A GUIDE TO THE LARVAE OF THE NEARCTIC DIAMESINAE

(DIPTERA:CHIRONOMIDAE)

THE GENERA BOREOHEPTAGYIA, PROTANYPUS, DIAMESA, AND PSEUDOKIEFFERIELLA

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ABSTRACT

The subfamily Diamesinae consists of the monogeneric tribes Boreoheptagini and Protanypini and the diverse tribe Diamesini with seven genera. These midges are prevalent in clean, cool arctic-alpine waters, but less abundant in the lowlands; therefore, the keys and descriptions to the known species of these four genera herein may prove valuable in the biomonitoring of these cool aquatic habitats. Larvae of this subfamily have squarish heads bordered by a wide, dark, postoccipital margin and dark mouth parts, short antennae, and have small to medium bodies, usually less than 10 millimeter long and with dark claws on the posterior parapod.

The larvae of Protanypus saetheri Wiederholm is described for the first time. This identification is based upon the absence of other species in the collection area.

Based on a detailed examination of a series of larval D. incallida Walker collected in Wyoming and a review of pertinent literature from Germany and Italy, it appears that there is considerable variation in the procerus and the labral armature. Because these characters are often used in keys, this variability can lead to misidentification of less recognizable species of Diamesa.

INTRODUCTION

The subfamily Diamesinae has been limited to the tribes Protanypii Boreoheptagini and Diamesini. The former tribe Prodiamesini has been elevated to the subfamily level (Saether, 1969; 1977).

The first two tribes are represented in the Nearctic by one genus in each. Protanypus resembles some Tanypodinae in habitus and habitat. Boreoheptagyia has two nearctic species that resemble Diamesa. The outstanding character of Diamesini is the annulated segment III of the antenna. The prementum is clothed with long bristles arranged in weakly trilobate groups (fig. 1). This tribe is the most diverse with seven genera.

Diamesinae have squarish heads having a wide, dark postoccipital margin, dark mandibular and dorsomental teeth and short antennae. The claws of the posterior parapods are often dark. Most species are less than 10 mm long.

The subfamily is stenothermous and is usually found in cool to frigid flowing water. Pseudokiefferiella appears to be restricted to first-order streams and springs. Only the genera Protanypus, Pseudodiamesa, and Potthastia have species associated with still water or lentic habitat; these genera and Pagastia are predatory. Diamesa, other species of Potthastia, and Sympotthastia are primarily scrapers of algal material.

Saether (1970) and Slack, and others (1979) showed Diamesinae to be pioneer forms, being the major part of the insect fauna in arctic-alpine aquatic environments. As a result, they may be useful for biomonitoring. Through the transitional zone the diversity increases by the addition of orthocladiinines represented by Eukiefferiella and Orthocladius. In lowland areas Diamesinae are less abundant. They are probably restricted to waters with cool inflow or are restricted to the cooler temperatures of the winter period or the profundal zone.

This review represents a consolidation of larval information not heretofore available in English. It utilizes modern nomenclature and keys the larvae of nine genera of the three above mentioned tribes. It is believed that "D." appendiculata Lundst. should have separate generic status. Lappodiamesa and Onychodiamesa are known only as adults from the Palaearctic. Keys to the other life stages of the tribe Diamesini and treatment of the genus Potthastia will be available in Doughman (in prep.). Taxonomic treatment of Sympotthastia and Pagastia are also in preparation by Doughman and D. R. Oliver respectively.

Species descriptions are excerpted from the literature and correlated with specimens when possible. Photomicrographs of the head and separational features are used to create picture keys to the known or herein described species of each genus. Distribution and ecology notes are included. Dates not appearing in parentheses next to the species name indicate the date the given authority erected the species, but no citation is given at the end of this publication because this reference was not reviewed. Most of these references are cited in Pagast (1947) and Hansen and Cook (1976). It is expected that these references do not describe the larval stage.

The keys represent specimens from the literature or specimens that have been observed at the laboratory that could be clearly seen with sufficient separational characters. The minimum taxonomic features that one should note when making up observable taxonomic units or keying larvae are the following: mentum shape and configuration of median teeth, the ratios of basal segment of antenna to its flagella and length of basal segment to its width; labral lamellar number and configuration; the S-setae; procercal height to its width and number of anal setae; the lengths of parapod and the anal tubules. See structure and terminology below. Fourth instars should be used, but this could be difficult because adult emergence is usually very early Spring.

The larva stage is not always positively identifiable to species. More information can be gained by connecting the other life states, for example, looking for pupae with larval skins attached or more positively through rearing (See Simpson and Bode (1980)). This group has been little studied in the Nearctic. Modern treatments of the adults and pupae are offered by Hansen and Cook (1976) and by Serra-Tosio (see bibliography in previous citation). Introductory keys are found in Roback (1976) and Coffman (1978).

Much of the existing descriptive work deals with the adults, but if studies of the boreoalpine aquatic environments are to be done, definition of the immature states of Diamesinae will be necessary. A cladistic and holistic systematic scheme based on reared specimens is much desired.

METHODS

Larval Diamesinae were mounted in CMCP-10[1/], a clearing and mounting medium. Mounts were made following the method in Beck (1968). It is modified as follows: After placing two drops of medium on slide, place specimen in one spot. Dissect head and move it to next spot; remove labrum from head. Manipulate head so that the ventral side is up and labrum is dorsal side up. Cover with appropriate size round cover slip. Dissection can be facilitated using a needle-knife made from a No. 000 insect pin. The head mount should be squeezed flat, reducing the depth of field for good pictures and for working with higher resolution microscope objectives. The body is mounted whole in lateral view, and the cover slip is not depressed.

Observations were made at X400 and sometimes with oil (X1000). Photographs were taken with an Olympus temperature corrected, 35 mm camera through a Zeiss Universal microscope, using Ilford PAN F or Kodak PANX film.

[1/] The use of brand names in this report is for identification purposes only and does not constitute endorsement by the United States Geological Survey.

STRUCTURE AND TERMINOLOGY OF LARVAL DIAMESINAE

The morphological terms are taken from Saether (1980). Illustrations are labeled to depict the location of the structures of taxonomic importance (figs. 1-2).

The head is bounded by a wide, dark postoccipital margin and the usually toothed mentum (= hypostomium). The mentum is composed of the median section, the ventromentum, which is flanked on each side by dark lateral teeth, the dorsomentum. Together it is referred to as the mentum. Translucent oval shields may obscure these laterals to some degree; these are the ventromental plates (VMP). The VMP may join with or form the median of the mentum.

The antenna is composed of a basal segment (segment I) and three or four smaller segments, the flagellum (segments II-IV or V). The antenna ratio (AR) is the length of the basal segment (segment I) divided by the lengths of the flagellum (II-V). Segment I has a ring organ (RO) near its base and bears a blade(s) at its apex. The basal, largest RO is the true ring organ and the other circular structures are sometimes referred to as sense pits. The blade is usually composed of a longer and a shorter element (the accessory) which arise from a common base. Herein, the blade is considered bifid, that is, composed of the two unequal elements as a unit, or otherwise described.

The ALAW is an index to the relative length of I, and is determined by dividing the length by the width. The peg sensillum is a short peg or blade (style) apically on segment II. Segment III has alternating sclerotized and unsclerotized portions forming annulations in Diamesini.

Above the mentum and between the premandibles is a horseshoe-shaped sclerite called the ungula. Within this ungula are spines and blades that are usually caudally directed. The central ones, usually three in number, are the pecten epipharygis (PE), and the more lateral ones are the chaetulae laterales (ChL). Either may obscure the other in the various genera; herein both together as an area are referred to as the PE area.

The labrum carries pairs of taxonomically important setae, the S-setae (SI, SII, SIII). The most anterior, the SI, is usually the largest and is bladelike or spinelike. Toward the dorsum of the head the next largest, usually, is the SII, and situated between the SI and SII is the usually hairlike SIII. At the anterior margin and under the SI may be a variable grouping of scales that end in various combinations of points; these are the labral lamellae, commonly referred to as the comb. This feature is found useful in deliminating species of Diamesa and you are referred to that section for further details.

