, and cannot be removed by the host (fig. 1). After the manner of the other known species the cast cuticles remain as a cake ("the saddle") below the larva, which does not move from the spot where the egg is laid. As regards *Polysphincta eximia* (l. c. p. 151, figs. 1 B, C, 2, 3) an account was given of the manner in which the larva holds on to its host. The fact is briefly that on the under side of the 8th and 9th segment of the larva there are two pairs of taps or processes, which are sunk in the above-mentioned saddle and prevent the larva from dropping; it is impossible to remove the saddle without injuring the larva and causing its death. Not until the last moult of the larva the taps are loosened from the saddle and the larva is disengaged from its host. In *Sch. podagrica* facts are like those in *P. eximia* except that *Sch. podagrica* has three, perhaps four pairs of taps, whereas *P. eximia* has only two pairs (fig. 5). When a reservation is made as to the taps on the 11th segment it is due to the fact, that on this segment some unevennesses are pre-

sent, which may be interpreted as reduced taps, although most likely they are nothing but unevennesses, which are not instrumental in holding the larva on to the saddle.

The larva always sucks at the margin of the cephalothorax, perhaps because the cuticle is here thinner or perhaps rather because the blood-vessels at the margin are larger than elsewhere on the cephalothorax, where the many muscles from the sucking stomach occupy a great part of the cephalothorax.

After the last moult the larva has got 6 pairs of warts along its dorsal side, viz. on the 4th to 9th segments. Each wart is provided with circularly placed hooklets, facing outwards. As is the case with the other species of the genus the warts may be retracted or protuded, thus enabling the larva to grasp the threads of the spider's as well as of its own web, when making its cocoon, and of holding the threads fast and advance in the web.

Considering the fact that the spider's nest is wholly closed, one should think such an outfit of the larva unnecessary, as the larva can only fall a short distance as contrasted with those larvae whose hosts are living freely in a vertical orb-web *(Polysphincta nielseni*, parasitic on *Cyrtophora conica* (l. c. p. 159, figs. 9, 10)). However, when having witnessed the awkwardness of such a larva, when it is placed freely on a table, one will understand

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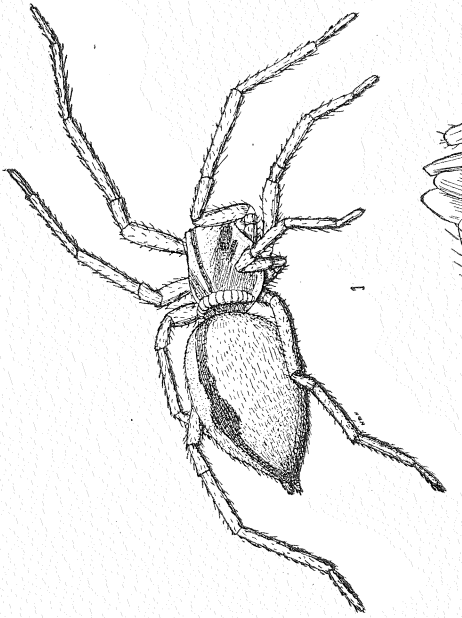
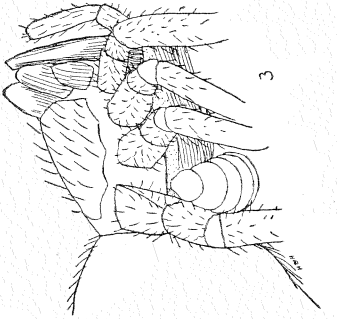
Fig. 1. Larva of *Schizopyga podagrica* on August 16th on the cephalothorax of *Cheiracanthium carnifex*.

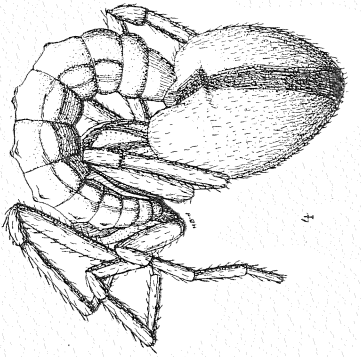
Fig. 2. The same larva on August 23rd exhibiting a considerable growth during one week. Several of the legs of the spider are removed in order to show more distinctly, that the larva sucks nearly quite at the margin of the shield.

Fig. 3. The larva on the same date as in fig. 2; ventral view of spider in order to show more distinctly the head of the larva and the spot on the spider to which it is attached.

