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Key to the Dutch larvae of **PARATANYTARSUS** Thienemann & Bause with a note on the ecology and the phylogenetic relations

Orgaan van Hydrobiologisch Adviesburo ir. A.G. Klink

Key to the Dutch larvae of **PARATANYTARSUS** Thienemann & Bause with a note on the ecology and the phylogenetic relations

ALEXANDER KLINK

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Abstract

A key to the Dutch larvae of **Paratanytarsus** Thienemann & Bause is presented, in which the following taxa are described:

P. austriacus
P. confusus
P. inopertus
P. intricatus
P. lauterborni
P. tenellulus
P. tenuis aggregate
P. spec. 1

A note is made on the ecology and the phylogenetic relationships of these taxa are discussed, by means of an argumentation scheme of preliminary nature.

Contents

1. Introduction

The present publication can be considered as the follow up of Klink (1982) dealing with the immature stages of the genus **Micropsectra** Kieffer. He made very clear that, when establishing the specific names of macro-evertebrates (in this case **Chironomidae**) as inhabitants of aquatic biotopes, a great deal of information is gained, compared to the approach of ecosystems by means of a list of generic names.
Stimulated by those results I decided to study on the larvae of **Paratanytarsus** Thienemann & Bause, since the adult and pupal stages have recently been revised by Reiss and Säwedal (1981), which made it possible to establish the specific name of the larvae, by means of pre-pupal specimens. Another reason for studying this genus is the wide range of biotopes in which the larvae can be collected. In contrast with **Micropsectra** which inhabits lentic biotopes like springs, streams and rivers, the larvae of **Paratanytarsus** can be found in marshes, pools, lakes, springs, streams, rivers and even in drinkwatersystems (Krüger, 1941).
In this study we will try to find out what the adaptation of the genus might be, to be able to inhabit this variety of biotopes. Unfortunately I have not been able to obtain **Paratanytarsus** species which are not encountered in the Netherlands, but have been collected in other parts of the Palaearctic, since Dr. Pinder is revising them for the **'Holarctic Chironomidae'** to be published whithin a few years. For this reason my data are somewhat restricted, but nevertheless have enabled me to present some topics which have not been discussed before.

2. Methods

1. Collecting and assigning a specific name to the larvae

In order to present a key to the larvae, two conditions have to be fullfilled. The first is the availability of enough adult and pupal material to have a reasonable impression of the species occurring in the area concerned (in this case The Netherlands). The second condition is to establish the conspecifity of the larvae with a known adult stage.
The adults and exuviae were mainly collected by myself with sweeping- and drifting-nets. Most of the pupal and larval stages were obtained from institutes, universities and water control authorities, which are listed in the acknowledgement.
Of the 8 species collected as adult, pupa or exuviae, 7 different

larval forms could be given a specific name by means of developed pupal characteristics. One more larval form could be distinguished, but unfortunately I could not proof the conspecifity with the subgenus, **Stylotanytarsus** Kieffer, which in the same sample was very abundant as exuviae.
The morphological concept of these 8 larval forms was tested against the larval material, devoid of any pupal characteristics. In this way I was able to establish the variability in a number of larval characteristics. Also a lot of ecological information could thus be obtained from the localities in which the larvae have been collected.
In this study I made no use of rearing methods since these are very time consuming. Furthermore the larval skins have to be extracted from their tubes in one piece, which is a very difficult manipulation.
Also the larval skin is folded many times and makes it very hard to locate the lateral setae on the abdominal segments, which are of great taxonomical importance.

2. Preparations

The preparation of larval material is of the utmost importance, since the way in which a slide is made and the chemicals that are used for clearing and mounting, determine the way a particular feature will appear under high magnification.
If you like to use the key, presented in this publication, you need to have a phase-contrast microscope at your disposal for studying the lateral setae on the abdominal segments and the lauterborn organs with their pedicels.
The clearing of the larvae preserved in ethanol (70 %), has to be done by transferring the larvae to warm (appr. 75°C) lactic acid (2-hydroxy propanoic acid) for 5 minutes. After this period you have to decide whether to make a permanent slide or not. In the first case you transfer the larvae through ethanol (70%) into ethanol (96%). Put 2 drops of Euparal mounting liquid separately on the slide and transfer the larva from the ethanol (96%) into one of these drops of Euparal. Separate the head from the body and put the head in the other drop. The body is put dorso-ventrally on the slide with the ventral side up and covered with a slip. In the other drop, the head is cut open dorsally, flattened and put upside-down on the slide. Sometimes it is necessary to separate the labrum from the head-capsule in order to study the labral setae, pecten labralis, pecten epipharyngis and premandibulae. When everything is in place, also this drop can be covered with a

coverslip. If there is no need for a permanent slide, you can glue 2 coverslips on the slide according to fig. 1 and lay the larva (in lactic acid) between the 2 slips. Cover it with a third slip and you will be able to turn the larva by moving this coverslip. This enables you to study the larva from all sides, which especially is important when you have to locate the lateral setae on the abdominal segments. When you have finished you can transfer the larva once more into ethanol (70%) for permanent preservation.
Never use potassium hydroxyde (KOH) as a clearing chemical, since the setae and lauterborn organs are damaged by this treatment and proper identification becomes very hard, if not impossible.

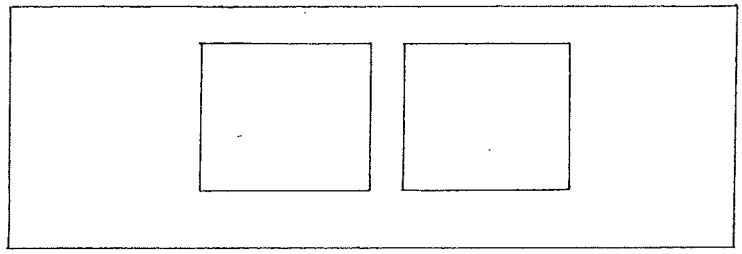


Fig. 1
Slide with 2 glued coverslips

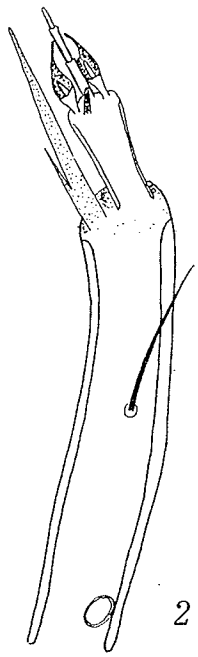
3.1. Diagnose of the larvae of the genus PARATANYTARSUS

The larvae of Paratanytarsus are medium-sized with a length of 4-8 mm, when full grown in their final instar. The colour is red when alive and turning pale in ethanol (70%).

Terminology according to Saether (1980)
Head: Colour yellow to brownish. In the latter case, normally 3 yellow perpendicular bands are present on the dorsal side of the headcapsule. One in the middle of the frontal apotome and two on each side.
Antenna (figs. 2,3): The antennal pedistal is not furnished with an apical spur. The first segment with an annular organ on its base, in the median part with a seta and apically with the antennalblade, on which an accessory blade is attached basally. The blade varies in length from hardly reaching the third segment, to exceeding the ultimate segment. The second segment with a small style and two lauterborn organs on short pedicels which, at most, are as long as the organs. Sometimes the organs taper into a considerable long apical part.

Third-fifth antennal segment, of diminishing length normally. In one species the fourth segment is longer than the third (in most cases).
Labrum and pecten epipharyngis (fig. 4): SI is dissected pectinate with appr. 10 internal teeth. SII with pectinate spines in the apical part. SIII is slender and simple. SIV, a small cone on a pedestal. Pecten labralis with 16-42 teeth. Chaetae labrale with subapical spines. The number of these chaetae is growing with the instar. The second instar only bears 1 pair. The third instar has 3 pairs, while the final instar bears 5 pairs of chaetae labralis. Pecten epipharyngis with 3-5 teeth (in one specimen only 2 teeth were present).
Chaetulae laterales simple.
Premandibulae (fig. 5): 2 apical teeth. The outer one is slender, the inner one is broad and partly covered by a hyaline plate, bearing a great number of microtrichae.
Mandibula: 3 lateral teeth, a large apical - and a small dorsal tooth. Seta subdentalis is long and reaches the tip of the mandibula. Seta interna is tree-like. Pecten mandibularis are present.
Mentum: Broad median tooth and 5 pairs of lateral teeth, diminishing in size. Ventromental plates very wide and touching each other medially.
Clypeus: One pair of long simple setae.
Thorax: Anterior parapods with small, medium-sized and large claws, all furnished with apical and internal teeth.
Abdomen: Segment 1-7: 4 lateral setae L1-4. Segment 1 (fig. 9): L1,3 and 4 always simple, L2 sometimes bifid or branched (figs. 28-30 and 38-41). Segment 2-6 (fig. 10): L1 and 3 simple, L2 as in segment 1, L4 separated in 2 plumose parts. Segment 7 (fig. 11): As segment 1. Segment 8: With a dorsal procercus, bearing 2 small lateral setae and 8 very long distal setae. Segment 9: Distally with 2 pairs of coniform anal tubuli. Between the upper and lower pair, 2 small setae arise. Posterior parapods with 15 (14-16) claws. No internal teeth are present on these claws.