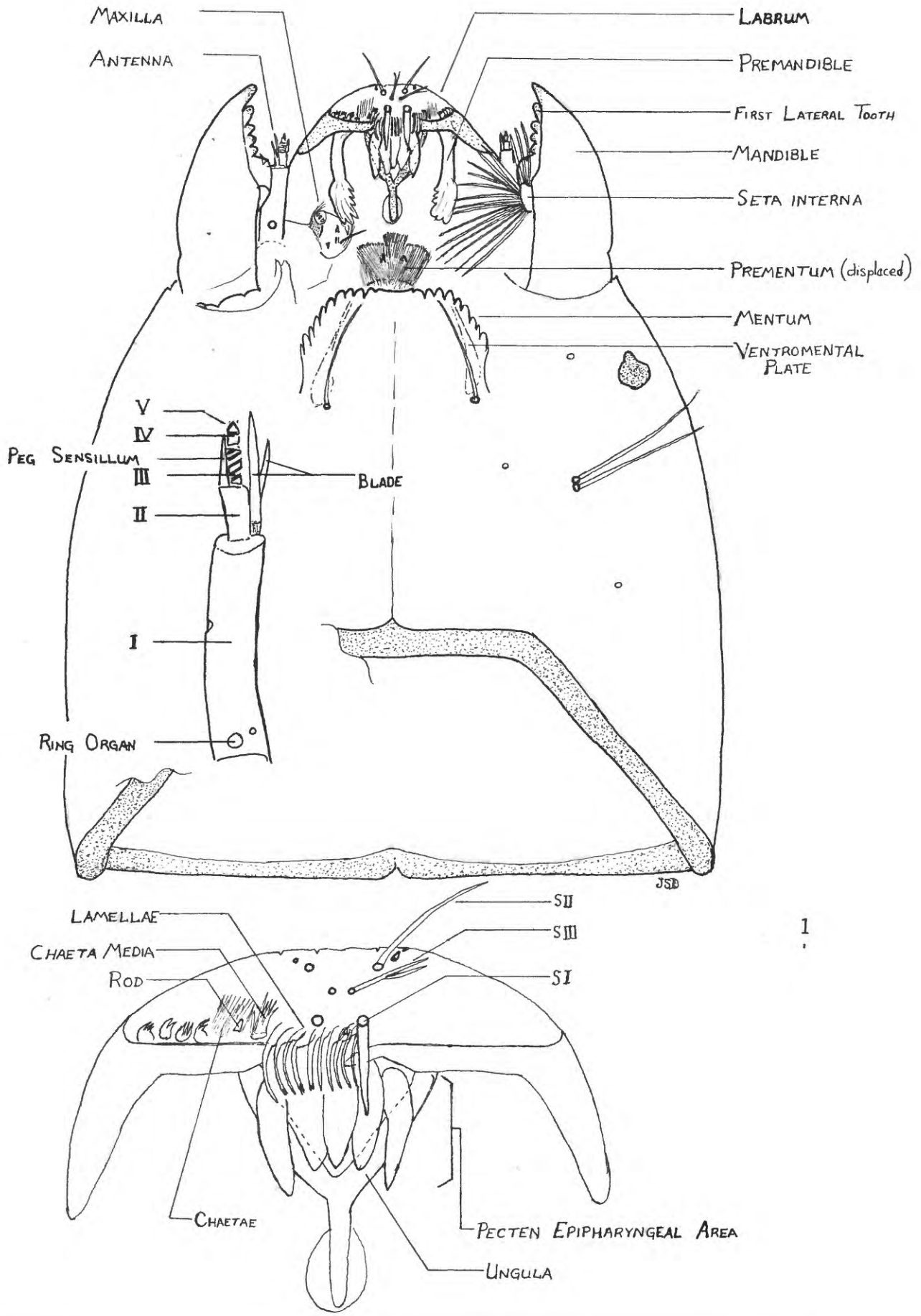
The premandible is typically dentate, distally, possessing 3-15 blunt teeth in most cases. The mesal margin of the stem has a brush that may be unilaterally branched as in Diamesa, or a simple spine as in Pseudodiamesa. The mandible is generally "normal". That is, the apical tooth is the largest and the lateral teeth (the internal teeth) are wedge

shaped, and the outer margin of the usually four lateral teeth steps down in a regular pattern toward the shoulder. See figures 3, 21 and 22 for examples. On the inner dorsomedial side of the mandible, a simple cut seta into about 20 subequal branches is usually present, the seta interna (Si). More distally yet, is a small scale just behind the lateral teeth, the seta subdentalis.

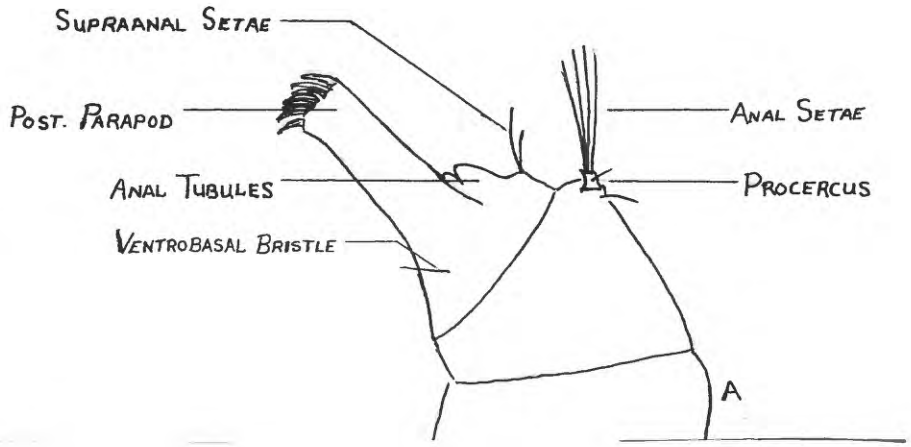
The body has few outstanding segmental setae except in Pseudokiefferiella. The two bundles of bristles on the dorsum of the last body segment before the posterior legs are the anal setae (AS). Many species possess a small pedestal, the procercus, which encircles and bears the AS. The degree of development of this procercus is indicated by the height divided by the width (H/W). The sclerotization of the procercus is usually stronger anally and sometimes produced into spurs. The anal segment is bent ventrally and two setae, the supraanal setae (Sa), are seen above the legs and behind the procerci. This segment also bears the legs, the posterior parapods, and two pairs of sacs, the anal tubules (TA).

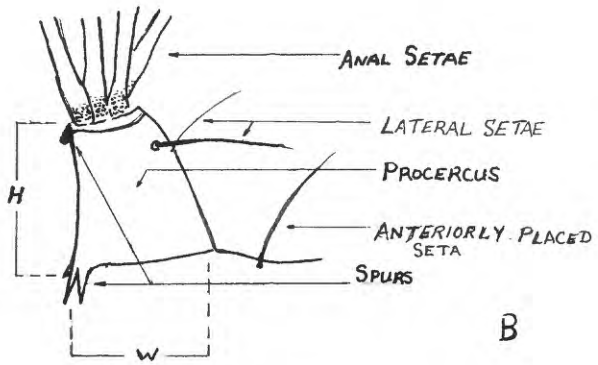
Figure 1.--Schematic asymmetrically drawn, showing larval head morphology with antenna and labrum inserts, p.6.

Figure 2.--Additional larval morphology: A, Caudal section; B, Enlargement of procercus; C, Mental appendage of Protanypus. The median lamellae (ML) are the two top most branches; D, Maxilla of P. gaedii Mg. Note row of five lanceolate blades on galea running from the medial extremity to the palp, p. 7.

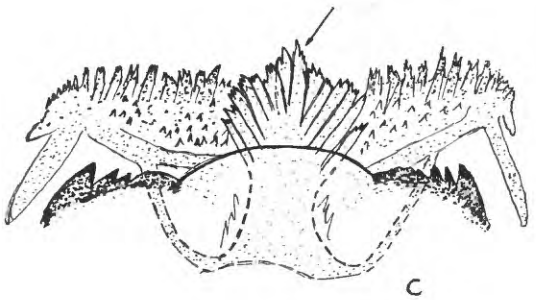

MAXILLA
ANTENNA
LABRUM
PREMANDIBLE
FIRST LATERAL TOOTH
MANDIBLE
SETA INTERNA
PREMENTUM (displaced)
MENTUM
VENTROMENTAL PLATE
V
IV
PEG SENSILLUM
III
BLADE
II
I
RING ORGAN
JSD
SII
SIII
SI
LAMELLAE
CHAETA MEDIA
ROD
CHAETAE
PECTEN EPIPHARYNGEAL AREA
UNGULA

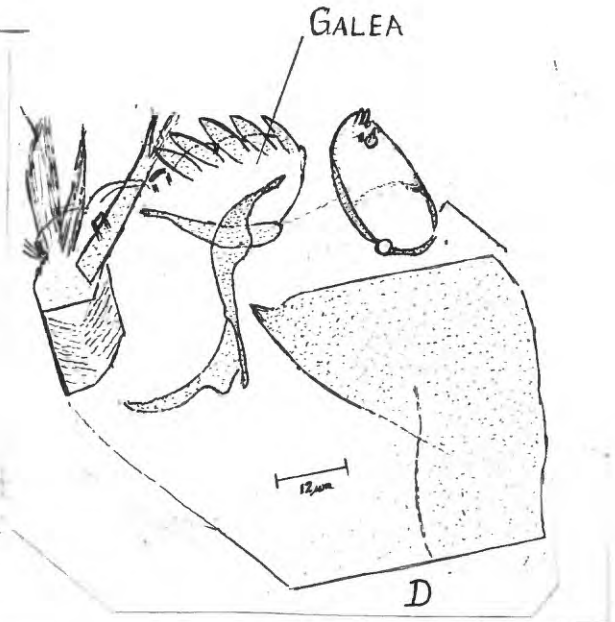
1


SUPRAANAL SETAE
POST. PARAPOD
ANAL TUBULES
VENTROBASAL BRISTLE
ANAL SETAE
PROCERCUS
A


ANAL SETAE
LATERAL SETAE
PROCERCUS
ANTERIORLY PLACED SETA
SPURS
H
W
B

2


C


GALEA
D

KEY TO THE GENERA OF THE NEARCTIC LARVAL DIAMESINAE

1. Antenna not retractile; no forked ligula present; procercal H/W less than 3; premandibles present, ventromental plates unstriated and usually small; never phoretic and never marine.....2
- Not limited as above.....Tanypodinae
.....Podonominae
.....Telmatogetoninae and
.....Clunionini
.....Chironominae