Fig. 4. Larva on August 25th after the last moult with two rows of warts dorsally. It has now killed the spider and is about to suck its abdomen.







how necessary it is for the limbless larva to be outfitted with warts and hooklets.

The cocoon is rather large, white and so open-meshed as to be transparent (fig. 10). Before pupating the larva expels the first time its excrements, some black little lumps, which are left partly in the opening of the cocoon below and partly on the outside of the cocoon.

It will appear from the figures (figs. 1—4) that the larva is growing quickly. Unfortunately I did not succeed in finding a spider on which the egg was not yet hatched, but I found larvae, which were still tender. A tender larva became full-grown and got warts in the course of 10 days. On August 25th the last moult of the larva took place, and the larva had got warts. Not until now it killed its host, and during only one day it was full-fed, still without devouring the cuticle or other chitinised parts of the spider. On August 26th it left its host and spun a cocoon, which was finished on August 28th. Already on

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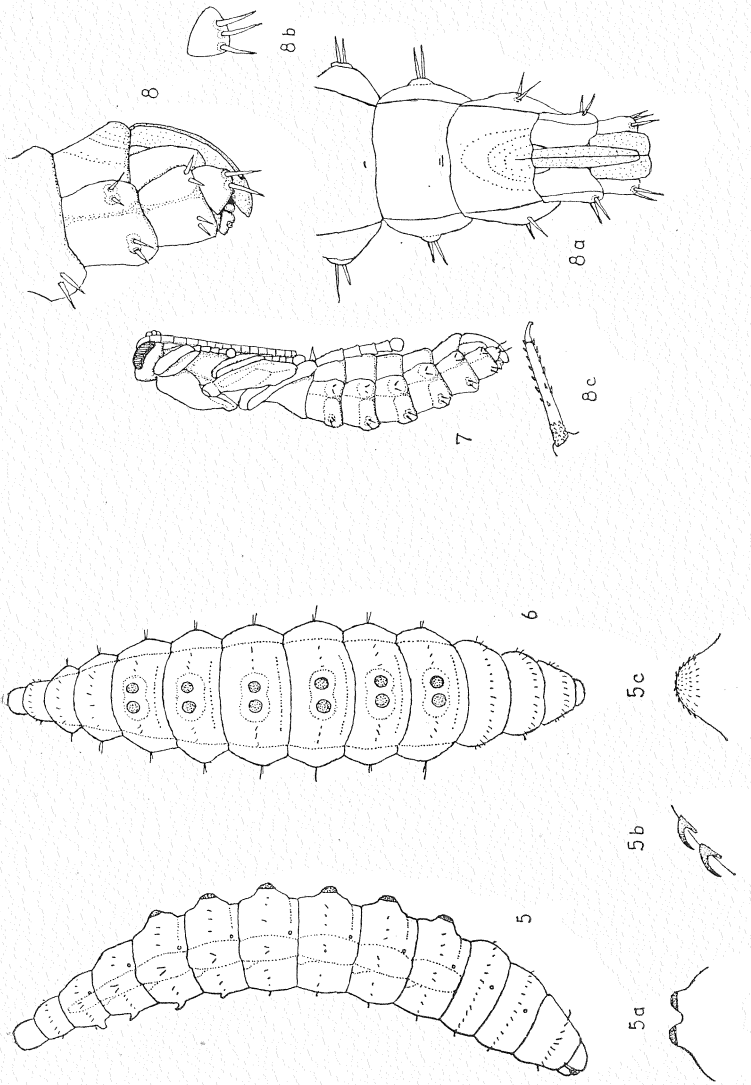
Fig. 5. Full-grown larva of *Schizopyga podagrica*, lateral view. Attention is drawn to the dorsal warts and the taps on the underside of the 8th, 9th, 10th and 11th segment.
a. The two warts of a segment.
b. Two hooklets of a wart.
c. A single wart. The hooklets are placed in circles.

Fig. 6. Dorsal view of larva, showing the 2 rows of warts.

Fig. 7. Pupa of *Schizopyga podagrica*.

Fig. 8. Lateral view of the three posterior segments of a female pupa showing the short ovipositor. Attention is drawn to the specific character, the cuticular lobe, lying close to the ovipositor. The lobe on the right side has two spines and that on the left side (fig. 8 b) three spines. Two spines on each lobe is the normal number.
a. The point from which the ovipositor takes its rise is shown and also the situation of the two cuticular lobes on each side of the ovipositor.
b. The specific character, the left of the two cuticular lobes, vide under fig. 8.
c. One of the spines of the specific character terminating in a hooklet and provided with minute hairs.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8b
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7
6
5
5c
5b
5a

August 31st the larva was transformed into pupa and the imago emerged on September 9th.

