DESCRIPTIONS OF THE LARVAE
OF ATURUS SCABER KRAMER,
PROTZIA EXIMIA PROTZ
AND PIONA UNCATA KOENIKE
WITH NOTES ON THE LIFE-HISTORIES
OF THE LATTER TWO.

[Hydracarina]

by R. K. H. Jones.

Although more than 3,000 species of water-mites have been described, the life-histories are known for less than 5% of that number, and comparatively few juvenile stages have been described. This paper describes the larvae of three common mites, one of which was previously widely believed not to produce larvae. Many mites with surface-running larvae have been observed but the precise method by which these larvae attain a position on their hosts has been a matter of conjecture. The method is described for Protzia eximia Protz which also provides the first published example of a mite whose larval parasitise adult Caddis Flies.

As life-history records are dispersed throughout a considerable and diffuse literature, it is thought desirable to bring together in one table particulars of the 153 mites whose life-histories have been published.

1. — GENERAL NOTES.

1.1. — Aturus seaber KRAMER.

This mite lives in fast-flowing water and the females lay one or two eggs only at one time. The eggs develop slowly within the females and it has therefore been assumed by many authors that they would probably hatch directly to nymphs. In order to test this idea I carefully isolated eleven ovigerous females until they produced, in all, 12 eggs, from which 12 larvae eventually hatched. The larvae lived for about three weeks in the laboratory but none formed nymphochrysalids, suggesting that a parasitic
stage may be needed. Larvae were subsequently found amongst mosses in rivers during the months of June and July, but none has so far been found attached to a host.

1.2. — Piona uncata KoëniKe.

Adult females of this species are found in plankton of ponds and ditches as early as March 1st and are usually common by early April, remaining so until June. In the laboratory they catch and feed on Cladocera and this seems to be their main diet. Eggs are laid in the laboratory almost always within a week of the females' capture, but wild females are always full of eggs up to the first week in May, so that it is probable that the normal egg laying period outside is in May and that it is the rise in temperature in the laboratory that promotes the earlier egg-laying. The eggs are laid in long strings containing 6 - 40 eggs. The strings are usually attached to algal threads or to pond weeds. In the laboratory the larvae hatch in two to three weeks and will live for 4 - 6 weeks. Stout [1953 b] found that larvae of the subspecies P. uncata exigia Viets developed to nymphs in 2 weeks without parasitism, but my specimens showed no signs of metamorphosis. In the field the larvae were in fact found to be parasitic on the midge Chironomus plumosus L. and other Chironomids. Their mouthparts were inserted into the arthrodial membranes of the host's abdomen and as many as 20 mite larvae were found on a single host. The host midges were kept in glass tubes containing a piece of rush standing in a few cm³ of water. The mites, on leaving their hosts, made their way down into the water and formed their nymphochrysalids either on the bottom of the tube or in the pith of the rush, often crawling 1 cm into the pith before settling down. The nymphs hatched in three weeks and formed their teleiochrysalids about three months later.

It has been reported by Crowell [1960] for Thyas stolli KoëniKe, Böttger [1962] for Piona nodata Müller and Piërsig [1900] and Crowell [1960] for Limnesia undulata Müller that these mites have alternative methods of development, large eggs giving rise directly to nymphs while smaller eggs produce larvae which must undergo a parasitic phase before reaching the nymphal state, and the situation in P. uncata KoëniKe may well be similar.

1.3. — Protzia eximia Protz.

The eggs of this species were found throughout the winter in crevices in boulders in fast flowing rivers. Egg batches were collected and divided into three separate tubes, one of which was kept in the dash at room temperature while the two others were placed in a refrigerator at 5,5° C. The eggs of the first batch hatched
after 18 - 23 days and the larvae lived for about three weeks. The second batch were raised to room temperature on the 23rd day and hatched in a further 18 days, at which time the third batch was removed from the refrigerator and also hatched after a further 18 days. This seems to offer conclusive evidence that temperature is a critical factor in the hatching of these eggs.