2. Ventromental plates large, unstriated reaching obliquely beyond mentum toward the lateral margin of the head; acutely pointed mesally, and may be heavily bearded. Antenna 4-segmented; III not annulate. Four unique genera.....Prodiamesinae
- Ventromental plates generally small and not produced laterally, or if large, the plates are produced more diagonally and posteriorly, and if bearded, the setae actually originate on the maxillae. Antenna segment III annulate or not.....3

3. Head covered with short setae. Post-occipital margin with lateral processes that are directed posteriorly. Possessing a transverse row of flat scales (lamellae) across the middle of the labrum (fig. 31). Antenna 4-segmented, seg. III not annulate.
.... **Protanypus**
- Not as above.....4

4. Antenna with 4-7 segments and segment III never annulate.....
..... Orthocladiinae
- Antenna with 4 or 5 segments and seg. III annulate..... 5

5. Head with a set of tubercles or bumps on the dorsal surface over the eyes. Antenna 4-segmented. Abdominal tergites with dark patterns formed by numerous spinules. Posterior parapods bear claws in several concentric rows. (figs. 3-4)..... **Boreoheptagyia**
- Head not bearing tubercles over the eyes. Antenna 5-segmented. Body characters not as above..... 6

6. Ventromentum broad, 7-10X first lateral tooth, or lateral teeth absent Premandible narrowed distally to a simple apical tooth or lateral teeth, if present, small and separated only slightly from stem, or flared with many fine teeth. Procercus heavily sclerotized, buttonlike . (S-setae and spinulae over premandible simple. Premandibular brush spikelike.).....13
- Ventromental teeth narrower and sharply defined (median absent in Pagastia.) Premandible usually flared distally into 5-12 blunt lateral teeth. Procercus, if present, cylindrical and perhaps with spurs on anal surface.....7

7. Epipharyngeal area with five, close fitting, spatulate blades; labral lamellae (LL) under the SI's composed of many individual spines or 3-6 pectinate scales (figs. 1,5). Premandible usually palmate.....9

- Epipharyngeal area with more than five, narrower spines. LL not conspicuous, rather platelike which are toothless, dentate or pectinate (S-setae of labrum simple. Premandible large, rectilinear, and usually with 8-13 teeth. Procercus longer than wide with 6-8 AS and two unequal lateral setae.).....8

8. Head squarish with dark postmentum. Mentum with 13 or 15 large, dark teeth; median triangular; first laterals formed by VMP and which are appressed to the first pair of dorsomental teeth. Mandible normal. AR 2 or 3. LL like two pocket combs. TA with constrictions. Large species, 10-18 mm. (Homogenous genus)..... **Pseudodiamesa**

- Head yellow with curved gula (Conchapelopia-like). Median tooth of mentum absent; median formed by thick, shield-like VMP. 8-10 mm. Two groups: (1) AR 1.0 or 1.6, lateral teeth of mandible compressed into a knob, LL two, paddle-like, dentate plates; and (2) AR 1.6, mandible normal, LL three, nondentate, trapezoidal plates.... **Pagastia**

9. Abdominal segments with regular circlets of usually long (200-300 um), dark setae (fig. 33). Procercal H/W 1-2. Mentum with 13 or 15 teeth, and, usually, the median group compose a raised and separate arc of five, lighter teeth (fig. 32). LL 3-6 finely pectinate, oval based scales (the most lateral ones = chaetae mediae) (fig. 5J). Spinulae over premandible simple. (AR 1.7-2+. S-setae simple. Procercus strongly sclerotized with or without spurs and with 6-8 AS and a very strong lateral seta. Large supraanal and dorsal setae of 10th segment.)..... **Pseudokiefferiella**

- Abdominal segments with inconspicuous setae or setae longer (100 - 200 um). Proceral H/W about one or less or absent. Mentum with 17 or more teeth. LL many pointed spines with mostly separate bases (fig. 19). Spinulae over premandible simple or not..... 10

10. Procercal H/W 0.7-1.0 with a strong lateral seta (anteriad) and 5-7 AS.. 11

- Procercus, H/W to about 0.5 or entirely absent; when present, lateral setae absent on the procercus itself but a seta present forward on body; usually with 4 AS and occasionally with small spurs anally. (Labrum: SIII variable; LL varied groups of 10-25, but up to 40 flat (rectangular in cross section), often individual hooks; chaetae mediae dentate, spinulose or plumose (fig. 5); spinule over premandible cut into several points. Posterior parapod elongate; TA shorter than leg. Supraanal setae reduced, hairlike. Mandible normal or with distal two or three teeth subequally large. Body 4-10 mm.)... **Diamesa** (most)

11. Labrum as in Diamesa above. (SIII simple. AR 1.7-2.0. On II, style much larger than lauterborn organs; on I, accessory blade 2/3 of the length of blade (typical of Diamesa). Median of mentum about 3X wider than first lateral. Procercus without spurs; Six AS about 200 um long. Supraanal setae? Abdominal segments with rather long (140-210 um) setae. 10-12 mm. Palaearctic.)..... **Diamesa dampfi** - gp.

- LL with about 20 simple (more round in cross-section) spines, similar to a simple SII. S-setae simple. Spinulae over premandible simple. Accessory blade of antenna much reduced..... 12

12. AR 2.2-3.0. Mandible normal. Premandible palmate with about 6 teeth. Ventromentum with three subequal teeth that are slightly or very much larger (wider) than appending lateral teeth (17-19 teeth total). Procercus with robust lateral seta and tendency to have terminal spur. Abdominal segments with long (about 100 um), conspicuous setae. Large, 10-13 mm. S. nigra Ros. with three very large median teeth; style of II reduced and subequal to lauterborn organs; triangular chaetae media; premandibular brush spike-like. It and S. mira Mak. have the lower AR, 6 AS (200 um long), VMP flaring out somewhat laterally, and dark postmentum. S. hygropetrica Kief. with AR 3 and 5 AS. Style, VMP and chaeta media as mentioned may be typical of the genus. Palaearctic.)... .... **Syndiamesa**

- AR 1.0-1.4. Mandible with the three distal teeth large and subequal. Mentum with median very recessed and the next two pairs of teeth largest, towering over the remaining 7-8 pairs of lateral teeth. Style reaching mid IV, larger than lauterborn organs. Premandible constricted distally, having about three teeth. Procercus with 7AS (200 um long) and small lateral setae. Abdominal segments without conspicuous setae. Small species, 5 mm.. **"D". appendiculata** Lundst.

13. Mandible not normal. Premandible with five or with many fine teeth apically..... 14

- Mandible normal. Premandible simple, with a broad apical tooth or with a broad apical tooth and 1-4 inconspicuous lateral teeth. Antenna II usually somewhat bifid..... 15

14. Ventromentum dissected into five unequal sections. VMP, hairless, expanded and rounded laterally. Six to seven pairs of lateral teeth. Antenna II bifid; AR 2.2. Labrum adorned with many strong, simple spines adorned with many strong, simple spines on level with S-setae; LL? Epipharyngeal area with 14-18 similar spines. Spinulae over premandible truncated. Premandible weakly digitate apically, with five teeth. Mandible with distal three teeth large, subequal and seta interna with 26 very plumose branches. Maxillary galea without row of blades. Prementum beset with short hairs. Procercus with 6 AS, 270 um long, and a robust lateral seta. Abdominal segment 10 with a strong ventral seta (130 um long). Supraanals reduced as for Diamesa (most). 6 mm. Sandy Creeks of SE USA..... **Genus P**

- Many head structures reduced: Mentum without lateral teeth or VMP. AR 0.5. SII and III fine, hairlike. SIVB longer than SIVA and an additional pair of socketed setae near labral margin and another above. LL absent? PE reduced. Mandible bight-shaped with no apparent lateral teeth or seta interna. Premandible broad apically with 15 serrations. Procercus, a strongly sclerotized button with usually 7 AS (about 220 um long) and a lateral that is about one third as long. Supraanals subequal to AS; dorsal seta of 10th segment (base of parapods) much shorter than supraanals and longer than the ventral seta of 10th. 8-11 mm..... **Potthastia longimana** Kief.