The short developmental period of *Sch. podagrica* might indicate the possibility of it having at least two generations during the summer. As I found the larva on full-grown as well as on quite young spiders, *Sch. podagrica* will always be able to find hosts for its eggs nothwithstanding the time of the year, so probably no change of the host takes place.

The length of the biggest of the reared ichneumon flies was exclusive of the ovipositor $7._9$ mm, the length of the ovipositor was $0._3$ mm; the length of the smallest of the ichneumon flies was exclusive of the ovipositor $6._4$ mm, the length of its ovipositor was $0._2$ mm. A pupa, which was killed, measured without the ovipositor $5._2$ mm, its ovipositor measured $0._{15}$ mm. This minimum measure of a pupa is perhaps due to its being reared from a little young of *Ch. carnifex*.

General view of the finds.

1. A nest in a dead leaf of *Phragmites*. Spider dead with saddle on cephalothorax. Cocoon empty.

The following nests all at the top of grasses.

2. Spider with larva on cephalothorax. Fresh-laid eggs in the nest.

3. A young *Ch. carnifex* in a breeding-nest with shrunk eggs and a shrunk full-grown female. The young spider with a larva on cephalothorax and very vivacious.

4. A young *Ch. carnifex* with larva on cephalothorax.

5. A full-grown female, sucked out and dead with saddle on cephalothorax and a pupa in cocoon.

6. A very little spider with larva on cephalothorax. When the spider moulted the larva remained on the cast cuticle of the spider. If this is the rule, *Sch. podagrica* differs in this respect from the known species of *Poly-*

sphincta, whose larvae keep their place on the host even when they moult.

7. A small spider with larva on cephalothorax.

8. A sucked spider with saddle on cephalothorax and an empty cocoon.

Considering the fact that so many nests were examined, the 8 finds of parasites is a very scarce result, which might indicate that the ichneumon fly is rather rare. Perhaps, however, this is after all not the case; in view of the fact that all the examined nests were breeding-nests, and that rather small spiders were ascertained to be hosts for *Sch. podagrica*, most likely considerably more infested spiders would have been found, if nests with young spiders, too, had been examined.

The reared ichneumon flies were all females.

On account of the few finds in 1933 of *Schizopyga podagrica* I continued in 1934 my investigations of the nest of *Cheiracanthium carnifex*. The result of these investigations was 59 new finds, from which 41 ichneumon flies were bred, viz. 30 females and 11 males, showing that the latter seem to occur rather scarce in number.

I wanted to ascertain, whether there should be a brood of *Schizopyga* succeeding that which early in July was to be found as eggs and larvae; from July 1st to 4th I found 2 *Cheiracanthium* with eggs of *Schizopyga* and not until July 23rd I found spiders (two altogether) again with eggs of this ichneumon fly, so I feel justified in maintaining, that another generation commences at end of July. This conclusion is confirmed by the fact that towards July 20th I almost exclusively found full-grown larvae, pupae and empty cocoons of *Schizopyga*. In order to try to obtain a further confirmation of my conclusion on July 23rd I provisionally ceased collecting the spiders for the purpose that material might be at hand for the days before my departure in the middle of August. In this, however, I failed;

when on August 8th I again entered the locality, where *Cheiracanthium* during the summer had been very abundant, I now merely found it very scarce, and this was caused by the heavy downpour of rain and blowing weather which succeeded the exceptionally dry summer and broke the ears of the different species of grasses, in which this spider prefers to build its nest. The material which could be collected was therefore rather scarce, and I only found one larva of *Schizopyga*, which was full-grown and released from the spider.

As in 1933 I had exclusively examined the nests of full-grown spiders, the scarce capture of *Schizopyga* implied, that the ichneumon fly preferably deposits its eggs on young spiders. The finds in 1934, however, show the reverse: firstly because I did not find larvae of *Schizopyga* in any of those nests of young spiders which I opened, secondly because there was only two young spiders with larvae amongst the many finds in the breeding nests, so these young spiders must be supposed to have been attacked by the ichneumon fly just because they had occupied the nests of full-grown spiders. — Most peculiarly I found a male of *Cheiracanthium* with a larva of *Schizopyga*; the larva was delicate and the spider died after a few days.

The larva of *Schizopyga* seems chiefly to feed on the blood of the spider, so it must be of no consequence to it, whether its host has laid its eggs or not, as it cannot make use of the nourishment contained in the eggs. As regards the material collected in 1934 in eight instances the spider had laid its eggs and in three instances the eggs were laid after the spider was put into the test-tube.