Fig. 2-5
2,3: ***P. lauterborni.*** *2=antenna (400x); 3=flagellum (1000x)*
4: ***P. tenuis,*** *labrum and pecten epipharyngis (1000x)*
5: ***P. confusus,*** *premandibula (1000x)*



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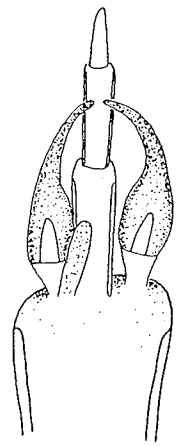

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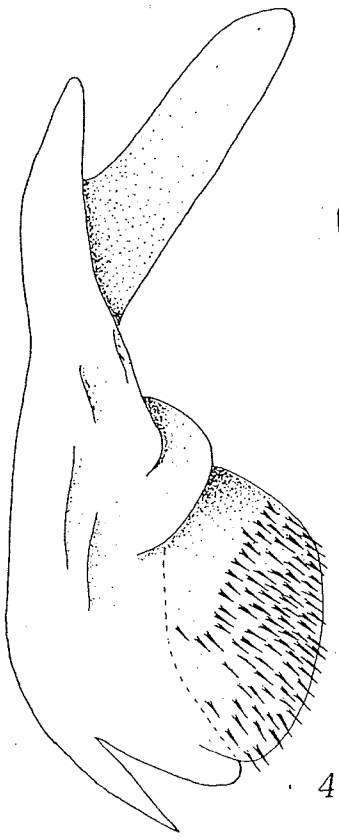

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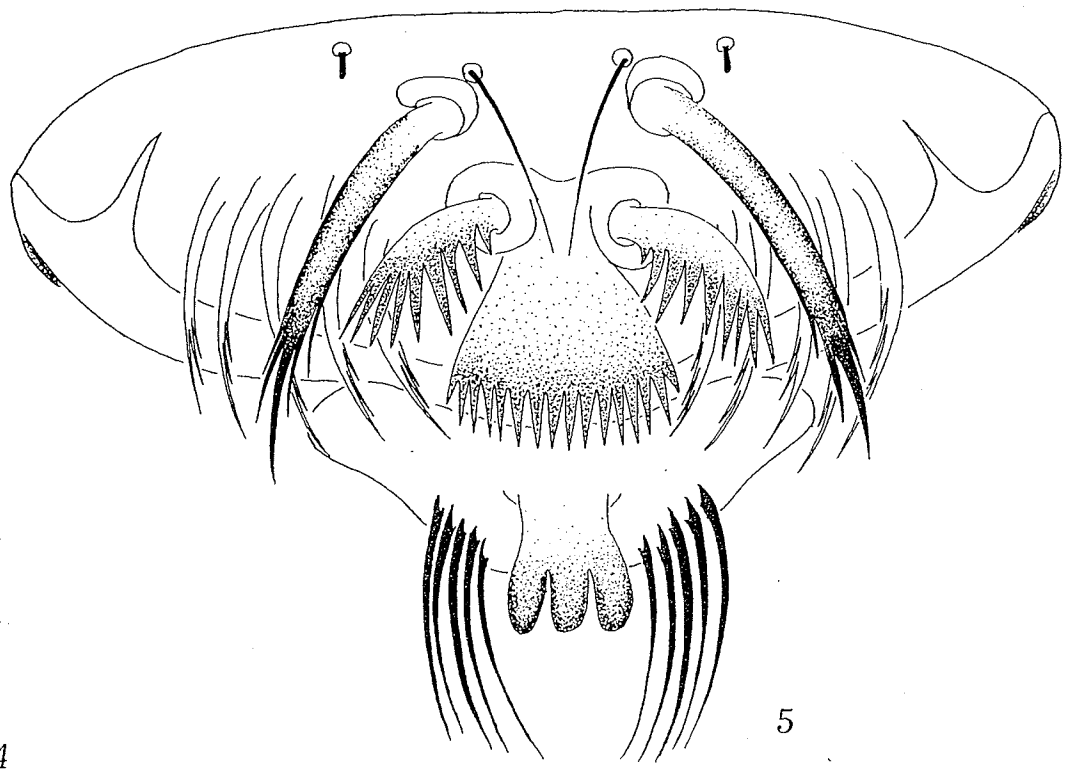

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3.2. Key to the larvae of PARATANYTARSUS, encountered in the Netherlands

1- 3 chaetulae labrales ..... 3rd instar larvae
- 5 chaetulae labrales ..... 2 (4th instar larvae)

2- Pedicels are as long as the lauterborn organs they bear (figs.15,21) Pecten epipharyngis with 5 teeth (fig. 12) 3
- Pedicels twice as short as the lauterborn organs they bear (figs.7,27,32,37,44,49). Pecten epipharyngis with 3-4 teeth (figs.8,42)..... 4

3- L4 on the abd. segments 2-6 weakly plumose (fig.25). L2 on the corresponding segments, in length (0,15 mm) subequal to L4 (0,20 mm).... **P. inopertus**
- L4 on the abd. segments 2-6 strongly plumose (fig.19). L2 on the corresponding segments, at most half as long (0,10 mm) as the L4 (0,25 mm) ..... **P. confusus**

4- Pecten epipharyngis with 4 teeth (fig.8)..... **P. austriacus**
- Pecten epipharyngis with 3 teeth (fig.42)..... 5

5- L2 on the abd. segments 1-7 bifid or branched (figs.28,30,38,41)..... 6
- L2 on the abd. segments 1-7 simple (figs.33,35) 7

6- L2 on the abd. segments 1-7 branched (fig.41). 4th antennal segment longer than the 3rd (fig. 37)..... **P. tenellulus**
- L2 on the abd. segments 1-7 bifid (fig.28,30). 4th antennal segment not as long as the 3rd (fig. 27) ..... **P. intricatus**

7- Pecten labralis with 38-42 teeth ..... **P. spec. 1**
- Pecten labralis with 16-26 teeth (fig.42) 8

8- Lauterborn organs taper gradually into a very long distal part (fig. 32) ..... **P. lauterborni**
- Lauterborn organs taper abruptly into a very small distal part (fig. 44) ..... **P. tenuis** aggregate

4. Description of the larvae and their ecology

4.1. **Paratanytarsus austriacus** Kieffer

Description: Large species, larval-length up to 8 mm.
Head: Brownish with 3 yellow bands on the dorsal side of the head-capsule.
Atenna (figs. 6,7). Lauterborn organs on small pedicels. The apical part of the organs is small and very weakly developed. The antennal blade exceeds the flagellum.
Pecten epipharyngis (fig. 8) with 4 teeth.
Pecten labralis with 20-26 teeth.
Abdomen (figs. 9-11): Segment 1-7 with a very long and simple L2. Also L3 is very long compared to the other species, except **P. lauterborni.** L4 on segment 7 is subequal to the L2, in which aspect **P. austriacus** can only be compared with **P. inopertus.**
Differentiating characteristics: The combination of a pecten epipharyngis with 4 teeth, short pedicels of the lauterborn organs and the setation of the abdominal segments.
Ecology: According to Brundin (1949:789) this species probably is an eurythermous, obligate inhabitant of shallow waters. Reiss (1968: 212) found a pupal exuviae in the 'Bodensee'. Thienemann (1954: 355) has found the species in muddy substrate in a spring-fed Lapland stream. Some German findings are made in various spring-fed habitats, but also among epiphytic algae on stones in a strong current and in the thin mudlayer on a board laying in the weak current (Lehmann, 1971: 504).
I found the larvae exclusively, in cold streams and small ponds, fed by deep groundwater, with a constant discharge throughout the year. Other Chironomidae, collected in the same samples can be divided in two groups. The first group consists of characteristic bottom chironomids in this type of streams, like:

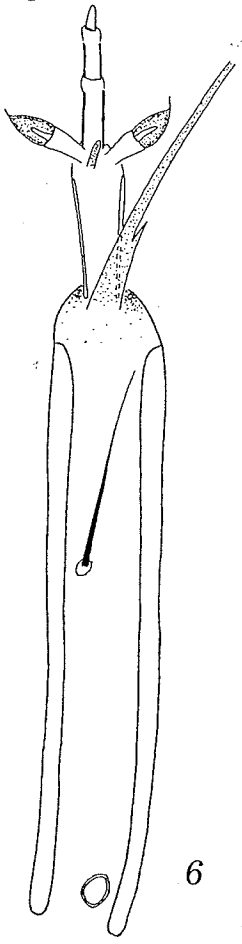
Heterotrissocladius marcidus
Micropsectra bidentata
Micropsectra fusca
Micropsectra lindrothi

The second group are mud-dwellers like:

Chironomus spp.
Microtendipes chloris agg.
Paratendipes albimanus
Psectrotanypus varius

which have been found in spring-fed pools with an abundant growth of macrophytes.
In these habitats **P. austriacus** did not dwell on the bottom itself, but was collected from solid substrate (branches and plants) in the above standing water.
According to my data from the Netherlands **P. austriacus** is a krenophilic and probably cold stenothermous species, dependant on the availability of a solid substrate above the bottom.