15. Ventromentum 10X first dorsomental (lateral) tooth. Maxillary galea with five lanceolate blades (fig.2). Premandible simple, with a broad apical tooth (spoonshaped) and without lateral teeth (Mandible sickle-like and usually 6 AS.)..... **Potthastia** (most)

- Ventromentum 7X first dorsomental tooth. Galea without blades. Premandible with 1-4 small lateral teeth. (Usually 7AS. SI and II spine-like, SIII small.) .....**Sympotthastia**

BOREOHEPTAGINI SENSU BRUNDIN
BOREOHEPTAGYIA Brundin (1966)

(= Heptagyia Phillipi 1865 (Edwards) in part.)
Type species: B. rugosa Saunders 1930).

Brundin (1966) grouped some species of Heptagyia into the holarctic genus, Boreoheptagyia. This genus was represented in North America until recently by a single species, B. lurida Garrett. Saether (1970) found a distinctive larva from Boulder Cr., Colorado, representing a new unnamed species. Two basic references not reviewed are Meyer (1935) and Saunders (1930).

Larvae occupy rock surfaces in splash zones of swift mountain streams where they are scrapers and gatherers.

A brief diagnosis of nearctic larvae follows:

Head. Resembling a darkly sclerotized Diamesa, but having a distinctive dorsal pair of swellings or large tubercles over the eyespots and a second pair of swellings posterior to the first pair.

Antenna. Considered 4-segmented in Brundin (1966).

Body. Abdominal segments with dark saddle patterns composed of closely spaced stellate or simple spinules, and in only the nearctic species the dorsum from the metathorax to the penultimate segment, each bear two sets of short, eversible papillae.

Posterior parapods. Short, with numerous dark claws in concentric circles and terminating in a sucker-like structure.

KEY TO THE NEARCTIC BOREOHEPTAGYIA

1. Short, light eversible papillae occurring in two pairs on the dorsum of the metathorax and the abdominal segments to the penultimate segment. Antennal seg. II bearing one or two peg sensilla.....2
- No eversible papillae. Peg sensilla two together and one opposite (3 pegs). Palaearctic species*
2. Dorsum of head over eyespots possessing a pair of large protruberances that bend and almost meet anteromedially. Only one peg sensillum. AR 2.....B. lurida Garr.
- Dorsum of head with two similar pairs of small, mound-like tubercules, each with stout bristle apically. Two peg sensilla. AR 1.6 ....B. sp.A Saet.

*Note--The key to the palaearctic species of Johannsen (1937, p. 29) is corrected as follows: The species H. sp.A is B. punctulata Goetgh; a species near B. rugosa is B. brevitarsis Tokunaga which has 5-7 concentric rings of claws on the post. parapod instead of just three as in rugosa. The H. sp.B. may be B. legeri Goetgh. (Thienemann (1944) and Chernovskii (1949).

Species.

1. B. lurida Garrett 1925

Distribution. Cordilleran: British Columbia, Alaska, Washington, Wyoming; and New York.

Description. From Johannsen (1937).

Head. Black. 1.3 times longer than wide. Tubercles of dorsum: anterior pair, large, angulate and nearly touching anteromedially; posterior pair, low mounds with a stout bristle apically.

Mentum. See Fig. 3. 16 teeth; median with six subequal teeth forming a straight line.

Antenna. Basal segment with three RO's, topped by a single blade as the accessory fork is very reduced. AR 2. One peg sensillum.

Labrum and PE area. Not evaluated, but B. punctulata is pictured with these structures as in Diamesa (Chernovskii, 1949 and Pankratova, 1970).

Premandible. Probably with six teeth as in B. sp.A.

Mandible. Four blunt teeth; Si with 14 branches (11 branches (Saether, 1970)).

Body. Length 5 mm. See generic description.

Procercus. Absent. Six short anal setae.

Post. parapod. See generic description.

2. B. sp.A Saether (1970)

Distribution. Colorado and Alaska, Galbraith Camp 68° 27'N 149° 29'W: Figs. 3-4.

Description. From Saether (1970).

Head. Tubercules: two pairs of low mounds with a stiff bristle apically as the rearward pair in lurida. Other head parts as in lurida except as follows:

Mentum. 18 teeth.

Antenna. Segment ratio 18:4:6:1. AR 1.6. Two peg sensilla, paired.

Premandible. Six blunt teeth.

Mandible. Six teeth, Si with 15 branches.

Body. Length 6 mm. Fuscous with green tint. Otherwise as in lurida.

3

4

Figures 3-4.--Boreoheptagyia prob. sp.A from Alaska: 3, Partial of head, mentum width 130 um; 4, Caudal section.

DIAMESINI

DIAMESA Meigen 1835 Waltl 1837

Type species D. cinerella Mg. (Type by Waltl cited in Saether (1977)).

Diamesa is the most diverse genus of the tribe. Thirty nearctic species have been defined in the adult stage (Hansen and Cook 1976). Unfortunately, little interest in the larval stage has left this section few descriptions with associations.

Diamesa are widely distributed in the highland and the northern regions. They often make up most of the insect population in the high arctic and alpine headwaters. Few are known to tolerate sedimentation, pollutants, low DO or warm water, so they are not found abundantly in the lowland streams.

Larval Diamesa have adapted to their habitat of swift water by having reduced procerci and elongated posterior parapods with strong claws. Many species living in torrential habitat are very small. These rheobionts fasten themselves by posterior claws and head downstream in the splash zone and scrape diatomaceous material for food.

Generic description:

Head. Squarish, luteous or heavily sclerotized and darker brown to black.

Mentum. Fully toothed, e.g., the median and first laterals strongly sclorotized, often slightly elevated from the arcs formed by 8-10+ pairs of additional lateral teeth. VMP thin, elongate teardrops which do not obscure the flattened mentum. Prementum with long setae in a trilobate group (fig. 1).

Antenna. Short and heavily sclerotized. Segment III regularly annulate. Blade unequally bifid. RO in the basal quarter. One or two additional circular pits are also commonly seen. Peg sensillum (style) present.

PE area. Conspicuously composed of five large, concave, spatulate blades fitted closely together. Two pairs of much smaller lateral chaetae and two pairs of small peg-like basal chaetae, attached to the ungula, may be seen. Labrum. SI simple, strong, horn-shaped spines, SII hair-or spine-like, SIII simple, bifid (Y-shaped), multiple, or dissected. Lamellae under the SI with various arrangements of pointed hooks, spines, or pectinate scales; see figures 1, 5 E-H and 6. On each side, flanking these labral lamellae, a distinguishable labral chaeta, the chaeta media (ChM); see figures 1 and 5A-D.

Premandible. Palmate with 6-7 blunt teeth; brush of fine branches. This configuration is termed "normal".

Mandible. With five teeth. Normal (see terminology) or with several of the distal teeth tubular and subequal and the remaining teeth reduced. Si with about 20 slightly plumose branches, the inner ones longest. Seta subdentalis small and scale-like.

Body. Length 4-10 mm. Color yellowish or brownish. Occasionally with conspicuous yellowish setae on abdomen.

Procercus. Present or absent; usually four, short, thick anal setae and an anteriorly or anteriolaterally placed smaller seta(e) present. Supraanal setae reduced, similar to the small anteriorly placed setae. TA cylindrical with rounded ends or conical but shorter than parapod.

Posterior parapod. Elongate, one to two times as long as the preanal body segment. Usually 16 brownish, simple claws.

KEY TO SOME SPECIES OF *DIAMESA*.

There are a few outstanding named species. Also, *Diamesa* larvae can be readily split into several groupings. These species groups are hard to separate further because of the homogeneity of the differential characters. Several characters were employed to separate the 4th instar, but because of the absolute values given, one may find themselves terminating incorrectly. This may be because specimen has worn mouth parts or broken setae, or because of intraspecific variability (see, for example, *D. incallida* Walk.), or because of artifact in mounting. The specimen may be closely represented by the key but does not quite fit. It is recommended that the species descriptions be utilized, and, if a good specimen does not fit the description, the observable taxonomic unit characters found in the introduction be employed to create an extension to this key.

1. Procercus absent. 1-5 anal setae (AS) arise directly from the postero-dorsal surface of the preanal body segment.....2
- Procercus present, may be represented only by a posterior wedge of sclerotization; usually 4 long AS (fig. 23)..... 18
2. AS 180 um long or less.....5
- AS more than 200 um long (AR 2.0).....3
3. Antennal III apparently unannulate. Mentum with the median three teeth appressed together and standing separate from remaining teeth.....4
- Antennal III regularly annulated. Mentum with a notched median and first three pairs of laterals forming a straight line..... .....*D. sp.8.*
4. Labral lamellae composed of two groups of type 1 lamellae, and the flanking chaeta media, a spinulose plate..*D. incallida* - form A.
- One or two type 3 labral lamellae flanking a few type 2 and the flanking chaeta media, a strong, dark, sickle-shaped hook..... ..... *D. incallida* - form B.
5. AS less than 120 um, usually less than 100 um long.....6
- AS more than 100 um but less than 200 um long..... 16
6. Four AS.....9
- One to three AS less than 50 um long.....7
7. One AS, 45 um long (Colorado).....8
- Two hooks and one needle-form AS about 20-30 um long. Mentum with a double or truncated median teeth and the first laterals forming a straight line and 7-9 pairs of additional lateral teeth..... ..... *D. steinboecki* Goetgh.