For the purpose of possibly getting an opportunity to observe the egg-laying of *Schizopyga* I placed a male and a female together. The male was immediately anxious to copulate, whereas the female continued running about in the glass. The copulation, however, soon took

place, but was of a very short duration, and immediately after the male again tried to form a connection with the female, in which he succeeded, but the copulation was of the same short duration as the first time.

The next day the female was put into a glass, in which a *Cheiracanthium* had made a nest by spinning a thin sheet of web across in the glass, thus dividing the same in two compartments. The ichneumon fly immediately forced its way through the partition wall by biting a crevice in the web by means of its mandibles and this was done so skilful as if it had never been engaged in anything else. I now expected to witness how the spider was paralysed, but I was disappointed, as the spider chased the ichneumon fly about in the glass trying to bite it, in which, however, it failed, and finally the ichneumon fly again bit its way out through the partition wall. Another attempt with another ichneumon fly gave the same result.

The few larvae from 1933 did not allow of an exact examination of the taps on the under side, by means of which the larva holds on to the saddle, which lies between the host and the parasite. In 1934, however, I ascertained the number of these taps, and the slight indication of a tap on the 11th segment, which was to be seen on the larva, drawn in 1933, actually appeared to be a tap, indeed a very large one, and the figure (fig. 5) has accordingly been corrected in this respect. It would be an obvious question to ask of what use this plenty outfit with taps, four in all — as contrasted with the fact in the other known species of *Polysphinctae* — may be to the larva of *Schizopyga.* In answer to such a question it is obvious to point out the bent position of the larva during its growth, which position requires more stability for securing the fastening to the host than in those larvae whose growth takes place in a constantly extended position, so that they are not exposed to fall to the ground by any turn of the body.

The position of the egg of *Schizopyga* must, when deposited, be such that the larva on hatching has its head pointing towards the median line of the spider and never towards the edge. This appears from the fact, that the larva immediately from the outset of its growth bends the free, anterior part of its body towards the edge for sucking blood. During its growth it gradually straightens until at last reaching the opposite side in an extended position (fig. 9 b); the larva always bends towards the edge from the posterior side of the saddle. If imagining, that the egg was not deposited as above maintained, so that the larva on hatching would have its head pointing towards the edge, there would at the beginning be no difficulty for it to suck, but soon its growth would cause it to exceed the edge of the host's cephalothorax, and in this position it would not only be difficult for it to suck at the spot, where it actually sucks, but the larva would also be exposed to be swept away from its host. When thus nature has provided *Schizopyga* with the instinct to deposit her eggs just as she does, the interest attached to it is more than a general one, and I do not repent

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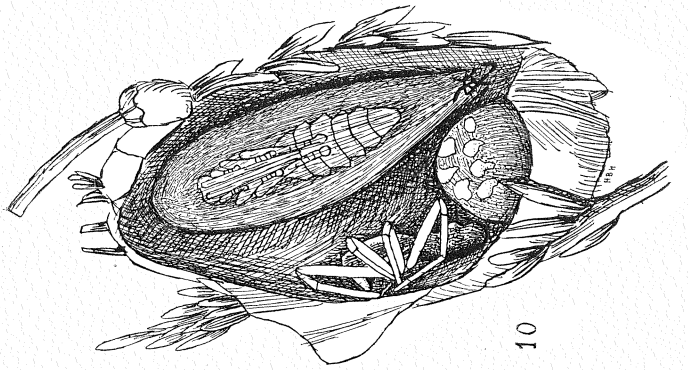
Fig. 9. Cephalothorax of *Cheiracanthium carnifex.*
a. with eggs of *Schizopyga podagrica*;
b. with larva of the same, bent down towards the edge of the dorsal shield for sucking blood.
c. Full-fed larva of *Schizopyga podagrica* on August 25th, which has left its now dead host; the latter is shown with the cuticular cake ("the saddle") on the cephalothorax on which the larva has rested.

Fig. 10. One wall of the spider's nest is removed. Within the nest the elongate, transparent, posteriorly tapering cocoon of *Sch. podagrica* is seen, in which the ichneumon fly is pupated. The black excrements are seen at the bottom of the cocoon both within and outside the same. On left the sucked spider is lying. Below the cocoon of the ichneumon fly and the spider the egg-cocoon of the latter is seen. The white spots on the spider's cocoon are egg-shells, showing that the young have hatched.