The larvae pass through the water film and run actively on the surface. About two days after hatching they are able to jump a distance of nearly 2 cm from the water surface. They are found in the summer months in large numbers on the moss of boulders which protrude from the water. It has been assumed by many authors that jumping habit observed in some Hydracarine larvae was associated with the attainment of a position on the host and observation of this species proved this to be so. It was found that when the resting larvae are walked over by the fly Weidemania bistignata Curtis or by an unidentified female Caddis fly, the larvae jumped upwards, landing on the insect, and rapidly adopting a parasitic attachment to it. Parasitised hosts were found in considerable numbers from early May until September. This can be taken as evidence of a second egg-laying period, as it is unlikely, in view of the laboratory hatching tests, that larvae of the winter eggs would hatch so late in summer.

Of the host insects caught and examined, in May 45 out of 90 were parasitised by a total of 103 mite larvae, while in September of 24 hosts examined 15 were parasitised by 23 mite larvae.

2. — LARVAE.

The nomenclature used for the bristles is that proposed by Sparing [1959] p. 13, "Schema der Korperbeborstung".

2.1. — Aturus scaber Kramer.

The larva is oval in outline with a distinct and deep invagination in the posterior end, reaching forwards further than the rear edges of the dorsal and ventral plates. The excretory field is without a plate but two pairs of long spines (representing probably Exp. 1 and Exp. 2) lie close to the excretory pore. Ex. 2 is inserted on the edge of the third epimeron. Ex. 4 is very long and inserted on a protuberance similar to that in Hygrobates spp. P. 3 bears a powerful curved spine. P. 4 ends in a strong almost straight claw and bears two bristles. P. 5 is very small and bears a short curved spine.

The dorsal bristles are very long, Pdb. 1 reaching 55 μ and Db. 1 61 μ. The suture between E. II and E. III is plainly visible
as far as the rearmost point of the E. I and is almost parallel to the body axis. The bristle Ep. 4 is inserted some distance from the suture.

Measurements (μ) :

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenght of body</td>
<td>230</td>
<td>225</td>
<td>225</td>
</tr>
<tr>
<td>Breadth</td>
<td>140</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>Capitulum</td>
<td>55</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>Posterior bristles</td>
<td>115</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>1 st leg.</td>
<td>140</td>
<td>135</td>
<td>140</td>
</tr>
<tr>
<td>2 nd leg.</td>
<td>140</td>
<td>135</td>
<td>145</td>
</tr>
<tr>
<td>3 rd leg.</td>
<td>160</td>
<td>140</td>
<td>160</td>
</tr>
</tbody>
</table>

2.2. — *Piona uncata* Koenike.

The larva is similar except in size to that of *P. coccinea* Koch. P. 4 bears two bristles approximately half the length of the long bristle on P. 3. E. I comes to a sharp point reaching past the point bristle of insertion of the palpi.

The suture between E. II & E. III is almost equidistant between the rear edge of E. I and the bristle Ep. 4. The excretory plate
LARVAE OF HYDRACARINA

FIG. 3: *Aturus scaber* Kramér, larva, palpi. — FIG. 4: id*, excretory field.

is triangular with well rounded angles. It is rather longer than broad. The rear end of E. III deviates round the bristle Ex. 1.

Measurements (μ) :

<table>
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<tr>
<th></th>
<th>1</th>
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<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>395</td>
<td>395</td>
<td>425</td>
<td>400</td>
</tr>
<tr>
<td>Breadth</td>
<td>220</td>
<td>195</td>
<td>220</td>
<td>220</td>
</tr>
</tbody>
</table>
Capitulum.............. 120 120 130 120  
Ex. 4.................. 155 130 155 155  
1 st leg................ 290 290 310 310  
2 nd leg................ 340 325 340 325  
3 rd leg................ 325 360 360 350  

Excretory plate:
Length................ 45 45 50 45  
Breadth................. 40 40 45 40  

Fig. 5 : Piona uncata K., larva, ventral surface. — Fig. 6 : id*, excretory field.