Figs. 6-11
***P. austriacus**. 6=antenna (400x); 7=flagellum (1000x); 8=pecten epipharyngis (1000x); 9=abdominal segment 1 (100x); 10=abdominal segments 2-6 (100x); 11=abdominal segment 7 (100x)*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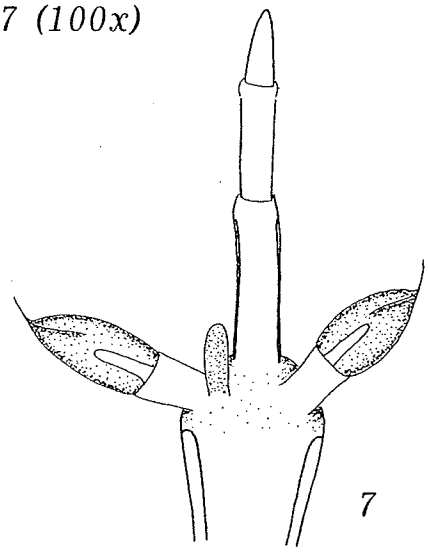
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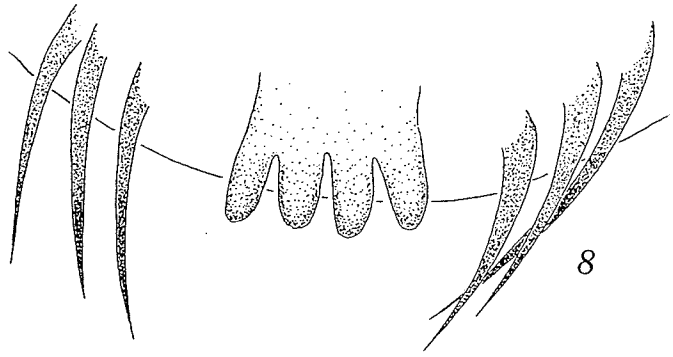
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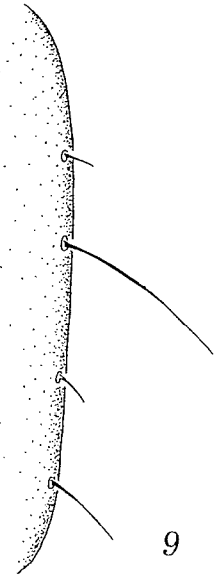
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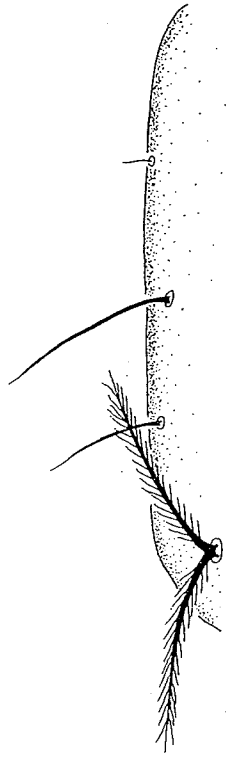
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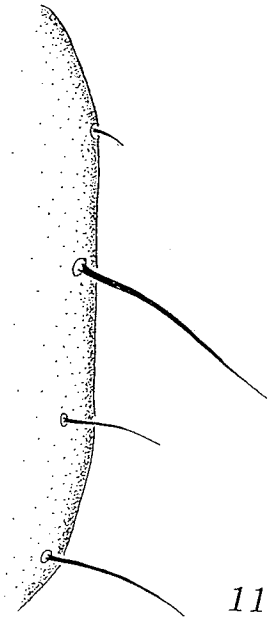
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In its preferences the species holds a unique position among the other Dutch species.
The very close relative of **P. austriacus** in the palaearctic is **P. hyperboreus** Brundin (according to the adult and pupal stages, see Reiss and Säwedal, 1981). The latter species seems to be also very simular in its ecological preferences by being cold-stenothermous and inhabiting shallow waters in the arctic and subarctic region (Brundin, 1949: 789-790). Unfortunately the larva of **P. hyperboreus** is not known, but it seems very likely that also the larvae of this species have developed a pecten epipharyngis with 4 teeth.
Pupal and adult stages have, so far, been found from June to the last week of September.

4.2. **Paratanytarsus confusus** Palmen

Description: Moderately large species. Larval-length up to 7 mm. Head: Yellow. Antenna (fig. 14,15). Lauterborn organs very small with a distinct apical part and situated on long pedicels. These pedicels are of the same length as the organs. The blade is not reaching the 5th antennal segment. Pecten epipharyngis (fig. 12) with 5 teeth. Pecten labralis with 16-26 teeth.
Abdomen (figs. 16,19): L2 on segment 1-7 is relatively short (0.10 mm). L4 on the segments 1 and 7 is very small. L4 on segments 2-6 is more than twice as long (0.25 mm) as the L2 and strongly plumose (fig. 19).
Differentiating characteristics: Combination of a pecten epipharyngis with 5 teeth, the long lauterborn pedicels, the short L2, the large L4 on the abdominal segments 2-6 and the tiny L4 on segment 7.
Ecology: Palmen (1960:281) collected the adults and exuviae from the oligohalinic estuaries in the southern part of Finnland, together with **P. inopertus** (Walker). In the potamal of the river Fulda, **P. confusus** is the dominant species in summertime. The larvae are found in mosses, algae and mudlayers on stones and branches. The species is stated as eurytermous and rheophilic (Lehmann, 1971:504-505).
In the large Dutch rivers, the larvae are part of the lithophilic fauna (Klink and Moller Pillot, 1982:13) of which they are a characteristic element, although they are never found in high numbers. In streams and small rivers, large numbers can be found on solid substrate, especially on leafs of waterplants.

In many occasions **P. confusus** has been found in combination with:

Cricotopus bicinctus **Micropsectra atrofasciata**
Cricotopus intersectus **Rheotanytarsus photophilus**

Interesting is the epiphytical way of living both **P. confusus** and **R. photophilus** have adopted. They can be found together on the same submerged leafs. **R. photophilus** on places more exposed to the current, while **P. confusus** inhabits the more sheltered parts. The very simular lauterborn organs and their pedicels is another indication that these two species are the result of a very closely related development.

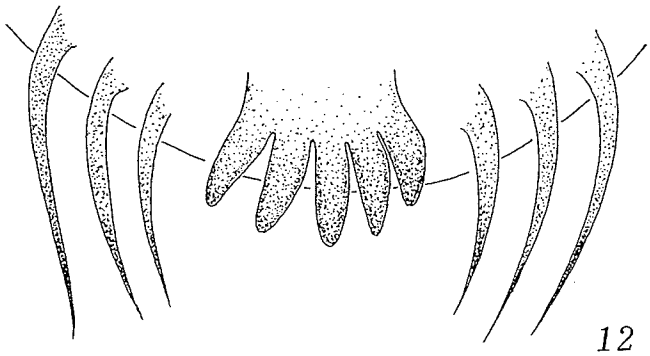
P. confusus can be characterized, in the Netherlands, as a moderately rheophilic species, with a preference for small rivers and streams.

Also there are good reasons to believe that **P. confusus** is not able to withstand a regulation of the streambed, since in a lot of streams, **P. confusus** has disappeared after regulation. This might have happened in favor of **P. lauterborni** (see 4.5).

Pupal and adult stages have been found from February till August.

Figs. 12-19

***P. confusus**. 12=pecten epipharyngis (1000x); 13=premandibula (1000x); 14=antenna (400x); 15=flagellum (1000x); 16=abdominal segment 1 (100x); 17=abdominal segments 2-6 (100x); 18=abdominal segment 7 (100x); 19=L4 on the abdominal segments 2-6 (400x)*



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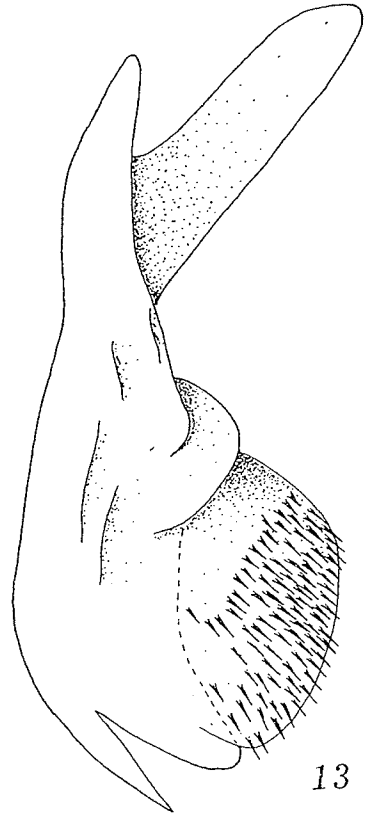

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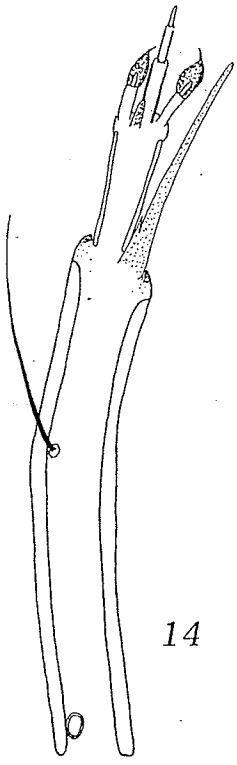

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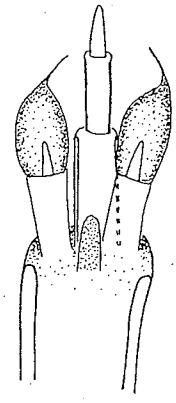

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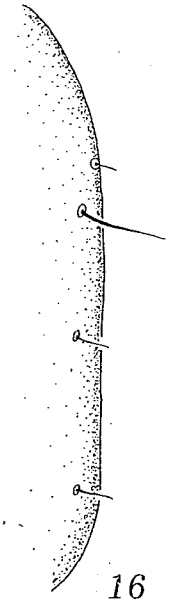

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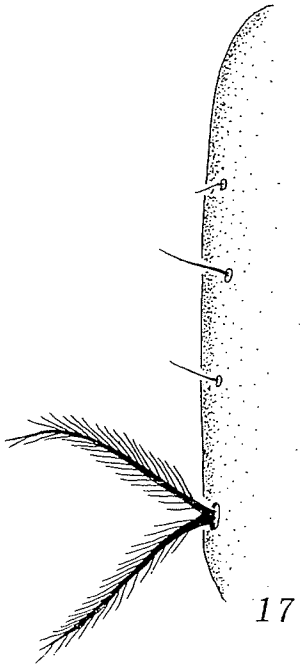

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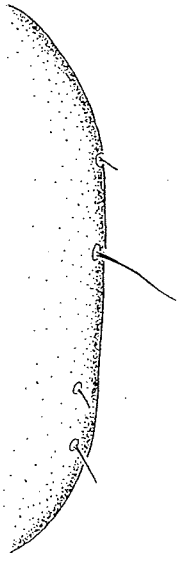