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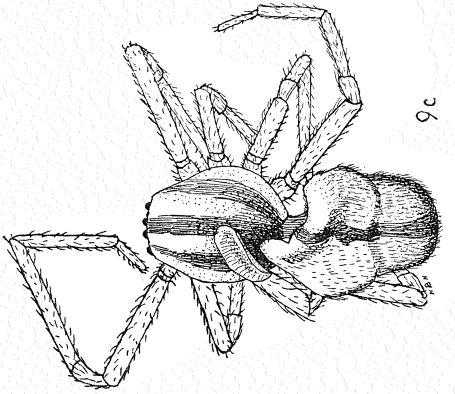

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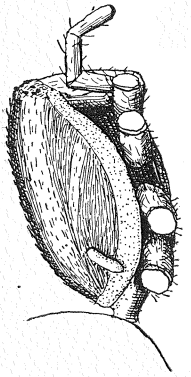

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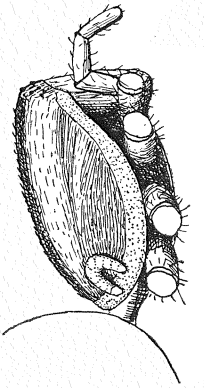

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having spent my summer holidays of two years for clearing up the peculiar facts of this species.

Zaglyptus varipes Gr.

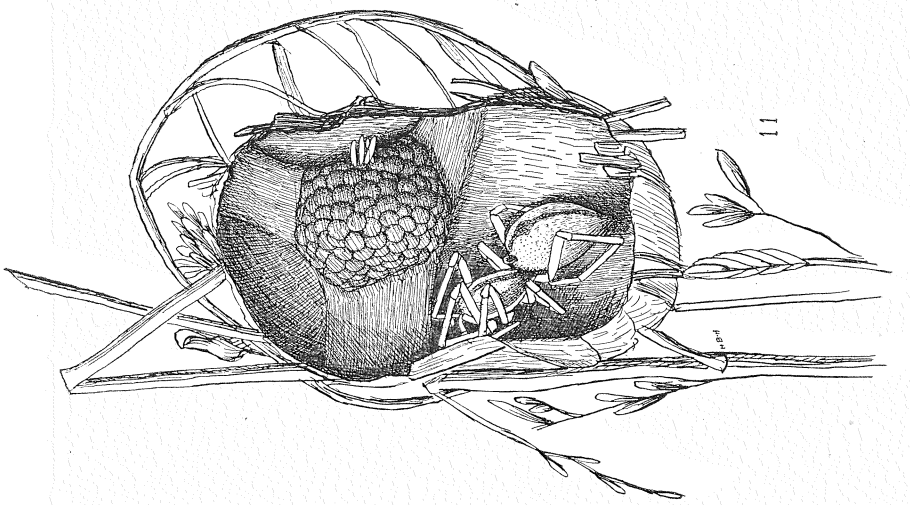
The ichneumon fly most frequently met with on my investigations of the nests of *Cheiracanthium carnifex* was *Zaglyptus varipes*, $13._{69}$ per cents of 241 nests being infested with this species. In all the nests infested with it I found the female spider dead, undoubtedly killed by one or more stings in the abdomen either dorsally, laterally or ventrally (fig. 11). In the wound from the sting there was a clot of gore, which frequently extended somewhat above the cuticle. It must be the ichneumon fly which thus kills the spider in the nest where it intends to deposit its eggs. Possibly it is done by thrusting in its ovipositor through the wall of the nest, as a few of these nests were dotted with many fine punctures. As, however, only a minority of the nests exhibited such punctures this supposition is set forth under all reserve, but if it is correct, the eggs, too, must be thrust in from the outside.

Fig. 11. Nest of *Cheiracanthium carnifex*. One wall is removed, so that the killed spider is seen below. Attention is drawn to the gore, which like a plug projects from the dorsal side of the abdomen quite at the anterior end of the same, marking the spot where *Zaglyptus varipes* inserted its ovipositor when killing the spider. Above the spider its eggs are seen wrapped in a cocoon with extremely thin and transparent walls. The cocoon is attached to the sides of the nest by means of three broad ribbons. Close to one side of the cocoon 4 of the eggs of *Zaglyptus varipes* are seen.

Fig. 12. Full-grown larva of *Zaglyptus varipes* with the dorsal warts.
a. A wart with hooklets.
b. Two hooklets of a wart.