2.3. — Protzia eximia Protz.

On the anterior part of the dorsum is a not very well defined plate bearing the median eye and three pairs of long bristles, the middle pair of which are pectinate and the other two pairs simple. The paired eyes are large and close to the edge of the plate. The rear eye of each pair is not distinctly pigmented.

Db. 1 to 8 are all pectinate. Db. 8 are on rounded protruberances at the extreme posterior end of the larva.

The legs are comparatively long and bear large numbers of long pectinate bristles. The rear side of segment 2 of the second leg and the proximal dorsal part of segment 4 of the third leg
each bear a simple bristle. The claws consist of a very large median claw with two smaller claws, one on either side.

The palpi bear a strong curved spine on P. 2 and a bristled protruberance on P. 3. There are only 4 visible segments.

Measurements (μ) :

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>4</th>
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<tbody>
<tr>
<td>Length</td>
<td>250</td>
<td>240</td>
<td>290</td>
<td>290</td>
</tr>
<tr>
<td>Breadth</td>
<td>130</td>
<td>120</td>
<td>120</td>
<td>130</td>
</tr>
<tr>
<td>Capitulum</td>
<td>50</td>
<td>70</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Palpi</td>
<td>90</td>
<td>100</td>
<td>90</td>
<td>85</td>
</tr>
<tr>
<td>1st leg</td>
<td>310</td>
<td>380</td>
<td>360</td>
<td>310</td>
</tr>
<tr>
<td>2nd leg</td>
<td>290</td>
<td>290</td>
<td>310</td>
<td>290</td>
</tr>
<tr>
<td>3rd leg</td>
<td>325</td>
<td>375</td>
<td>340</td>
<td>325</td>
</tr>
</tbody>
</table>

Fig. 7: Protzia eximia Protz, larva, dorsal surface.
3. — LIST OF KNOWN HOSTS OF WATER-MITES.

In the table following the earliest known author is given in each case. Where subsequent authors have given different hosts these are also listed.

The names of hosts are given exactly as in the papers cited and no attempt has been made to bring them up to date, but in the case of the mites themselves the synonyms and classification have been brought into line with Viets [1956].

I have been able to find no information whatsoever on hosts of the super-families Mideopsae Viets or Krendowskiae Viets.