8. Mandible normal. Mentum with simple median and 10 pairs of lateral teeth. AR 1.8.....*D. sp.1.*
- Mandible broad with all teeth nearly equal. Mentum with 19 simple teeth. AR 1·1 ..... *D. sp. 2.*
9. AS 40-50 um long. SIII divided into at least four strong branches. Developed scale at base of SII.....10
- AS about 60-100 um long. SIII with one or two branches.....11
10. AR 1.1 (Rif-blank, France).....*D. latitarsis* Goetgh.
- AR 1.5. Northern.....? *D. lindrothi* Goetgh.
11. AR about 2.....12
    AR 1-1.5.....13

12. Median section of mentum with teeth forming a straight line; mentum with more than 20 teeth. Labral lamellae composed of about 30 or 40 hooks (type 1).....D. aberrata Lundb.
.....D. sp.15
- Mentum with 20 teeth or less; median section sloping downward in a smooth arc. Lamellae with only about 20 hooks (type 1).....
.....D. sp.6.
13. AR less than 1.5. Second lateral pair of mental teeth not the largest. 14
- AR 1.5. Mentum with the second pair of lateral teeth superior. SIII with two strong branches.....D. bertrami Edw.
14. AR 1.2 or 1.3. Mentum with an even number of teeth. Mandible with the first lateral tubular and subequal to the apical.....15
- AR 0.9 Mentum with 17 or 19 teeth. Mandible with the first lateral wedge-shaped. SIII a simple spine.....D. sp.9.
15. SIII composed of two strong spines.....D. sp.3.
SIII simple, hairlike..... D. sp.4.
16. AR about 2.....D. sp.15.
- AR 1.2.....17
17. Mandible with first lateral large, tubular and subequal to the apical. AR about 1.2. Labral lamellae of about 16 hooks flanked by a dentate plate (ChM type 2). Mentum with the median three teeth sagittate and much longer than the remaining 9-10 lateral teeth. SIII simple and hairlike...D. sp.10.
- As above but median tooth of mentum bifid and SIII comprised of two spines.....D. sp. 3.
18. AS more than 200 um long.....19
- AS 130-180 um long. AR 1.5. Mandible with two distal teeth large and subequal. Mentum an even arc of subequal lateral teeth.....29
19. Mentum with a low, wide median and only 6 pairs of lateral teeth.(Midwest).....D. mendotae Mutt.
- Median tooth about twice as wide as the first lateral tooth or less and may be simple, notched or a doublet; usually eight or more pairs of lateral teeth.....20
20. Procercal H/W 0.5 and bearing 2 or 3 small spurs directed anally. AR 1.7.....D. davisi Edw.
- Procercus without spurs.....21
21. AR about 2.0.....22
- AR 1.2-1.7.....25

22. The various labral lamellae flanked by a spinulose plate chaeta media with even or uneven branches..... 23
- Labral lamellae composed of 16-24 hooks and flanked by a dentate plate type 1 chaeta media..... 30
23. AR 2.0; ALAW 2.6. Mentum with 17-19 teeth..... 24
- AR 2.0-2.3; ALAW 3·5-4. Mentum with 19-21 teeth (SIII bifid)..... 31
24. SIII simple. Lamellae composed of about 20 type 1 hooks..... .....D. sp.12
- SIII hairlike, bifid. Mentum with the second and third lateral teeth the largest and wedge-shaped. Lamellae in the groups totaling about 14 points and flanked on each side by a spinulose chaeta media with only a few points ..... D. sp.11
25. Median tooth of mentum flattened or shallow notched and mentum with 8-9 pairs of laterals..... 26
- Median broadly truncate or with a wedge-shaped median with a conspicuous V-notch..... 28
26. SIII simple, hairlike..... 27
- SIII bifid, hairlike. Labral lamellae in 4 groups (type 1A hooks) making about 16 points total; flanking these a dentate plate (type 1A). AR 1.6..... D. sp.14.
27. AR 1·2. Lamellae of labrum composed of about 14 hooks (type 1); the flanking chaetae mediae, each a broad dentate plate type 2).....D. leona Rob.
- AR 1·6. Lamellae of labrum with 20 closely set hooks and the flanking chaetae mediae, each a spinulose plate (type 1)..... ..... D. sp. 13.
28. Mentum with a very broad median tooth and 8-10 pairs of lateral teeth. AR 1·5.....D. insignipes Kief.
- Median tooth only about 1.5 times the first lateral and with a conspicuous v-notch.AR 1·5.....D. sp.7.
29. SIII a fine, bifid hair. Labral lamellae 20 closely set hooks (type 1); chaeta media dentate..... D. leoniella Hansen.
- SIII simple. Labral lamellae only about 12 type 2 lancets and the chaeta media spinulose ..... D. sp. 5.
30. AR 1·8-2·1. Mentum with 10 pairs of lateral teeth. SIII bifid. Head dark.....D. spinacies Saeth.
AP 2·2. Mentum with 8 pairs of lateral teeth. SIII simple. Head light.....D. heteropus Coq.
31. Antennal segment III apparently unannulate. The first and second lateral teeth of mentum rather widely separate.....4
- Antennal III regularly annulate; first and second lateral teeth not appreciably separate.....32
32. Median tooth of mentum somewhat lower than the surrounding first lateral teeth which are not appressed to median..... ..... D. bohemani Goetgh. ..... D. cinerella Mg. ..... D. thienemanni Kief.
- Median tooth of mentum somewhat above first lateral teeth which are appressed to median..... D. sp.16. ..... D. zernyi Edw.

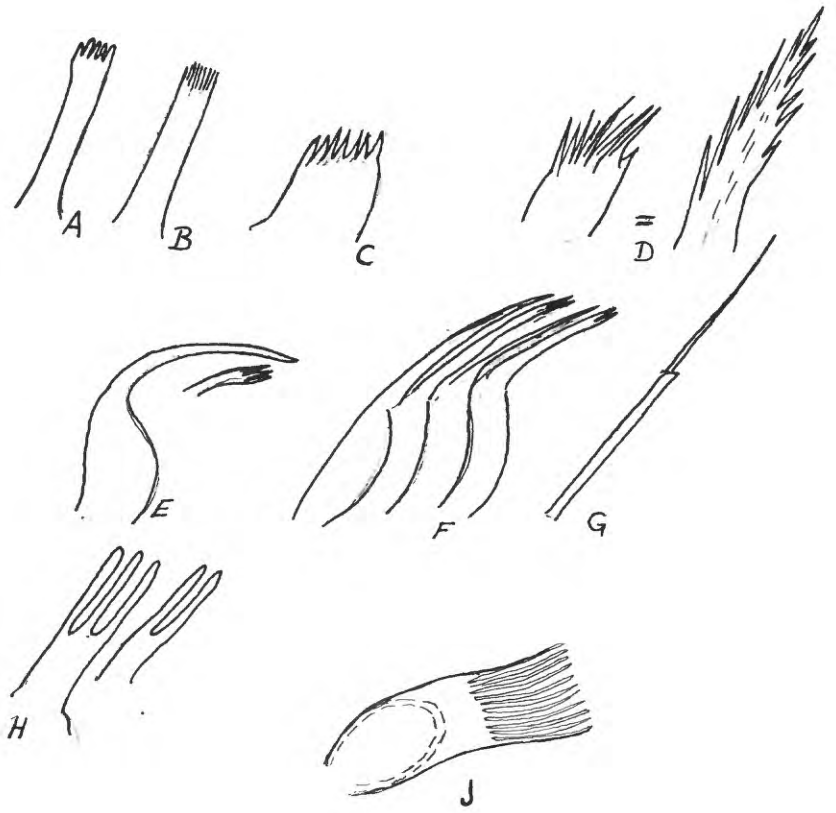
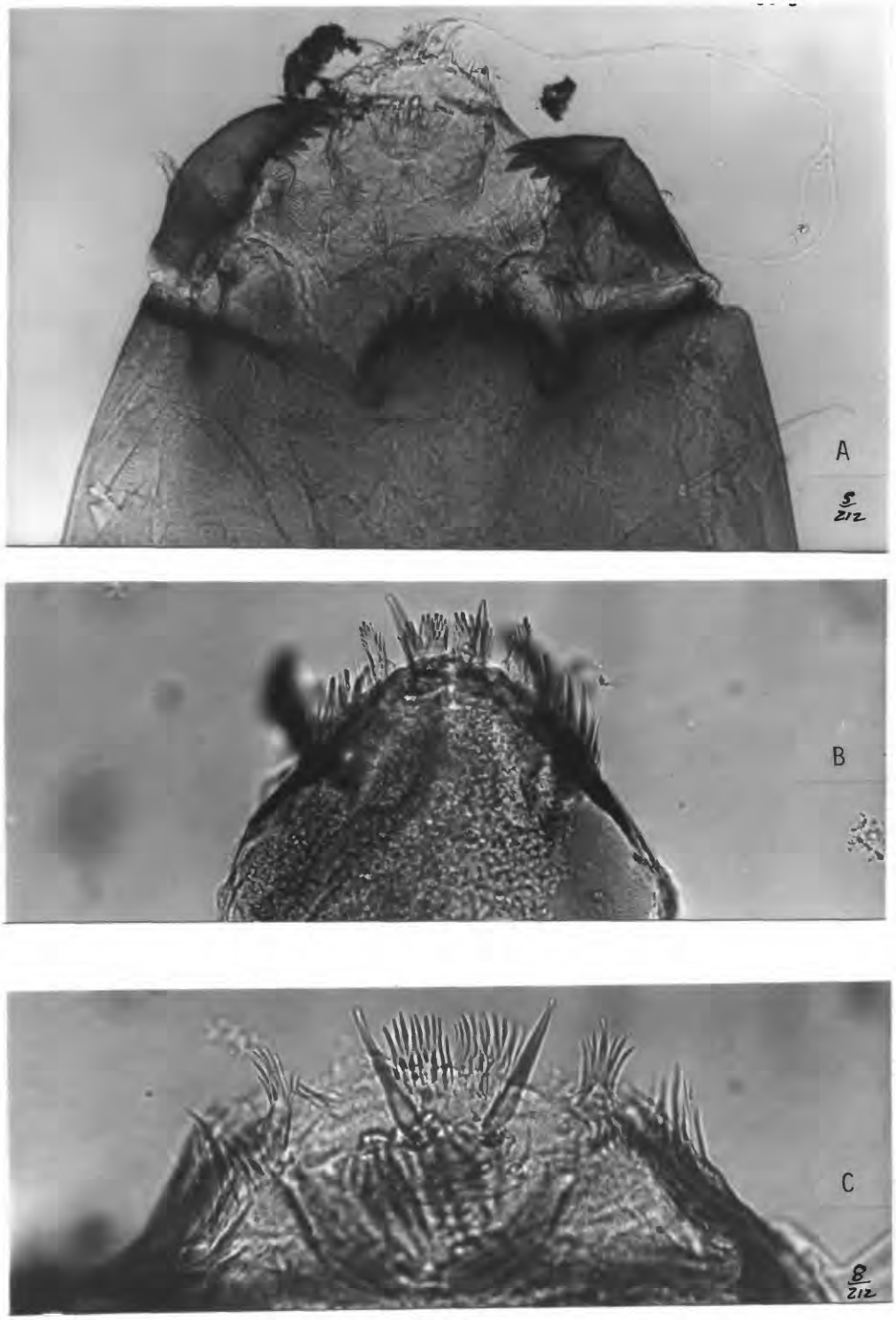