Fig. 13. Posterior parts of female-pupa. The specific character highly resembles the corresponding character of the egg-parasite *Tromatobia oculatoria* (l. c. fig. 34, p. 193).
a. The specific mark; enlarged.

Fig. 14. Posterior part of male-pupa.



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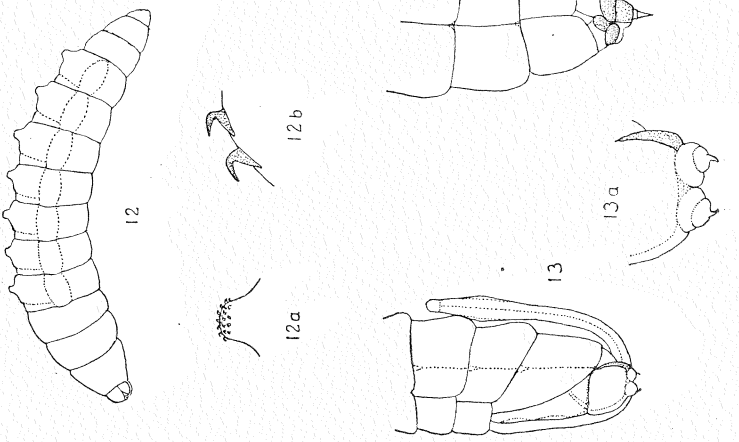

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Formerly I found rather frequently wounds like the above mentioned on the abdomen of spiders (*Cheiracanthium* and *Clubiona*). On these occasions the spider was alive and had only one wound, which apparently did not cause it any inconvenience, and there was in none of the cases eggs in its nest. In view of my investigations in the summer 1933 I should be inclined to believe, that such spiders were exposed to an attack of *Zaglyptus varipes*, which did not succed in killing its prey.

Number of parasites in one nest:	1	2	3	4	5	6	7	8
Distribution of sexes in the different nests. (l = larva, which did not finish its development)	♂ l	♂♀ ♂♀ ♀♀ ♀♀ ♂ l ♀ l l l	♂♂ 2♀♀ l l l l l	♀♀ 3♂♂ l♀ 2♂♂ 2♀♀ l l	♀♀ 2♀♀ 3l l l	5♀♀ l l l l	♀♀ 2♂♂ l♀ 4l l	♀♀ 6♂♂ 2♀♀ 3♂♂ 5♀♀

From the above table it will appear that the number of eggs deposited in a nest is much varying, it being from 1 to 8, most frequently 2; the frequency of more than 2 eggs is decreasing evenly from 3 to 8 eggs, whereas 1 egg occurs rarest. The number of reared females was double that of the males, viz. 46 against 23. When taking into consideration only those of the 33 nests in the table from which all the parasites were reared to imago, it appears that 8 of these nests only produced one sex and the remaining 7 nests both sexes.

In the cases of finding eggs of ichneumon flies on opening a nest I generally found them on the cocoon of the spider (fig. 11). A few times I found the eggs deposited on the spider itself, although it had got eggs in its nest; in one instance there was in the same nest 3 eggs on the spider and 3 on the cocoon. When opening the nests after the larvae have grown somewhat, it is frequently

difficult to decide whether the eggs of the ichneumon fly were laid on the cocoon or on the spider, because the larvae may be found devouring both the eggs and the spider. Those of the spider's nests which contain eggs of the ichneumon fly ought to be opened cautiously, because the removal of the eggs, which are deposited rather loosely, from their place generally makes it difficult to establish the necessary intimate connection between the fresh hatched larvae and their host.

As the larvae can devour both the eggs and the spider, they will not easily be short of food; the spider, however, is merely sucked out and not totally devoured.

Notwithstanding the plentiful food the developed insect still varies not a little in size, especially in nests with many individuals. The length of the female thus varies from $4._1$ to $8._1$ mm exclusive of the ovipositor; the length of the latter varies correspondingly from $1._4$ to $2._8$ mm. The length of the male varies from $4._5$ to $6._6$ mm; a single specimen had a minimum length of $3._4$ mm.

After the last moult the larva is furnished with the warts with hooklets which are characteristic of the genus *Polysphincta*; the total number of warts is 7, namely one on each of the fourth to tenth segments, and they may be applied in the same way as described in *Schizopyga podagrica*.

In the locality van Hauen's area, which in wet summers is very moist, the jumping-spider *Attus floricola* C. L. Koch is very common, and one or more of its white bags were frequently attached to the nests of *Ch. carnifex* and spun close to their outer wall. In 6 of such nests of *Attus* I found parasitic larvae, but I only succeeded in rearing the larvae from one of them; the 3 imagines emerged were males of *Zaglyptus varipes*.