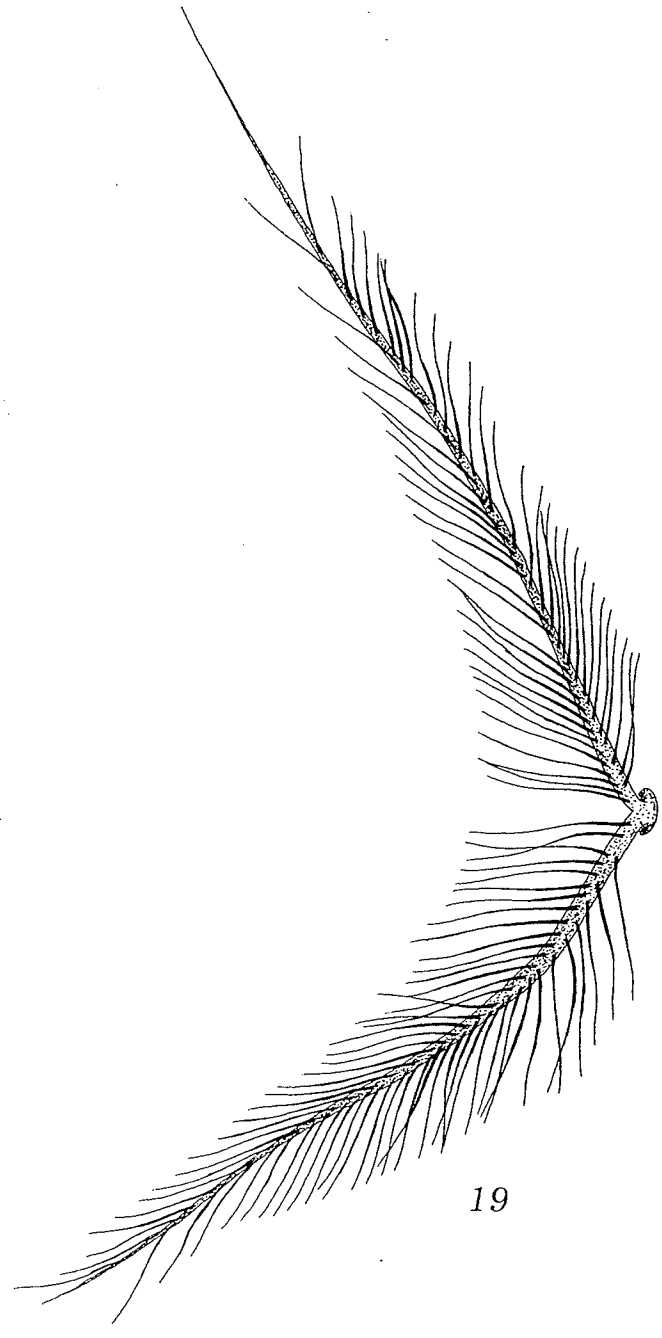

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4.3. **Paratanytarsus inopertus** (Walker)

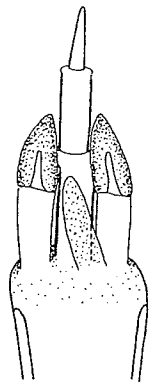
Description: Moderately large larvae, length up to 7 mm.
Head: Yellow. Antenna (figs. 20,21). Lauterborn organs very small with sometimes a distinct apical part, but mostly as in fig. 21. The pedicels are as long as the organs. The antennal blade reaches the tip of the flagellum. Pecten epipharyngis with 5 teeth. Pecten labralis with 20-26 teeth.
Abdomen (figs. 20,25): L2 on segment 1-7 is long (0.15 mm). L4 on segment 7 is very large compared to the other species (except **P. austriacus**). L4 on segment 2-6 is only 0.20 mm long and weakly plumose (fig. 25).
Differentiating characteristics: Combination of pecten epipharyngis with 5 teeth, long pedicels of the lauterborn organs, the stout L2 and the long L4 on segment 7.
Ecology: Brundin (1949:790) states that the larvae are inhabiting freshwater- and brackish lakes, in algae on reed and stones. **P. inopertus** tends to show a preference for eutrophic lakes. According to Thienemann (1951:626) the larvae occur in freshwater, but definitely prefer brackish water. Palmen (1960:281) collected **P. inopertus** as one of the most abundant chironomids in the brackishwater area Tvärminne (South-Finland). The species is assigned to a solid substrate and algal growth. In waters with a soft bottom, the species can only be found on the vegetation. In the 'Bodensee' **P. inopertus** is the dominant species with **P. dimorphus** in the growth on solid substrate and in the sediment (Reiss, 1968: 276-277).
In the Netherlands the finding areas are situated in both brackish- and freshwater lakes. The larvae are collected from stones, waterplants and branches in the littoral zones of open water. In vegetation of the water soldier (**Stratiotes aloides** L.) high numbers of these larvae have been collected on the submerged phase of the plant (Higler, 1977:60,76-78 sub. Paratanytarsus spec.) together with **P. tenuis.**
Other chiromomids that can often be found in combination with **P. inopertus** are:

Ablabesmyia monilis — **Endochironomus tendens**
Dicrotendipes nervosus — **Glyptotendipes pallens**

These species can also be characterized as inhabitants of the littoral zones in eutrophic lakes and so my findings are in full agreement with the cited literature, that **P. inopertus** prefers eutrophic lakes in the freshwater- and brackish area in which they probably inhabit the solid substrate on the wind-exposed banks. Adult and pupal stages have been found from May till September.

Figs. 20-25
***P. inopertus**. 20=antenna (400x); 21=flagellum (1000x); 22=abdominal segment 1 (100x); 23=abdominal segments 2-6 (100x); 24=abdominal segment 7 (100x); 25=L4 on the abdominal segments 2-6 (400x)*

20



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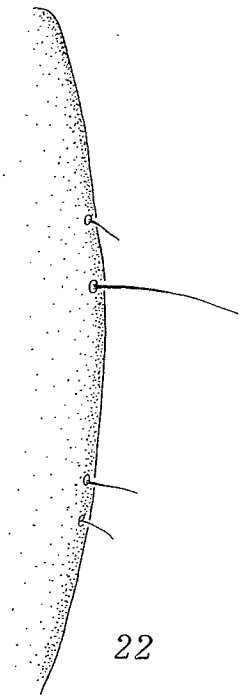

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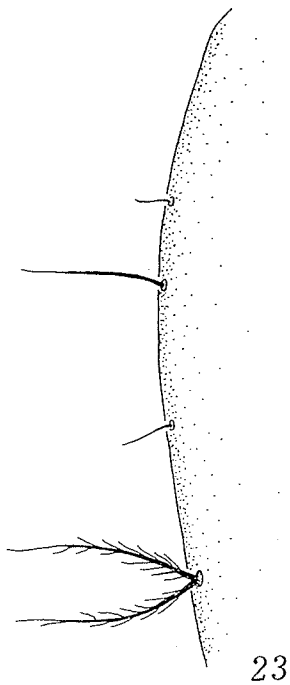

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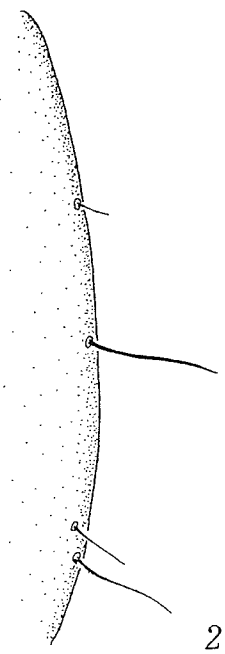

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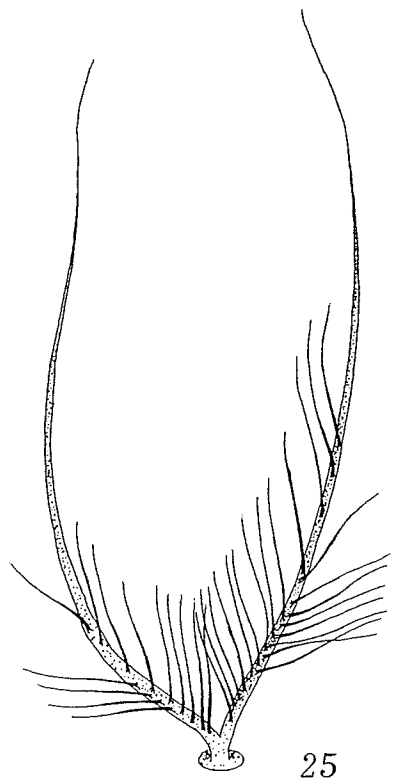
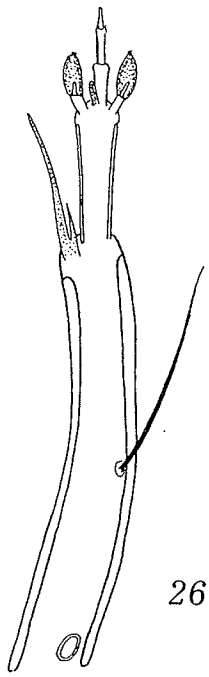


25

4.4. **Paratanytarsus intricatus** Goetghebuer

Description: Small larvae, length up to 4 mm.
Head: Yellow. Antenna (figs. 26,27). Lauterborn organs on small pedicels, less than half the length of the organs. No distinct apical part can be distinguished. The antennal blade is very short and hardly reaching the base of the second antennal segment. Pecten epipharyngis with 3 teeth. Pecten labralis with 20-26 teeth.
Abdomen (figs. 28,30): L2 on segments 1-7 is very large and bifid. This apomorph character is unique in the genus, as far as the Dutch species are concerned. The L2 of **P. tenellulus** are not bifid, but always branched (see 4.6). L4 on the segments 2-6 is weakly developed and not as long as the L2 on the corresponding segments.
Differentiating characteristics: Combination of a pecten epipharyngis with 3 teeth, very short antennal blade and bifid L2 on the abdominal segments 1-7.
Ecology: Thienemann (1951:613) describes the finding places as ponds and ditches. In a very shallow pool, at the bank of the 'Ferchensee' he found the larvae in the normal detritus-tubes on leaves in the water, which in summer could be heated to 30°C. Riess (1968:277) considers **P. intricatus** as a rare species in the 'Bodensee'.
The findings in the Netherlands are in agreement with the description of Thienemann (1951:613). The species seems to prefer ditches and pools with an abundant vegetation. Also this species had developed an epiphytic way of live, as most of the Paratanytarsus-species seem to have. For **P. intricatus** this has nicely been demonstrated by Mulder (unpubl.) which collected the larvae and pupae from microscopic slides placed at some hight above the peat-bottom in ditches with an abundant submerged vegetation of macrophytes and filamentous algae.
Species which can dominate in this habitat are **Cricotopus intersectus** and **C. silvestris.** Pupae have been found in June and August.