<table>
<thead>
<tr>
<th>Mite Classification</th>
<th>HOST. [Host classification]</th>
<th>Author</th>
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<tbody>
<tr>
<td>1. Super-family Hydrovolziae Viets</td>
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<tr>
<td>Hydrovolzilidae Thor</td>
<td>Microvelia Americana</td>
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<tr>
<td>H. gerhardi Mitchell</td>
<td>Uhler [Ins. Hem.]</td>
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<td>Host classification</td>
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<td>2. Super-family Hydrachnae Part.</td>
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<tr>
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<tr>
<td>H. cruenta Müller</td>
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<tr>
<td>H. globosa De Geer</td>
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<tr>
<td>CORIXINAE [Ins. Hem.]</td>
<td>Sparing 1959</td>
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<td>Dorsal on Dytiscus. [Ins. Col.]</td>
<td>Wesenberg-Lund 1918</td>
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<tr>
<td>NEPA; RANATRA [Ins. Hem.]</td>
<td>Wesenberg-Lund 1918</td>
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<td>Dytiscidae [Ins. Col.]</td>
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<td>Cymatia; Notonecta</td>
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<td></td>
</tr>
<tr>
<td>[Ins. Hem.]</td>
<td>Viets 1936 d</td>
<td></td>
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<tr>
<td>H. magniscutata</td>
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<tr>
<td>MARSCHALL</td>
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<tr>
<td>NOTONECTA UNDULATA; RANATRA; ARCTOCORIXA</td>
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<tr>
<td>[Ins. Hem.]</td>
<td>Crowell 1960</td>
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<td>H. maramauensis Stout</td>
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<td>ANISOPS WAKEFIELDI; ARCTOCORIXA ARGUTA</td>
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<td>[Ins. Hem.]</td>
<td>Stout 1953 b</td>
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<td>H. processifera Koenike</td>
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<td>DYTISCUS MARGINALIS L.</td>
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<td>[Ins. Col.]</td>
<td>Wesenberg-Lund 1918</td>
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<tr>
<td>H. uniscutata Thor</td>
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<tr>
<td>DYTISCS [Ins. Col.]</td>
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</tr>
<tr>
<td>[Ins. Hem.]</td>
<td>Jones 1965</td>
<td></td>
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<tr>
<td>H. leegei Koenike</td>
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<tr>
<td>NOTONECTA GLAUCA L.</td>
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<tr>
<td>[Ins. Hem.]</td>
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<tr>
<td>3. Super-family Limnochardae Viets</td>
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<tr>
<td>Limnochardiae Grube</td>
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<td>Limnochares Latreille</td>
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<td>Limnochares aquatica L.</td>
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<td>GERRIDS [Ins. Hem.]</td>
<td>Duges 1834 b</td>
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<td>VELIIDS &amp; HYDROMETRIDS [Ins. Hem.]</td>
<td>Sparring 1959</td>
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<td>AQUARIUS PALLUDUM &amp; LIMNOPHORUS RUFOSCUTELLATUS [Ins. Hem.]</td>
<td>Imamura 1954 b</td>
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<tr>
<td>ZYGOPTERAN IMAGINES [Ins. Odo.]</td>
<td>Killington &amp; Bath 1947</td>
<td></td>
</tr>
</tbody>
</table>
LARVAE OF HYDRACARINA

Eylaidae Leech:

*Eylais Latreille*

- *E. bisinuosa Koenike*
- *E. extendens Muller*
- *E. discreta Koenike*
- *E. hamata Koenike*
- *E. infundibulifera Koenike*
- *E. do meridionalis Thon*
- *E. mutila Koenike*
- *E. setosa Koenike*
- *E. waikewai Stout*

Protziidae Viets:

- *Protzia Piersig*
- *P. eximia Protz*

Protiidae Viets:

- *WEIDEMANIA BISTIGMATA Curtis [Ins. Dip.]*
- *UNIDENTIFIED CADDIS FLY [Ins. Tri.]*

Partnunia Piersig:

- *P. steinmannii Walter*
- *P. uchidal Imamura*

PLECOPTERA Viets:

- *6 Spp. of PLECOPTERA IMAGINES [Ins. Plc.]*

4. Super-family Hydryphantae Viets

Thyasidae Thor:

- *Aedes Lutescens [Ins. Dip.]*
- *Panisopis Viets*

- *P. curvisrons Walter*

- *P. n. spp (unnamed)*

Thyopsis Piersig

- *DIPTERAN IMAGINES [Ins. Dip.]*

T. cancellata Protz

- *T. barbiger Viets*

T. spp. Probably T. pachystoma Piersig

- *T. stolli Koenike*

- *1. Aedes Vexans & Aedes spp. [Ins. Dip.]*

- *2. Hatched as nymphs*

Trichothyas Viets

- *T. muscicola Mitchell LIMONIA HUMIDICOLA O. S. [Ins. Dip.]*

Panisus Koenike:

- *GYROCAMPA UBIGINOSA Hal. [Ins. Hym.]*

Hydryphantidae Thor:

- *Hydryphantes Koch*

- *H. ruber De Geer CULEX [Ins. Dip.]*

- *Viets 1936 d*
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R. K. H. JONES (10)

H. dispar Von Schaub
Georgella Koenike
G. helvatica Haller

Hydrodromidae Viets
Hydrodroma Koch
H. despiciens Muller

PALUDINA [Mol. Gas.]
EPHYDRINAE [Ins. Dip.]
ISCHNURA; AGRION [Ins. Odo.]
CHIRONOMIDS; CORETHRA [Ins. Dip.]