In order to ascertain, whether the infestation of *Attus floricola* with *Zaglyptus* should possibly be owing to a mistake for *Ch. carnifex* I examined several colonies

which were not attached to nests of *Ch. carnifex*, but without any result. No importance can, however, be attached to the last examination, which was not thorough enough on account of the difficulty connected with opening the little closely accumulated white bags in such a colony.

In the locality in the fire-line a ditch run from this to one side and here, too, there was a growth of *Phragmites*, but only few nests of *Ch. carnifex* were present. However, I found a bent blade of *Phragmites* with a dead spider, *Clubiona stagnatilis* Kulcz. (*C. grisea* L. Koch) (fig. b, p. 193). The spider had an extravasation of blood after a wound from a sting, and 3 ichneumonid eggs were present, placed with one end on the actual wall of the nest and the other end resting on the spider. There was no cocoon in the nest. The rearing of the eggs failed, for when at home I reopened the nest a living *Clubiona* sat feeding on the dead one. On the first cautious opening of the nest I did not observe that the bent blade served for a residence for two spiders, separated from each other by a wall of silk. This wall was now broken, and the catastrophe occurred which prevented me from ascertaining, whether the ichneumonid eggs were laid by *Zaglyptus varipes*, which, however, I have no doubt about, because not only the killed spider but also the manner, in which the eggs were applied, tended towards *Zaglyptus*.

During the summer of 1933 I several times found eggs of *Zaglyptus varipes* on a killed specimen of the spider, *Cheiracanthium carnifex*, although the same had deposited its eggs, whereas I never found a killed specimen of *Ch. carnifex* with eggs of *Z. varipes*, when the egg-laying of the spider had not taken place; only in the case of *Clubiona stagnatilis* Kulcz. there was no eggs of the spider in the nest, but here the eggs of *Zaglyptus* were not hatched. Judging from this material one might, though with

a strong reservation, suppose the larvae of *Z. varipes* to be able to feed on the killed spider exclusively, but still everything was indicative of the fact, that the ichneumon fly preferably selected those nests in which the egg-laying of the spider had taken place. The assumption derived from the material from 1933 was strongly supported by the investigations in 1934, chiefly because these began one week earlier. Thus on July 4th I found 5 nests of *Cheiracanthium*, in which the spider was killed and covered with eggs of *Z. varipes* and the egg-laying of the spider had not taken place; on July 5th I found three other spiders treated in the same manner, on July 6th I found three, on July 7th six, on July 8th four, on July 9th one, on July 17th one and on August 9th one, in total 24 instances of *Cheiracanthium* being infested with *Z. varipes* without egg-laying of the spider having taken place. That the instances of infestment are more numerous early in the month and rare later is undoubtedly owing to the fact, that only few spiders had laid theirs eggs at the early point of time, whereas later those spiders, the egg-laying of which had taken place, were predominant. On the infested spiders the larvae of the ichneumon fly were fully developed. — In 1934 attacks of *Zaglyptus* were found in 82 nests of *Cheiracanthium*.

The observations from 1934 give rise to the question, whether *Zaglyptus varipes* is an egg-parasite or not. The answer must be, that *Zaglyptus* is on the point of becoming a pure egg-parasite and in the main already has become so, also when it uses spiders, the egg-laying of which has not taken place, as food for the larvae. The fact is, that the infested spiders always appear to be full-grown females near the egg-laying stage; accordingly the larva of the ichneumon fly have the egg-mass for their disposal, only that the same is concealed in the abdomen of the spider. Thus there is no greater difference as to the conditions offered the larvae of *Z. varipes* in either case,

that is whether the egg-laying of the spider has taken place or not.

The irregularities as to *Zaglyptus*' choice of a host for the larvae which were observed during the summer of 1933 also occurred in 1934. This year, however, they did not refer to attacks on *Attus floricola* but on *Clubiona pallidula*, which had laid its eggs at the top of *Phragmites*. However, the spider was not dead, but had distinct marks from the ovipositor of the ichneumon fly. In a nest of *Ch. carnifex* I found a young *Dolomedes* of a brood from 1933; it was killed by several stings in the under side of the abdomen and several eggs were laid on it. However, the larvae from these eggs were not hatched, because in carrying the eggs home they were shaken from their base, and it is not easy to replace them so exactly in their original position that the delicate larvae are enabled to suck.