Figs. 26-30
***P. intricatus**. 26=antenna (400x); 27=flagellum (1000x); 28=abdominal segment 1 (100x); 29=abdominal segments 2-6 (100x); 30=abdominal segment 7 (100x)*



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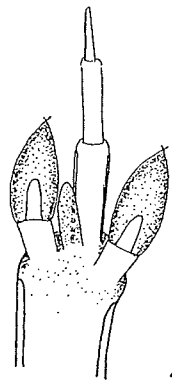

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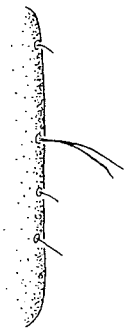

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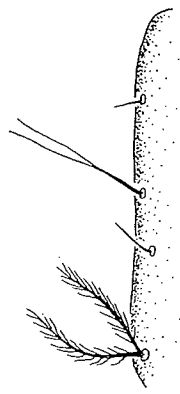

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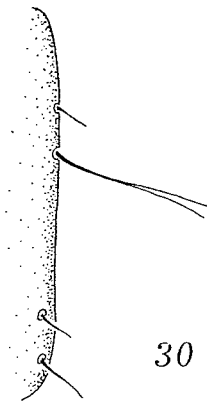


30

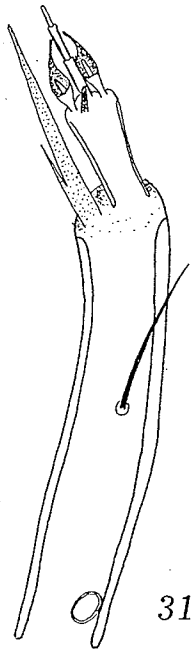
4.5. **Paratanytarsus lauterborni** Kieffer

Description: Moderately large species. Length up to 7 mm.
Head: Yellow to brownish-yellow. Antenna (figs. 31,32). Lauterborn organs very large with a distinct apical part. The organs reach to the upper half of the pen-ultimate antennal segment. Antennal blades reach as far as the tip of the fifth antennal segment. Pecten epipharyngis with 3 teeth. Pecten labralis with 20-26 teeth. Abdomen (figs. 33-35). L3 on segments 1-7 is longer than L4 on the corresponding segments. L2 on segments 1-7 is large and stout.
Differentiating characteristics: The combination of a pecten epipharyngis with 3 teeth, a very long apical part of the lauterborn organs and the L3 on segments 1 and 7 being longer than the L4 on these segments.
Ecology: According to Thienemann (1951:610) **P. lauterborni** is collected in ponds, pools and the littoral zone of lakes.
Reiss (1974:210) has found the adults mostly near ponds and ditches. The habitat in which the larvae have been collected in the Netherlands is not in agreement with the former authors, since the finding places are all situated in streams of which the bulk is regulated, eutrophic, with a vegetation of **Elodea Spp., Callitriche Sp.** and **Glyceria maxima.** The current velocity is very low most of the time. In this aspect, **P. lauterborni** can be seen as the successor of **P. confusus,** in streams with growing man-made adaptations. Chironomids which often co-dominate in these systems are:

Macropelopia nebulosa — **Paratendipes albimanus**
Micropsectra atrofasciata — **Tanytarsus pallidicornis**

Adults and pupae have been found in April/May and August/October. In the months between these periods, only third and fourth instar larvae have been found.

Figs. 31-35
***P. lauterborni**. 31=antenna (400x); 32=flagellum (1000x); 33=abdominal segment 1 (100x); 34=abdominal segments 2-6 (100x); 35=abdominal segment 7 (100x)*



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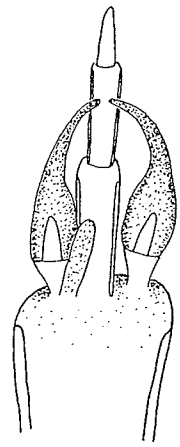

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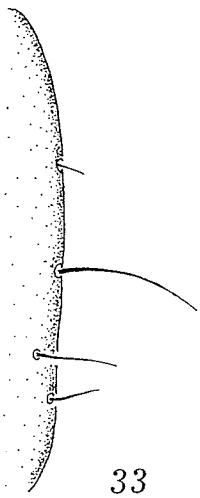

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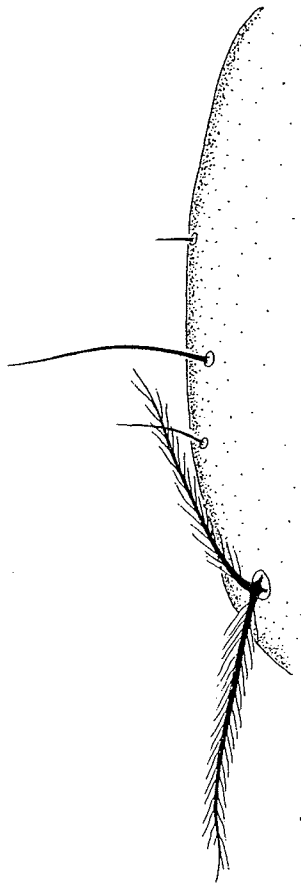

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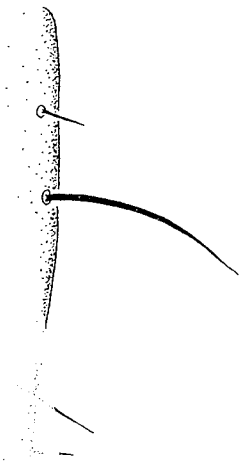


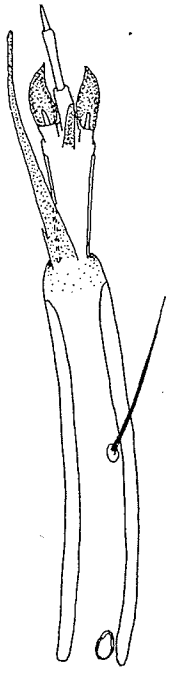
35

4.6. **Paratanytarsus tenellulus** (Goetghebuer)

Description: Medium-sized species. Length up to 6 mm.
Head: Yellow. Antenna (figs. 36,37). Third antennal segment shorter than the fourth (in a few cases they are of equal length). Second antennal segment often brown, while the remainder of the antenna is yellow. Lauterborn organs are large and taper to a conical tip. No distinct apical part (as for instance in **P. lauterborni**) can be distinguished. Antennal blade reaches to the basal part of the fifth segment. Pecten epipharyngis with 3 teeth. Pecten labralis with 30-34 teeth.
Abdomen (figs. 38,41). L2 on segments 1-7 is large and branched.
Differentiating characteristics: Pecten epipharyngis with 3 teeth, pecten labralis with more than 30 teeth, but far less than 40, L2 on segments 1-7 is branched and the fourth antennal segment is longer than the third.
Ecology: "The larva of **P. tenellulus** has been found on plant debris floating at the water's surface in shallow eutrophic pools up to 1.5 m deep. There are indications that **P. tenellulus** belong to the discrete habitat in floating vegetable debris and whenever conditions alow this remain unbeached for considerable periods of time certain species will be found. Wave action and flowing water (however slowly) prevents the development of this habitat and these chironomids disappear. But a very sheltered bay in a lake or a river could also supply the same conditions and these species may appear in otherwise apparently unnatural environments" cited from Säwedal and Langton (1977:170). In the Netherlands, the larvae have been found in pools and lakes in areas with a lot of vegetation among which **Nymphoides peltata** and **Potamogeton natans** did dominate sometimes. So indeed the larvae might prefer vegetation with floating leaves.
Other Chironomidae found at the same sites are:
Dicrotendipes lobiger
Endochironomus gr. dispar.
Glyptotendipes pallens
(Tanypus punctipennis)
Paratanytarsus spec. 1 (see 4.8)
The adults and pupae have been collected in April, May and September.