Thor 1899
Soar 1906
Munchberg 1935
Wesenberg-Lund 1918

5. Super-family Lebertiae Viets

Sperchonidae Thor: Sperchon

S. brevirostris Koenike
S. denticulatus Koenike
S. setiger Thor
S. squamosus Kramer
S. glandulosus Koenike
S. longissimus Viets
S. jasperensis Marshall
S. spp.

ORTHOCLADIUS SORDIDEL-
LUS ZETTERSTADT [Ins. Dip.]
CHIRONOMIDS [Ins. Dip.]
Pupae of MELUSINA ORNATA [Ins. Dip.]
ORTHOCLADIUS SORDIDEL-
LUS [Ins. Dip.]
4 spp. CHIRONOMIDS

Koehnemann 1908
Sparing 1959
Besseling 1939

6. Super-family Pionae Viets

Pontarachniidae Thor: Pontarachna Philippi
P. punctulum Philippi
Limnesiidae Thor: Limnesia Koch
L. connata Koenike
L. undulata Muller
L. fulgida Koch
L. maculata Muller
Hygrobatidae Koch: Hygrobates Koch
H. forelli Lesbert
H. longipalpis Herrmann

OSTREA [Mol. Lam.]
Hatched as nymph
Hatched as nymph
TANYTARSUS DECORUS
JOHANNSON [Ins. Dip.]
CHIRONOMIDS [Ins. Dip.]
WATER-BEETLE LARVAE [Ins. Col.]
CHIRONOMIDS [Ins. Dip.]
CHIRONOMIDS [Ins. Dip.]

Andre & Lamy 1930
Piersig 1900
Piersig 1900
Johansen 1960
Crowell 1960
Wesenberg-Lund 1918
Sparing 1959
Lundblad 1926 c
Lundblad 1927 c
Munchberg 1935 b
LARVAE OF HYDRACARINA

Atractides Koch
A. nodipalpis Thor
A. spinipes Koch

Unionicolidae
Oudemans:
Unionicola Halldeman
U. aculeata Koenike

Larvae
U. abnormipes Wolcott
U. arcuata Wolcott
U. bonzi Claparede
U. cirrosa Koenike
U. ampullariae Koenike
U. crassipes Müller
U. diversipes Viets
U. fissipes Koenike
U. formosa Dana & Whitley
U. fossulata Koenike
U. intermedia Koenike

Aduts & nymphs
MIDGE IMAGINES (Ins. Dip.)
Various CHIRONOMIDS (Ins. Dip.)
LARVAE OF HYDRACARINA

Not parasitic but resting stages found in MUSSELS
CAMPELOMA LECEIUM Say
[Ins. Lam.]
ANODONTA ANATINA L.
[Ins. Lam.]
Various CHIRONOMIDS
LAMPSILLIS SILICIQUOIDE

U. japonensis Viets
U. parasitica Uchida & Imamura
U. perforatus Koenike
U. procurnipes Koenike
U. rugosa Koenike
U. uchidai Imamura
U. serrata Wolcott
U. upsilophora Bonz

Aduts & nymphs
ANODONTA ANATINA L.
[Ins. Lam.]
Various CHIRONOMIDS
[Ins. Lam.]
VIVIPAROUS MALLETATUS
[Ins. Lam.]
ANODONTA BERINGUANA
[Ins. Lam.]
ANODONTA LATIMARGINATA
[Ins. Lam.]
ANODONTA GIGANTEA
[Ins. Lam.]
ANODONTA LATIMARGINATA
[Ins. Lam.]
ANODONTA CYGNEA L.
[Ins. Lam.]