Figure 5.--Schematic of the Chaetae mediae and lamellae observed on the medio-anterior margin of the labrum of Diamesa and Pseudokiefferiella: A-D, Chaetae mediae types in Diamesa: A, Dentate plate type 1; B, Dentate plate type 1A; C, Dentate plate type 2; D. Spinulose plate type 1; E-H, Labral lamellae types in Diamesa: E, Lamella type 1 (hook), F, Lamella type 1A (grouped); G, Lamella type 2 (lancet), and H, Lamella type 3 (bases fused); J,Lamella and chaeta media type in Pseudokiefferiella.

Figure 6.--Diamesa. sp.8 from Alaska. Mentum, 159 um wide. Note the many lamellae.



Figures 7A-C--Diamesa incallida Walker: 7A, Head, (Wyoming specimen, 3d instar new molt), mentum, 166 um wide; 166 um wide; 7B-C, Labrums on form A (Wyoming specimens).

Figure 8.--Diamesa incallida Walker Labrum on Form B (Utah specimen).

Figure 9.--Diamesa steinboecki Goetgh. from Alaska. Mentum, 83 um wide.

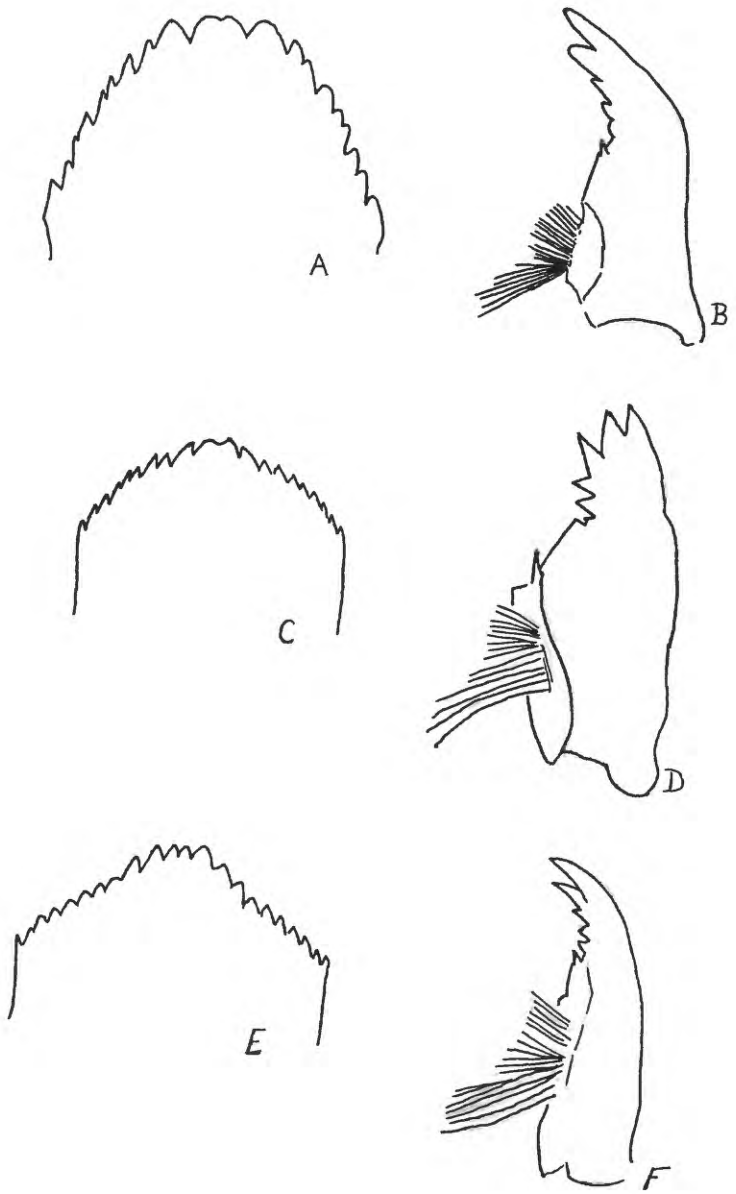
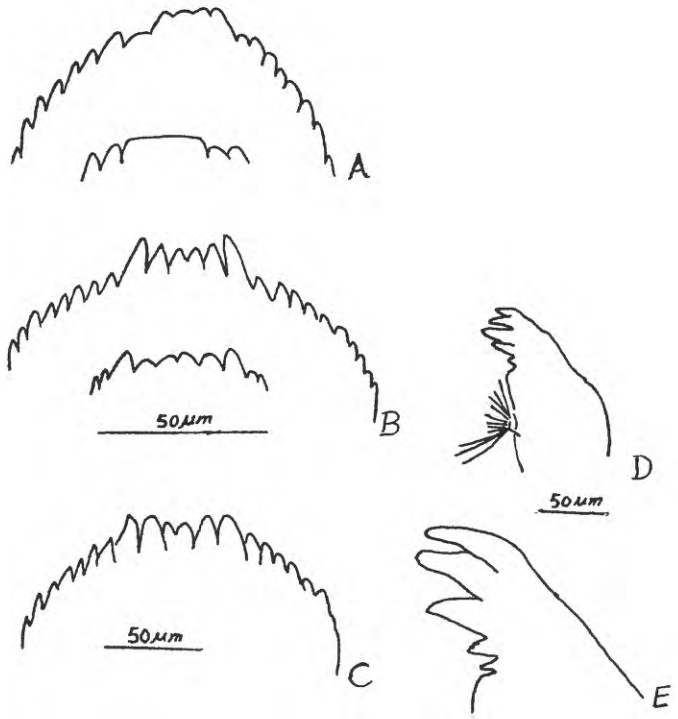


Figure 10A-F.--Diamesa spp. from Colorado: A-B, D. sp.1. Mentum and mandible; C-D, D. sp.2. Mentum and mandible: E-F, D. sp.4. Mentum and mandible. (From Saether, 1970, courtesy of the Colorado Assoc. Univ. Press.) No scale given.



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12

Figure 11A-E.--Diamesa spp: A, D. gp. - latitarsis mentums. (Scale as in B.); B-E, D. bertrami Edw. Mentum and mandible. (A, B, D redrawn from Rossaro, 1980, courtesy of Schweizerbart'sche Verlagbuchandlung; C and E redrawn from Tilley, 1978, courtesy of Pan-Pacific Entomologist.)

Figure 12.--Diamesa sp.6 from Alaska. Antennal I, 58 um long.