Figs. 36-41

***P. tenellulus**. 36=antenna (400x); 37=flagellum (1000x); 38=abdominal segment 1 (100x); 39=abdominal segments 2-6 (100x); 40=abdominal segment 7 (100x); 41=L4 on the abdominal segments 2-6 (400x)*



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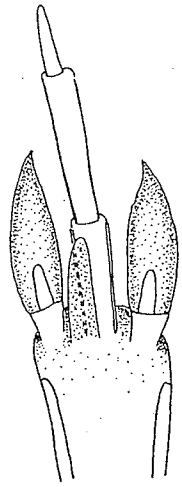

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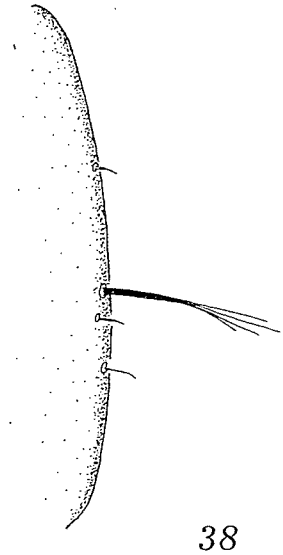

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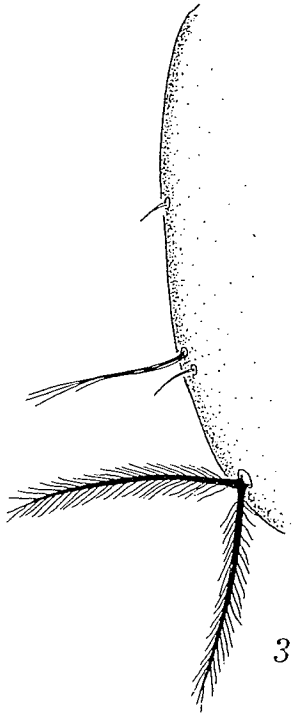

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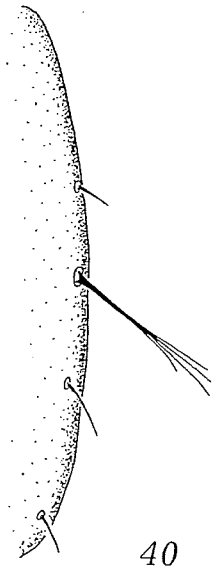

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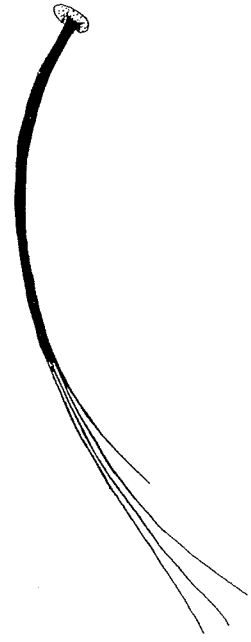
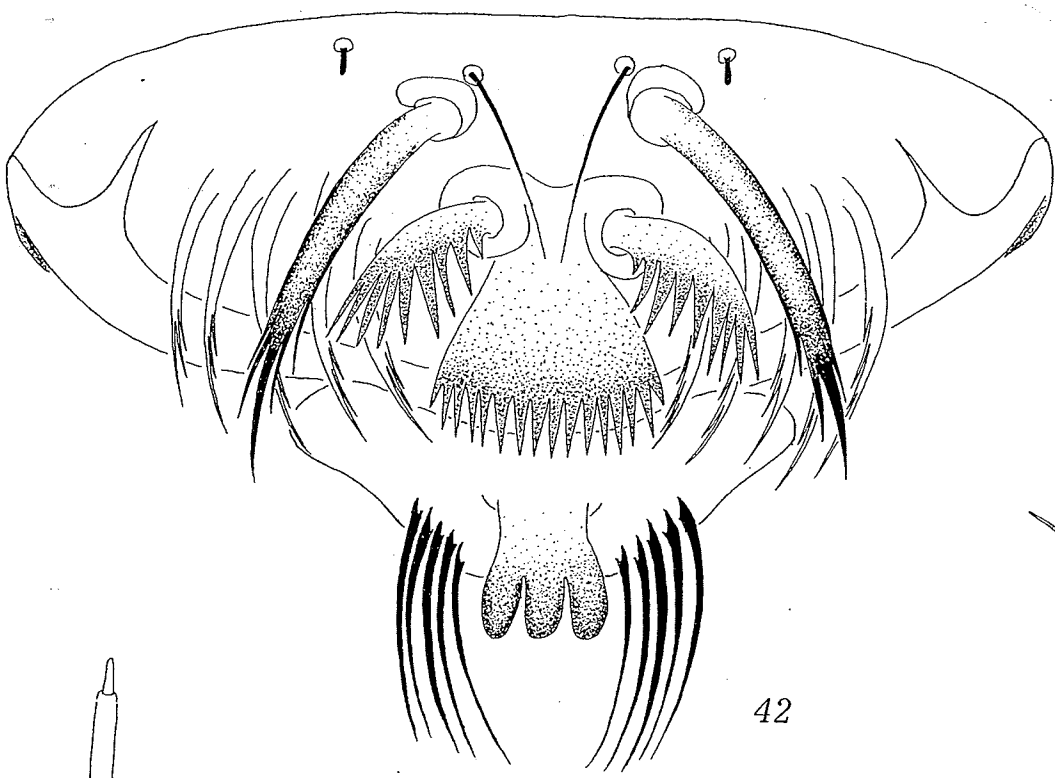


41

4.7. **Paratanytarsus tenuis** aggregate

Description: Small larvae. Length up to 5 mm.
Head: Yellow. Antenna (figs. 43,44). Lauterborn organs very small on indistinct pedicels. The organs taper abruptly into the very small distal part. The blade is reaching the ultimate antennal segment. Pecten epipharyngis (fig. 42) with 3 teeth. Pecten labralis with 16-26 teeth (fig. 42).
Abdomen (figs. 45-47). Tiny L2 on the abdominal segments 1-7, also the other lateral setae are small compared to the other species.
Differentiating characteristics: Combination of a pecten epipharyngis with 3 teeth, small lauterborn organs and simple L2 on the abdominal segments.
Taxonomic remarks: The description is based on a larval-exuviae, attached to a male pupa, collected from a cobble on a bank in the River Waal. For this reason, it would not be necessary to form an aggregate around this species. However, simular larvae have been found in totally different habitats. Of these larvae no proof could be obtained concerning the conspecifity. When we combine this with the close relationship between the pupa and adult of **P. tenuis** (Meigen) and **P. laetipes** (Zetterstedt) and take into consideration that Kruseman (manuscript) has found the adults of **P. laetipes** in Leiden, June; Zaltbommel VI, 1935 (numerous) and Hengelo (O) V, 1931 (3), we must conclude that it is not unlikely that the larvae of **P. laetipes** has been collected, but cannot be distinguished from the **P. tenuis**-larva.
With these facts in mind, I prefer to give these larvae the status of an aggregate.
Ecology: Apart from the findings in large lowland rivers, the larvae have been collected among **Stratiotes aloides** L. (leg. F. Repko) as well as in a stream. The more reason to believe that more than one species is involved.
The larvae of **P. laetipes** according to Reiss (1968:277) are known from limnic and brackish environments. They seem to inhabit only shallow waters, like ditches, ponds and the littoral zones of lakes. **P. tenuis** is an eurythermous inhabitant of shallow waters (Brundin, 1949:793). Reiss (1968:277) found the larvae epiphitical and in the littoral sediments of Lake Constance.
Pupae (of **P. tenuis)** were collected in April, May and August. No pupae or adults of **P. laetipes** have been found during this study.

Figs. 42-47
P. tenuis. *42=labrum and pecten epipharyngis (1000x); 43=antenna (400x); 44=flagellum (1000x); 45=abdominal segment 1 (100x); 46=abdominal segments 2-6 (100x); 47=abdominal segment 7 (100x)*



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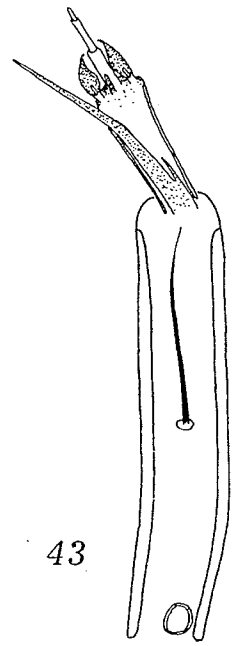

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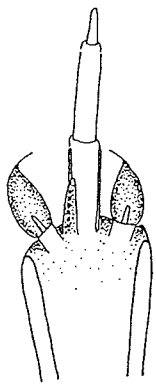

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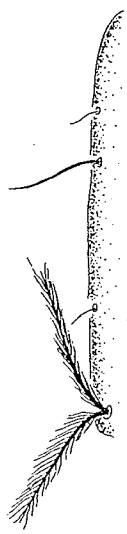

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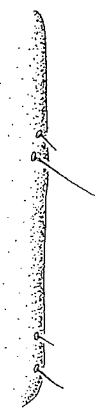
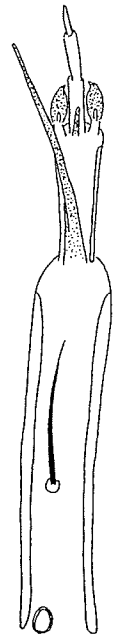


47

4.8. **Paratanytarsus spec. 1**

Description: Medium-sized larvae. Length up to 6 mm.
Head: Yellow. Antenna (figs. 48,49). Lauterborn organs small with a small apical tuft. Pedicels of moderate size. Blade reaches to the basal part of the ultimate antennal segment. Pecten epipharyngis with 3 teeth. Pecten labralis with 38-42 teeth.
Abdomen (figs. 50,52): L2 on segments 1-7 rather long and simple. L4 on segments 1 and 7 very small.
Differentiating characteristics: Combination of pecten epipharyngis with 3 teeth, pecten labralis with appr. 40 teeth and L2 on segments 1-7 simple.
Taxonomic remarks: I have not been able to establish the conspecifity with a known pupa or adult. In one case, the larva has been found in company of numerous exuviae of **Stylotanytarsus boiemicus** group (s. Krüger, 1941:243) and **P. tenellulus**. The growing amount of teeth on the pecten labralis can be considered as an autapomorph character. In this aspect, it might be possible that the described larvae indeed is a member of the **Stylotanytarsus boiemicus** group. This group has obtained some distinct autapomorph characters in the partenogenetic way of live and the reduction of the pupal thoracic horn. Further evidence will be needed to confirm or reject the conspecifity of **P. spec. 1** with the **Stylotanytarsus boiemicus** group and also it is not clear whether **Stylotanytarsus** deserves the rank of (sub)genus (Reiss and Säwedal, 1981:73).
Ecology: The larvae, collected from 2 areas only, may be conspecific, but can also belong to different, although closely related species. The areas can be described as ponds with some emergent vegetation and in one case, a lot of **Nymphoides peltata** and **Potamogeton lucens** was present. In this habitat the **Stylotanytarsus** exuviae were collected.
Other exuviae belonging to the **S. boiemicus** group have been collected in ponds and also in a regulated stream with a very low current velocity, accompanied by numerous **P. lauterborni** exuviae. **Stylotanytarsus** exuviae were collected in August and September.