Polytacticides Lundblad
P. prominens Koenike
Atacella Lundblad
A. schubartii Viets
A. clathrata Lundblad
Najadicola Pierson
N. ingenus Koenike
Neumania Lebert
N. deltoides Pierson

CHIRONOMIDS (Ins. Dip.)
N. uchidai IMAMURA  
Huittfeldtia Thor  
H. rectipes 
Feltiridae Thor :  
Felttria KOENIKE  
F. setigera (?) KOENIKE  
F. romijni BESSLING  
F. minuta KOENIKE  
Pionidae Thor :  
Typhis KOCH  
T. ornatus KOCH  
T. spp. 
Pionopsis PIERSIG  
P. lutescens HERMANN  
Pionocercus PIERSIG  
P. leuckarti PIERSIG.  
P. carnea KOCH  
P. coccinea KOCH  
P. conglobata KOCH  
P. disparalis KOENIKE  
P. linguaplae CROWELL  
P. nodata MÜLLER  
P. reighardi WOLCOTT  
P. rotunda KRAMER  
P. uncata uncata KOENIKE  
P. uncata exigua VIETS  
P. variabilis KOCH  
Foreil HALLER  
F. spp. 

7. Super-family Axonopsae  
Axonopsidae VIETS :  
Brachyoda LERERT  
B. versicolor MÜLLER  
Ljania THOR  
L. bipapillata THOR  
Parasitalbia VIETS  
P. sumatrensis VIETS  

8. Super-family Arrenuridae  
Arrenuridae Thor :  
Arrenurus DUGÈS  
Sub-genus Arrenurus s. str. DUGÈS
A. abbreviator BERLESE LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. affinis KŒNIKE LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. agrionicus UCHIDA AGRIONIDAE [Ins. Odo.] IMAMURA 1958
A. Americanus major MARSHALL ISCHNURA VERTICALIS SAY [Ins. Odo.] MÜNCHBERG 1951
A. angiellii Cass. - LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. americanus major ISCHNURA VERTICALIS SAY [Ins. Odo.] MÜNCHBERG 1951
A. angelieri Cass. - ZYGOPTERA [Ins. Odo.] MÜNCHBERG 1935 a
A. bicuspidator BERLESE LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. bleptopetiolatus EPICIRDULIA PRINCEPS COOK HAGEN [Ins. Odo.] MÜNCHBERG 1935 d
A. bruzelii KŒNIKE LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. claviger KŒNIKE LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. compactais ENALLAGMA EBRIUM HAGEN [Ins. Odo.] MÜNCHBERG 1935 d
A. compactus PIERSIG LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. crenatus KŒNIKE LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. crassicaudatus KRAMER CORETHRA CRISTALLINA [Ins. Odo.] MÜNCHBERG 1935 a
A. cuspudator MÜLLER LIBELLULIDAE [Ins. Odo.] MÜNCHBERG 1935 d
A. cuspider PIERIS ZYGOPTERA [Ins. Odo.] MÜNCHBERG 1935 d
A. daietsuenses IMAMURA ENALLAGMA EBRIUM HAGEN [Ins. Odo.] MÜNCHBERG 1935 d
A. dimonifer MÜNCHBERG ZYGOPTERA [Ins. Odo.] IMAMURA 1951 a
A. dimonifer MÜNCHBERG ZYGOPTERA [Ins. Odo.] MÜNCHBERG 1958 b
A. daisetsuenses AESCHNA NIGROFLAVA [Ins. Odo.] IMAMURA 1951 a
A. daisetsuenses AESCHNA NIGROFLAVA [Ins. Odo.] MÜNCHBERG 1958 b
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Sub-genus Megaturacarus VIETS
The larvae of these three mites are described for the first time.

1. — *Aturus scaber* Kramer.

Females of this species lay one, very large egg at a time, suggesting a suppression of the larval stage and direct development to nymph. This expectation has been refuted and the larvae bred in the laboratory. Further information on the life-history is lacking but a parasitic stage is indicated.

2. — *Piona uncata* Koenike.

The complete life-history of this mite is described. In the specimens studied the main host was *Chironomus plumosus* L. Work by Stout shows that this species has an alternative direct development. The larvae are similar except in size to those of *P. coccinea* Koch.