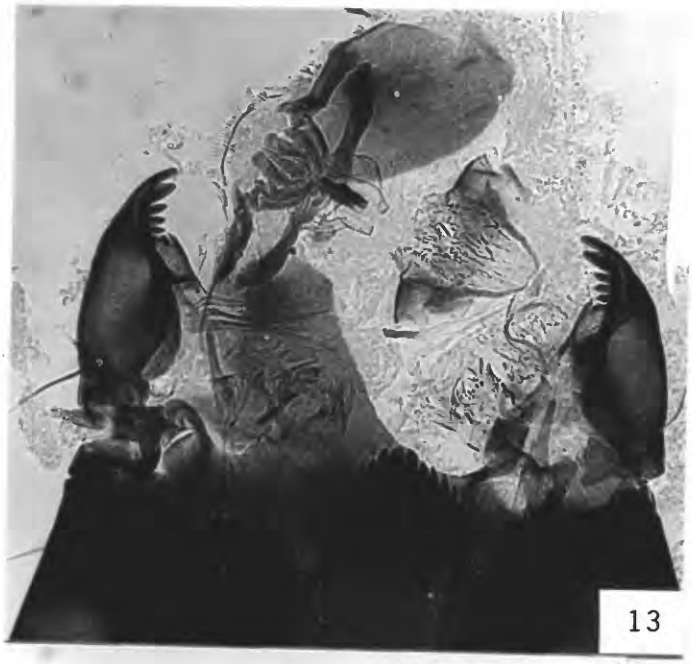
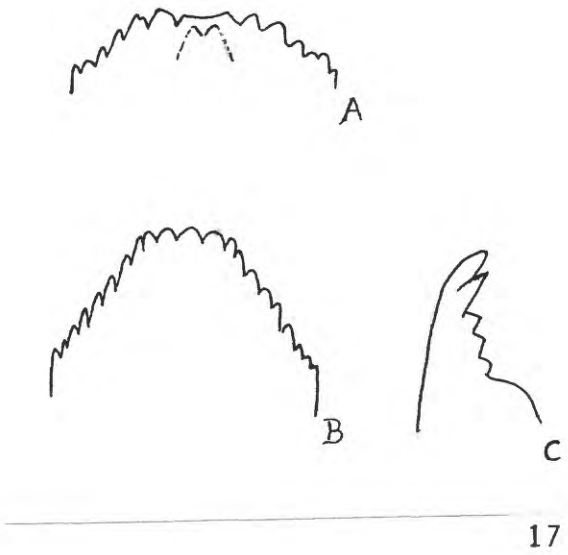


Figure 13.--Diamesa sp.9 from Alaska. Mentum, 86 um wide.

Figure 14.--Diamesa sp.3 from Alaska. Mentum, 71 um wide.

Figure 15.--Diamesa sp.10 from Alaska. Antennal I 38 um long.

Figure 16.--Diamesa sp.5 from Alaska. Antennal I, 39 um long.



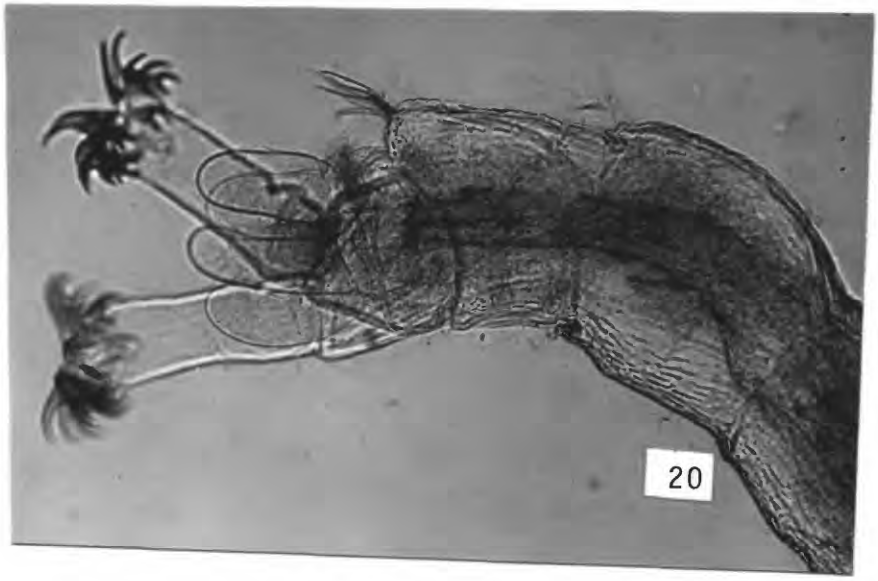


Figure 17A-C.--Diamesa spp: A, D. mendotae Mutt. Mentum (Redrawn from Johannsen, 1937; Courtesy of Cornell U.); B-C, D. davisi Edw. Mentum and partial of mandible (Redrawn from Saether, 1968, courtesy of Schweizerbart'sche Verlagbuchlandlung.)

Figures 18-20.--Diamesa spinacies Saet. Paratype: 18, Mentum, 119 um wide, 19, Labral lamellae; 20, Caudal section.

Figure 21.--Diamesa cf. spinacies Saet. from Alaska. Antennal I, 58 um long.

Figures 22-23.--Diamesa sp.12 from Pennsylvania: 22. Head, antennal I is 56 um long; 23, Caudal section.

24

Figure 24.--Diamesa sp.11 from Alaska. Mentum, 172 um wide.

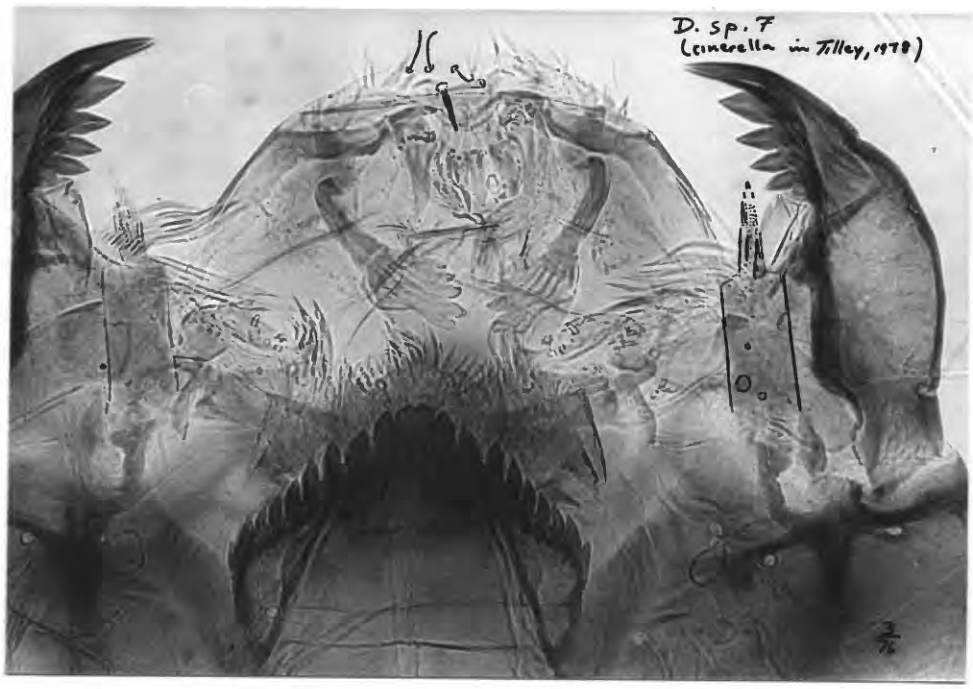
Figure 25.--Diamesa. sp.13 from Alaska Antennal I, 46 um long.

26

27

28

Figures 26.-28.--Diamesa cf insignipes Kief. from Utah 26, Mentum, 126 um wide; 27, PE area; 28, Caudal section.



A

Figure 29A.--Diamesa sp.7 from Alaska. Antennal I, 52 um long.