Figs. 48-52
P. spec. 1. *48=antenna (400x); 49=flagellum (1000x); 50=abdominal segment 1 (100x); 51=abdominal segments 2-6 (100x); 52=abdominal segment 7 (100x)*



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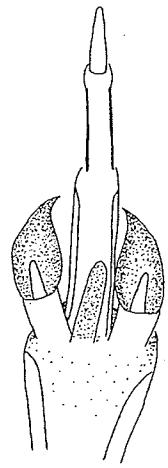

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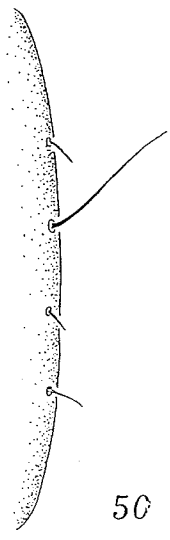

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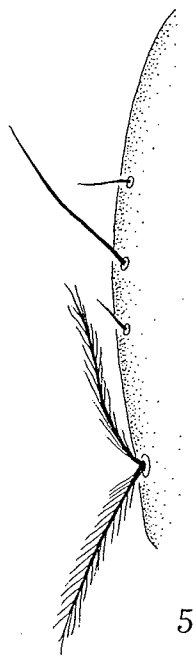

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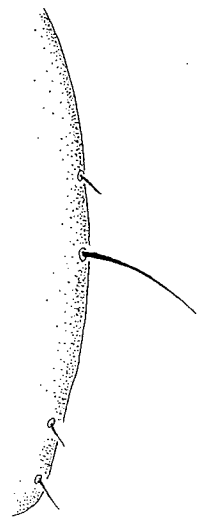


52

5. The position of PARATANYTARSUS within the Tanytarsina and phylogenetic relationships between the species concerned

Despite the fact, that little is known about the phylogenetic relations in the Tanytarsini on the level of species, Saether (1977:130-139) makes clear that the Tanytarsina are monophyletic through an amount of synapomorph characters. The genera **Tanytarsus** and **Cladotanytarsus** can be considered as sistergroups, as well as the **Rheotanytarsus-Paratanytarsus** group is the sistergroup of **Micropsectra-Parapsectra-Krenopsectra.** Unfortunately these important relationships have only been established by characteristics of the female genitalia. A synapomorphy between the larvae of **Rheo/Paratanytarsus-Micro/Para/Krenopsectra** is the reduction of the 4 teeth of the premandibula (in **Tanytarsus** and **Cladotanytarsus**) into only 2 teeth.

Synapomorphic characters between the larvae of **Micro/Para/Krenopsectra** are:
1. The long pedicels of the lauterborn organs
2. The large amount of claws on the posterior parapods (at least established in the Dutch larvae of **Micropsectra** (Klink, 1982) and in **Parapsectra styriaca** Reiss (see Klink, in prep.).

Unfortunately, it has not yet been possible to find synapomorphic characters in the larvae and pupae of **Rheotanytarsus** and **Paratanytarsus.** According to the trends 1 and 2 in the scheme of argumentation, the larvae and pupae of the investigated species of **Paratanytarsus** are a monophylic group. If the assumption is made, that the larvae of **P. spec. 1** are conspecific with the exuviae of **Stylotanytarsus** (see 4.8), than also this taxon is member of this group.

Although the scheme of argumentation is subject to a lot of criticism, mainly because of the limited amount of species and the fact that little attention has been given to the male adults, and no attention at all to the females, I think it is usefull to present this preliminary scheme, since it provides some very interesting characters to be studied in the other species of the genus. For instance, do the other species have also developed a pecten epipharyngis with single teeth, instead of the 3 groups of teeth? Or is the synapomorphic character of this group (in this scheme based on the fusion of the fields of spinules on the 4th tergite of the pupa) valid? Since **P. penicillatus** Gtgh. and **P. setosimanus** Gtgh. have 2 separated fields of spinules on this tergite it will be interesting to search for arguments that can contribute to the assumption that a secondary separation of this field has taken place.

According to the tables 1 and 2, the genus **Paratanytarsus** in

the Netherlands can be divided into 4 more or less distinct groups:
1. **Stylotanytarsus**-group
2. **austriacus-confusus-inopertus**-group
3. **tenellulus**-group
4. **intricatus-tenuis-lauterborni**-group

When considering the palaearctic species (see Reiss and Säwedal, 1981) more distinct groups could be formed, among which the **austriacus-hyperboreus**-group, that can be separated from the **confusus-dimorphus-inopertus-natvigi**-group, as well as separating **intricatus-laetipes** from the **lauterborni-tenuis**-group. When these species are to be studied, the trends 12-19 and 27-37 should be stressed.

The place of **P. tenellulus** in the scheme is very tentative since both trends 10 and 11 can also be due to parallellism, in which case no connections whatsoever can be drawn between **P. tenellulus** and the **intricatus-tenuis-lauterborni**-group, as demonstrated in table 2. In this table the problem arises that it is not possible to determine which 2 groups from the **tenellulus, austriacus** and **intricatus**-group are most closely related. In this situation one must search for synapomorphic characters between any of these groups. In this respect it would be quite interesting to compare **P. tenellulus** with the other palaearctic species with spoon-shaped (cochleariform) setae on their median volsella (**P. abiskoensis** Reiss and Säwedal, **P. kaszabi** Reiss, **P. koreanus** Reiss and Säwedal and **P. mediterraneus** Reiss and Säwedal), in an attempt to close the gap. Unfortunately however, no larval stage is known from these species, while only of **P. abiskoensis** the pupa is known. A pupa which shows no close relationships at all with the pupa of **P. tenellulus.**

Trends:

1. 3-5 single teeth on the pecten epipharyngis (a), or 3 groups of teeth on the pecten epipharyngis (p).
2. Fusion of the fields of spinules on the fourth tergite of the pupa (a), or two separated fields of spinules on tergite 3 (p).
3. Pecten labralis with 38-42 teeth (a), or pecten labralis with no more than about 30 teeth (p).
4. Thoracic horn absent (a), or present (p).
5. Partenogenetic way of live (a), or not (p).
6. 3 lateral setae on pupal segment 5 (a), or 4 lateral setae on this segment (p).

7. Pecten epipharyngis with 4-5 teeth (a), or with 3 teeth (p).
8. First dorso-central seta of the pupa filamentous (a), or chitinous (p).
9. Median volsella with simple setae (a), or with lamellar setae of various shape (p).
10. Single median field of spinules on pupal tergite 5 (a), or a pair of median fields of spinules on this tergite (p). Since the great difference in the shape of the field in **P. tenellulus** compared to the other species, this character might be no valid synapomorphy, when **P. tenellulus** is included.
11. Reduced pearlrow on wingsheets of the pupa (a), or well developed pearlrow (p).
    Could also be considered as a parallellism instead of synapomorphy, when **P. tenellulus** is included.
12. Reduction of the spinules on tergite 3 of the pupa (a), or fields of spinules not reduced (p).
13. Pecten epipharyngis with 5 teeth (a), or with 4 teeth only (p).
14. Small lauterborn organs (a), or lauterborn organs of normal size (p).
15. Long pedicels of lauterborn organs (a), or small pedicels (p).
16. Lateral fields of spinules on tergite 4 of the pupa (a), or no such fields on this tergit (p).
17. Small L4 on the segments 2-6 of the larval abdomen (a)? Or large L4 on these segments (p)?
18. Reduction of the amount of setae on the median volsella (a), or median volsella densely covered with setae (p).
19. Short setae on median volsella (a), or longer setae (p).
20. Fourth antennal segment longer than the third (a), or not longer (p).
21. Pecten labralis with appr. 30 teeth (a), or with no more than 26 teeth (p).
22. L2 on abdominal segments 1-7 of the larvae are branched (a), or not branched, but bifid at the most, normally simple (p).
23. Median field of spinules on pupal tergites 4 and 5, slender and elongate (a), or semicircular (p).
24. Wingsheets of the pupa without pearlrow (a), or with a pearlrow, even if reduced (p).
25. Median volsella with spoon-shaped setae (a), or with lamellar setae (p).
26. Sternapodeme without oral-lateral point (a), or with point (p) (Reiss and Säwedal, 1981:75).
27. Segment 6 of the pupa with 3 lateral setae (a), or with 4 lateral setae (p).
28. Development of a median field of spinules on pupal tergite 6 (a), or not (p).

29. Development of a median field of shagreen on pupal tergite 7 (a) or not (p).
30. Reduction of the lateral shagreen on pupal tergite 6 (a) or no reduction (p).
31. Digitus with 2 basal parts (a), or with a simple base (p).
32. Reduction of the larval antennal blade (a), or not (p).
33. L2 on abdominal segments 1-7 of the larva is bifid (a), or simple (p).
34. Second part of the digitus is fully developed (a), or not (p).
35. No lateral hooks on the male anal tergite (a), or one pair of hooks present (p).
36. Reduced antero-lateral seta on the fourth pupal segment (a), or not reduced (p).
37. Reduced antero-lateral seta on the fifth pupal segment (a), or not reduced (p).
38. Reduction of the antero-lateral seta on the sixth abdominal segment of the pupa (a), or no reduction (p).
39. Reduction of the antero-lateral seta on the seventh abdominal segment of the pupa (a), or no reduction (p).
40. Reduction of the distal lobe on the inferior volsella (a) or not (p).
41. Lauterborn organs with a distinct distal part (a) or not (p).
42. Development of lateral fields of spinules on tergite 4 of the pupa (a), or not (p).
43. Development of lateral fields of spinules on tergite 4 of the pupa (a) or not (p).
44. Lamellar setae on the median volsella with distal points (a), or rounded distally (p).