**SUMMARY**
3. — Protzia eximia Protz.

Eggs are found throughout the winter and laboratory tests show that hatching is dependant on temperature. The larvae resemble those of Panisopsis species, and run actively on the water film. They are able to jump 2 cm from the surface and use this ability to gain a place on their hosts, an unidentified Trichopteran and the fly, Weidemannia bistigmata Curtis. There are probably two generations a year.

An up-to-date table gives hosts for 150 species and references for this information.

DESCRIPTION DE LAEVE DE ATURUS SCABER KRAMER, PROTZIA EXIMIA PROTZ ET PIONA UNCATA KŒNIKE ET NOTES SUR LE CYCLE BIOLOGIQUE DES DEUX DERNIÈRES ESPÈCES.

[Hydracarina]

Les larves de ces trois Hydracariens sont décrites pour la première fois.

1. — Aturus scaber KRAMER.

Les femelles de cette espèce pondent un très gros œuf unique, fait qui avait suggéré l’absence du stade larvaire et un développement donnant directement une nymphe. Cette supposition s’est avérée inexacte et les larves ont été élevées au laboratoire. On manque encore d’autres données sur le cycle biologique, mais il semble exister un stade parasite.

2. — Piona uncata KŒNIKE.

Le cycle biologique complet de cette espèce est décrit. Chez les spécimens étudiés, l’hôte principal est Chironomus plumosus L. Un travail de Stout montre que cette espèce peut également présenter un développement direct. A l’exception de leur taille, les larves ressemblent à celles de P. coccinea Koch.

3. — Protzia eximia Protz.

On rencontre des œufs de cette espèce pendant tout l’hiver et des expériences réalisées au laboratoire montrent que l’éclosion dépend de la température. Les larves ressemblent à celles des espèces de Panisopsis et courent activement à la surface de l’eau. Elles sont capables de sauter à 2 cm de la surface et utilisent cette faculté pour parvenir sur leurs hôtes, un Trichoptère non identifié et le Diptère Weidemannia bistigmata Curtis. Il existe probablement deux générations par an.

Une table mise à jour indique les hôtes de 150 espèces et les références bibliographiques de ces données.

BESCHREIBUNG DER LAEVEN VON ATURUS SCABER KRAMER, PROTZIA EXIMIA PROTZ UND PIONA UNCATA KŒNIKE UND ANGABEN ÜBER DEN ENTWICKLUNGSZYKLUS DER BEIDEN LETZTEN ARTEN.

[Hydracarina]

Die Larven dieser drei Hydracarinen werden zum erstenmal beschrieben.

1. — Aturus scaber KRAMER. Bei dieser Art legen die Weibchen ein
einziges grosses Ei, wodurch man auf das Fehlen des Larvenstadiums und auf eine direkte Entwicklung zur Puppe geschlossen hatte.

Diese Annahme bezeichnet sich als ungenau, und die Larven wurden im Laboratorium aufgezogen. Weitere Angaben über den Entwicklungszyklus fehlen noch, aber es existiert aussehend ein Parasitenstadium.

2. — *Piona uncata* KÖNIGE. Der gesamte Entwicklungsgang dieser Art wird beschrieben. Bei den bearbeiteten Exemplaren ist der hauptsächlichste Wirt *Chironomus plumosus* L.

Eine Veröffentlichung von STOUT zeigt, dass es bei dieser Art ebenfalls eine direkte Entwicklung geben kann. Wenn man von ihrer grösser absieht, ähneln diese Larven denen von *P. coccinea* KOCH.

3. — *Protzia eximia* PROT. Während des ganzen Winters kann man Eier von dieser Art finden und die im Labor durchgeführten Versuche zeigen, dass das Schlüpfen von der Temperatur abhängt.


Eine vervollständigte Tafel zeigt die Wirte von 150 Arten sowie alle diesbezüglichen Literaturnachweise auf.

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