It is an exceedingly rare fact not only that two ichneumon flies of the same species but also that two of different species deposit their eggs on the same spider. In 1934 I, however, experienced, that both of these facts occur. On July 17th in a nest of *Cheiracanthium* I thus found larvae of *Zaglyptus*, some near the pupal stage and some almost fresh-hatched, that is in developmental stages so far different that necessarily they originated from two different broods. The last comer of the ichneumon flies must then have omitted the killing process, which seems almost incredible. From this nest I reared 1 male and 6 females.

As to the other of the two facts above mentioned on July 7th I found a nest of *Cheiracanthium* containing eggs of the fossorial wasp *Salius sanguinolentus* as well as of *Zaglyptus varipes*. In this case *Salius*, no doubt, was the first comer, and its larva had eaten up already on July 14th but did not complete its development. On July 8th I found a nest in which a brood of *Zaglyptus*

larvae were about to spin their cocoons and where the dead spider had a dead larva of *Schizopyga* on its cephalothorax. On the same day I found a nest with a big larva of *Schizopyga* and small larvae of *Zaglyptus*; the former completed its development although for some time it must have fed on a killed spider; the *Zaglyptus* larvae, however, died. On July 9th I found a nest with a spider infested with a larva of *Salius*; the spider undoubtedly had been attacked by *Zaglyptus*, as on its abdomen it had marks from stings. Finally on July 23rd I found a nest where the spider was covered with a larva of *Salius* as well as with *Zaglyptus* larvae, but none of them completed their development.

There were some of the larvae of *Zaglyptus varipes* which I did not succeed in rearing, and none of which attained the pupal instar. From two of these larvae I reared the Eulophid *Rhopalotus cothurnata* Thoms., a species which was not found in this country since R. W. Schlick found it 50 years ago. (Thomson: Hym. Scand. V p. 255).

As the emergence of more *Rh. cothurnata* was not continued within a rather long time, I considered the remaining larvae of *Z. varipes* dead from another cause; however, by opening one of them several little larvae appeared, and during the following winter *Rh. cothurnata* was reared from all the *Zaglyptus* larvae. *Rhopalotus* thus emerges at most different points of time, only few of them emerging the same summer they had devoured their host, whereas most of them would not have reached the imaginal instar until the next summer.

Besides from *Zaglyptus* larvae I reared *Rh. cothurnata* from a single larva of *Schizopyga podagrica.*

In a single nest of *Ch. carnifex*, containing cocoons with larvae of *Z. varipes*, there was moreover two imagines and two pupae of *Leptacis scutellaris* Thoms. The

two pupae were reared, but one of the four imagines was lost. At first I supposed that *Leptacis* was reared from the spider's eggs, some of which the *Zaglyptus* larvae had left, and the pupae lay near the cocoon. However J. P. Kryger gave me the following informations:

"The Proctotrypid *Leptacis scutellaris* Thoms. belongs to the subfamily *Platygasterina*, of which about 600 species are known; almost all of these species were swept and only few were reared. Only a little is known about the hosts, which seem to be galls on many different plants, especially the galls of *Cecidomyiidae.* This also applies to the genus *Leptacis*, which is known from Europe, North and South America and the West-Indies; it comprises 36 species in all, 11 of which are European, 14 nearctic and 11 neotropical. Two of the European species were reared from gall-gnats, the one from gall-gnats on grass; four of the American species, amongst which one from North America, were also reared from galls of Cecidomyiids on grass. In the sping of 1933 some *Leptacis* were sent me from Lund; they were reared from *Cecidomyia destructor* (the Hessian fly).

Leptacis scutellaris has formerly been found in Scandinavia".

After having received the aforesaid informations I realised that my small ichneumon flies were to be referred to anything else but spiders' eggs. The nest, in which they were found, was built in the spikelets — drawn together by web — of soft-grass *(Holcus lanatus)*. In two such nests, which likewise were built at the top of soft-grass, I found several larvae of gnats sitting in the densely meshed web-threads, which kept the spikelets together. The one set of these larvae was red, the other yellow. I tried to rear the larvae but failed, as all of them got mouldy together with the grass. The larvae lived in the spikelets. Imagining that the hosts of *Leptacis scutellaris* might be such larvae, I brought out the nest, from which

Leptacis was reared and on examining the same together with Mr. Kryger, I found two little larvae in it. As these were determined by Dr. Kai L. Henriksen to be Cecidomyiid larvae there can hardly be any doubt about their relation to *Leptacis scutellaris.*

I want to render my best thanks to the following persons:

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Copenhagen, Nov. 25th 1934.