Table 1:
Scheme of argumentation illustrating the relationships of the ***Paratanytarsus****-species by means of trends 1-44.*

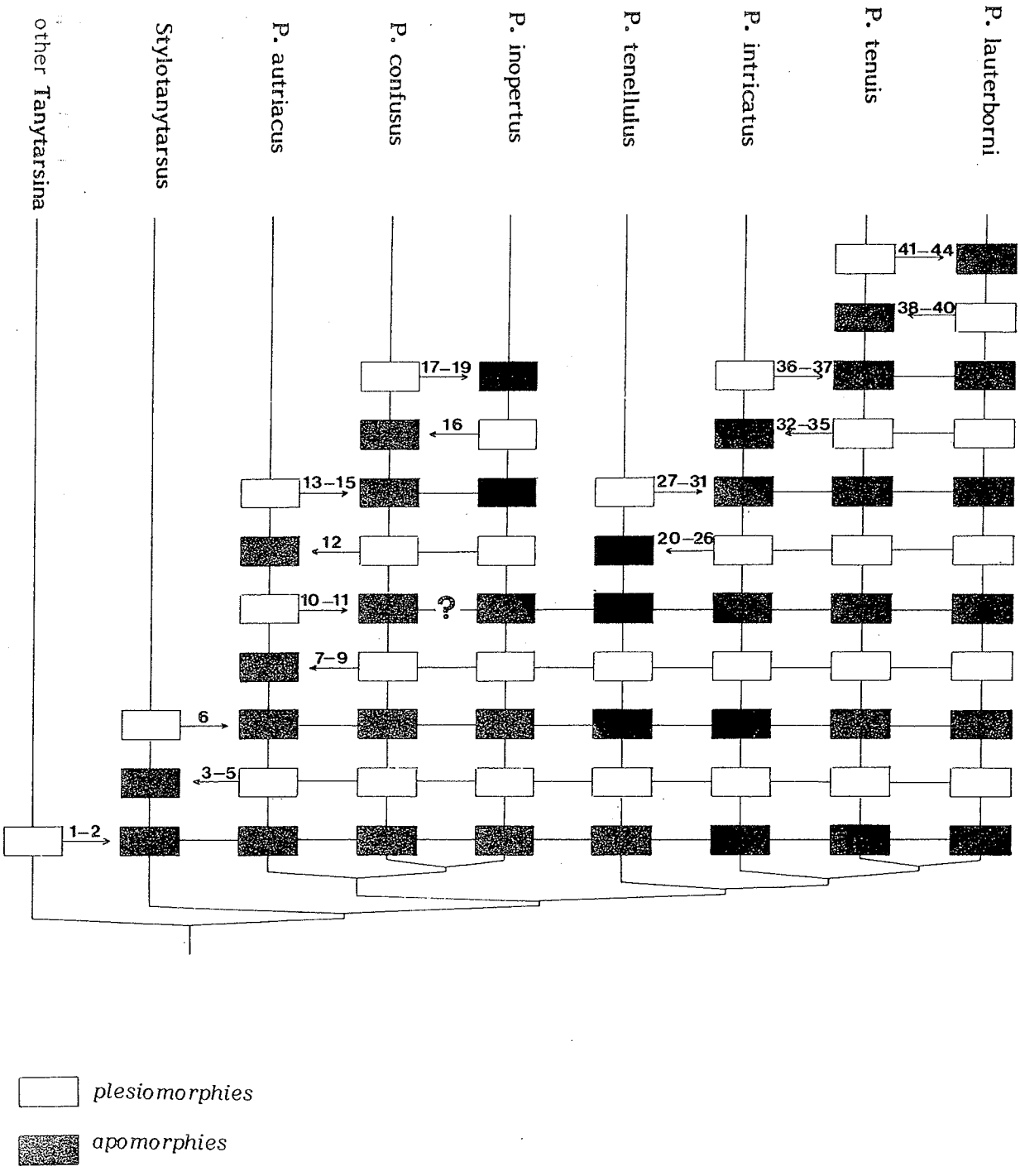
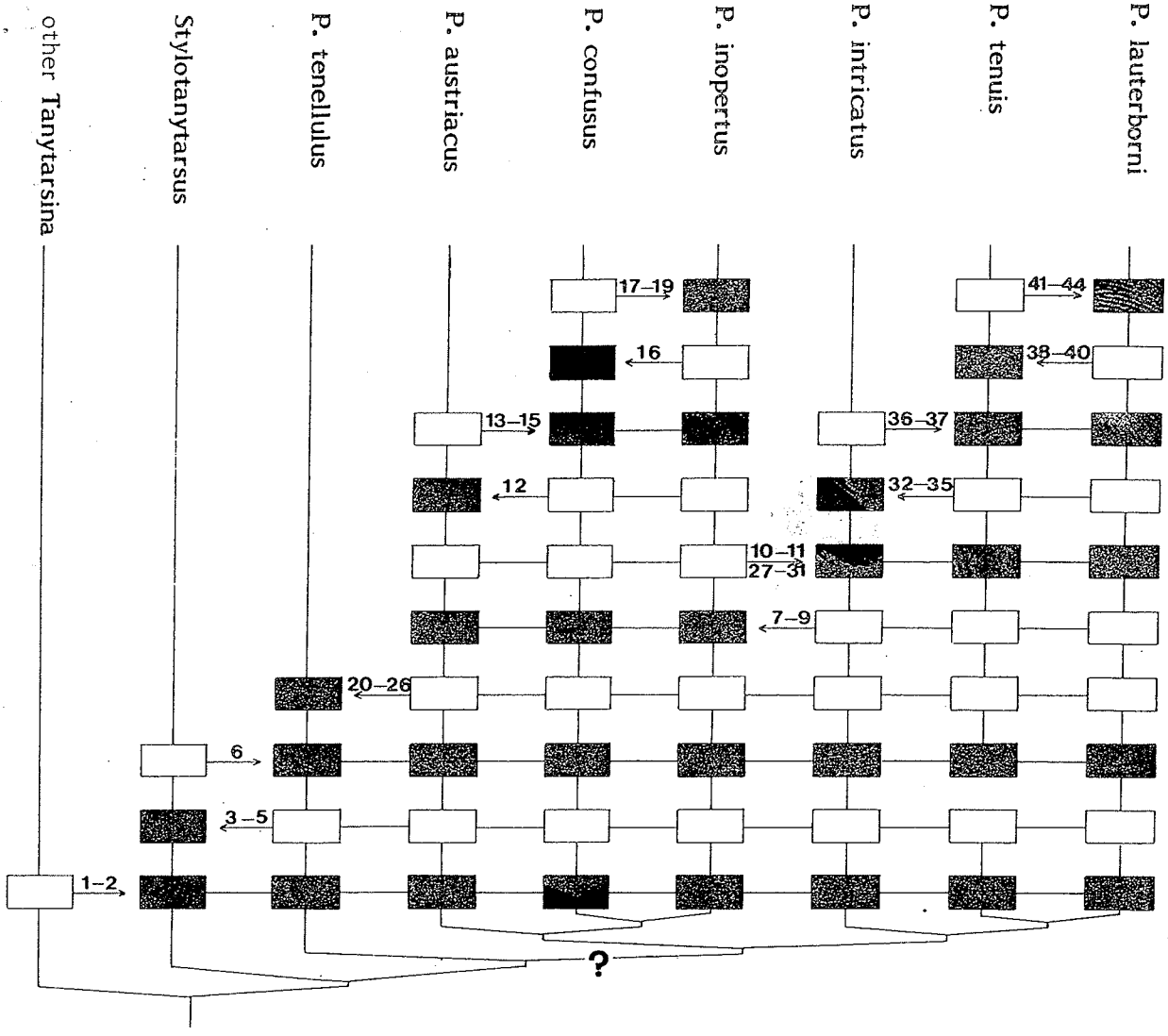


Table 2:
Scheme of argumentation, illustrating the relationships of the ***Paratanytarsus****-species by means of trends 1-44.*
As table 1, but with the alternative position of ***P. tenellulus****.*



plesiomorphies

apomorphies

6. Summary

8 **Paratanytarsus** taxa have been found in the Netherlands. I was able to give 7 larval forms a specific name, by means of pre-pupal larvae. In the case of subgenus? **Stylotanytarsus**, no conspecifity could be proven between the exuviae and larvae, collected from the same habitat. Therefore the larva is keyed as **P. spec. 1.**

All the **Paratanytarsus**-larvae, here described can be distinguished from the other genera in the subtribe **Tanytarsina** (s. Saether, 1977: 138) by the pecten epipharyngis, which only bears separate teeth instead of 3 groups of 4-7 teeth each. The diagnostic importance of the second lateral seta of the abdominal segments 1-7 has been shown for the genus **Micropsectra** Kieffer (Klink, 1982). Also in **Paratanytarsus** this feature is of great taxonomical value, together with the shape of the lauterborn organs and their pedicels.

In contrast to the close related genera **Rheotanytarsus** and **Micropsectra**, which are confined to habitats, exposed to strong current (**Rheotanytarsus**) or to weak current (**Micropsectra**), the larvae of **Paratanytarsus** are inhabitants of a great variety of habitats. In these habitats however, the larvae can only be found on solid substrates, like plants and stones. According to the gut-contents, they scrape algae from these substrates, in which diatoms form the main source of food.

The position of **Paratanytarsus** within the **Tanytarsina** has not clearly been established, since only characteristics of the female genitalia have been considered (Saether, 1977:130-139). The position of the Dutch species within the genus has been discussed and 4 more or less distinct groups can be distinguished, in which **Stylotanytarsus** (= **P. spec. 1**, as assumed in the argumentation) and **P. tenellulus** can be considered as isolated from the 2 main directions in the genus, formed on the one hand by the **austriacus-confusus-inopertus**-group and the **lauterborni-intricatus-tenuis**-group on the other.

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