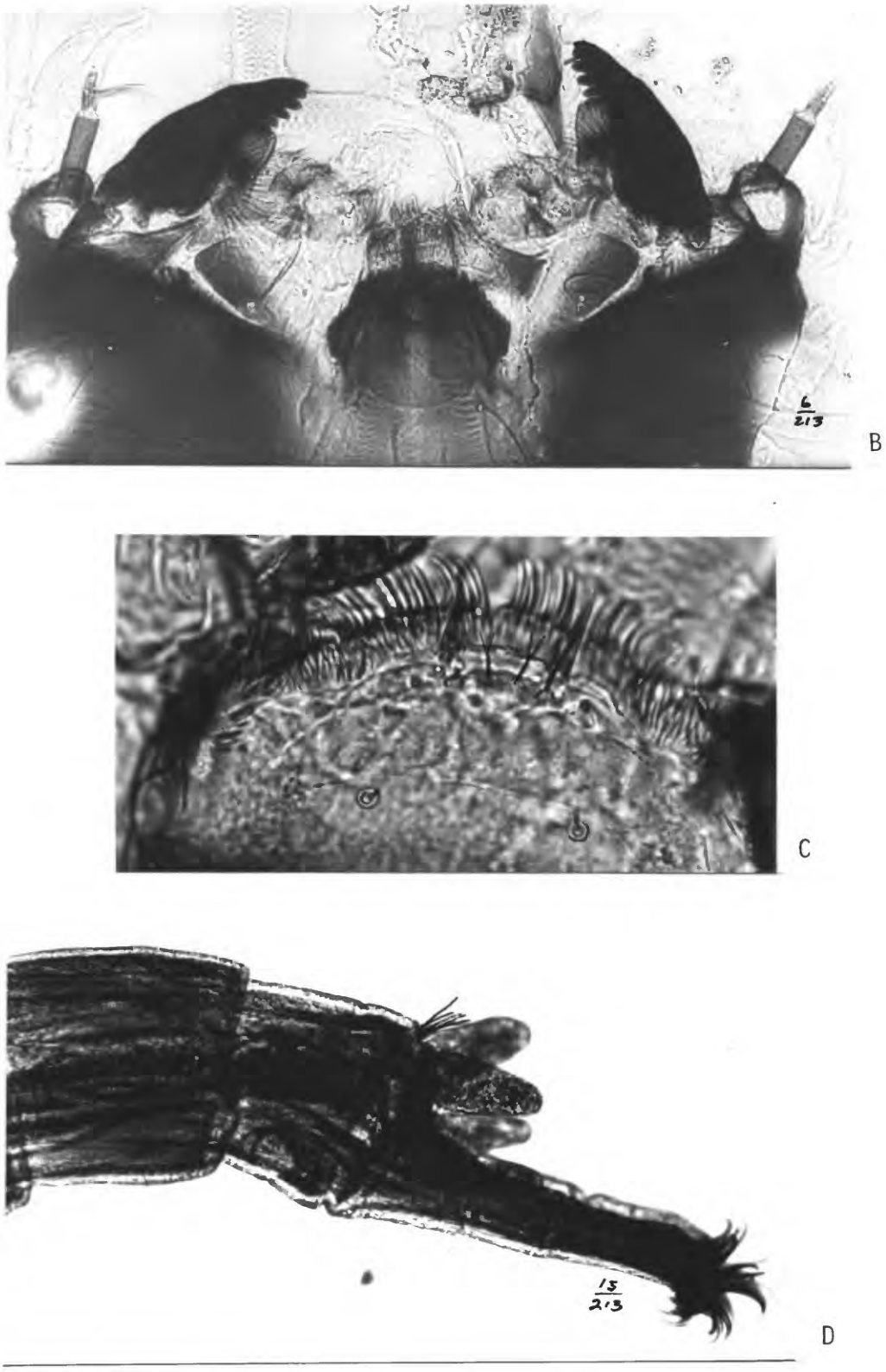


Figure 29B-D.--Diamesa sp.15 from Wyoming: B, Head, mentum 140 um wide; C, Labrum; D, Caudal section.

Figure 29E-F. Diamesa sp.16 from Wyoming: E, Head, mentum 156 um wide; F, Labrum.

Species.

Most reportings of the holarctic species are distributed in the northern regions and extending southward down the Rocky Mountain cordilleran. Saether (1970) compares a species-assemblage from a glacier brook and a high mountain brook with a list by Thienemann of such habitats and found very similar species. He speaks of species-pairs and sister species, linking the Nearctic to the Palaearctic and northern to the alpine. Only species of the nearctic D. nivoriunda-gp are routinely found in the eastern U.S.A. (endemic).

Hansen and Cook (1976) reviewed the adults, reaffirming 21 species, synonomizing several of the species of Roback and Saether, and creating nine new species, of which most are in the D. nivorunda-gp. Unfortunately, they had no material from the Alaskan arctic; many of the unassociated species listed below are from there. Much of the distributional information on these 30 species in Hansen and Cook is derived from "material examined." If the species is not marked Holarctic, it is Nearctic and a state and Canadian province listing follows.

Some species reviewed by Hansen may never have had the larval state described. Older European literature was not obtainable. The 30 species reviewed by Hansen are annoted or described when possible; this is followed by descriptions of 16 unnamed species that were differentiable from each other by several "diagnostic" characters. Two groups whose species are mostly Palaearctic, the D. cinerella-gp. and latitarsis-gp are discussed at the end of this section.

Species in Hansen and Cook, 1976

1. D. aberrata Lundbeck 1898
   (not= D. aberrata in Pankratova (1970))
   Distribution. Holarctic. Wyoming, Alaska.
   Ecology. In spruce forest about 3000 m alt. Species-pair with D. incallida Walk.
   Description. From Rossaro (1980).
   Head.
   Mentum. Median tooth deeply notched (bifid) and forming a straight row with the first four pairs of subequal lateral teeth. This forming the top of a trapezoidal mentum and the sides formed by seven or eight pairs of smaller lateral teeth. 24-26 total teeth (see fig. 6.). The median area commonly worn flat.
   Antenna. Seg. I, 73 ± 14 um, with a short bristle extending from circular pit occurring above midheight. AR 2.1.
   Labrum. SI very wide, bladelike. SII simple, with no developed scale at base. SIII very thin and bifid. Labral lamellae about 40, simple type 1 (fig. 5) and laterally, spinulose type 1, chaetae mediae.
   Premandible. Assumed normal.
   Mandible. "...lateral teeth are not generally more developed than the apical tooth (Rossaro, 1980)"? This is taken to mean that many of the lateral teeth are about equal to the apical and no teeth seem very much enlarged as in Tilley (1978, fig. 6C), and see also figures 6. and 29c herein.

Body. Length 7±1.9 mm.
Procercus. Absent, but sometimes having a narrow sclerotization directed anteriorly. Four anal setae, short (88 ±16 um) and stout, preceded by a seta that is about one-third as long.
Post. parapod. Elongate (765± 114 um) with a stout ventrobasal spine 73±9 um long.
Remarks. A similar group of specimens from WY could key out as aberrata, but these specimens do differ. They may be separated by the number of labral lamellae and length of AS. See sp.15.

2. D. amplexivirilia Hansen (1976)
Distribution. Holarctic (Makarchenko, 1980a) Alberta, British Columbia, Montana, Washington.
Ecology. Timberline in a meltwater stream.
Adult related to D. davisi Edw.

3. D. ancysta Roback 1959
Distribution. Alaska, Idaho, Montana, Washington, Utah, Colorado, New York.
Ecology.
Collected from mountainous terrain. Of the D. nivoriunda-gp.

4. D. arctica Boheman 1865
Distribution. Alaska, Northwest Territories.
Adult close to D. spinacies Saeth.

5. D. bertrami Edwards 1935 Fig. 11 B-E.
(= ? D. sp.II Tilley (1978)).
Distribution. Holarctic. Bear Is. but not limited to the Arctic.
Ecology. Often found with latitarsis - gp (Rossaro, 1980).
Description. From Rossaro (1980).
Head. Blackish-brown.
Mentum. With a deeply notched (bifid) median; the second lateral teeth always superior in height. The median pair, first and second laterals forming a concave group of subequal teeth, and the remaining 7-8 pairs of smaller teeth slope off obliquely from the base of the second lateral.
Mentum near D. lindrothi when worn medially.
Antenna. Seg. I, 45 um; AR 1.5. Blade overreaches IV. Peg sensillum overreaches III. RO in basal fifth; and in the upper third of I extends a short bristle from a circular pit.
Labrum. SI strong blade-like; SII short spine; SIII has two large branches and, in between, several fine hair-form branches. Lamellae, about 14 hook-form (see fig. 5) with 2-4 teeth distally; laterally, the chaeta media, each a flat, oval, dentate plate (type 2?).
Premandible. Assumed normal.
Mandible. First or second lateral largest; the four distal teeth subequal and remaining tooth small.
Body. Length 7 mm. Color greyish black.
Procercus. Absent. Four anal setae (76 ± 10 um) and an anteriorly placed seta about one-third as long.
Post. parapod. Very long (710 ± 97 um). Strong ventrobasal bristle 42± 11 um long.
Remarks. D. sp.II Tilley (1978) found in the Brooks Range (see D. sp.5, herein) may be bertrami. Unfortunately, the labrum was not described.

6. D. bohemani Goetghebuer 1932
(Not = D. zernyi Edw.).
Distribution. Holarctic. Northwest territories.
Description. This larva of the D. cinerella-gp. is not distinguishable from D. thienemanni or D. cinerella Pankratova (1970), Rossaro (1980). See D. thienemanni Kief. below.

7. D. cheimatophila Hansen (1976)
Distribution New York. Adult related to the nivoriunda-gp .

8. D. chiobates Hansen (1976)
Distribution. Wisconsin, Minnosota.
Ecology Found with D. mendotae. Adult in the nivoriunda-gp.

9. D. chorea Lundbeck 1898
Distribution. Alaska, California, Wyoming.
Ecology. Boggy springs in e. Greenland. Torrential streams, 2400-3200 m alt.
Description. From associated specimen located in Univ. of Minn. Collection: DH 69-283. Determination :D. Hansen.
Head. Dark brown with clear eye field.
Mentum. Near D. heteropus
Mandible. Worn. Apparently with the three distal teeth tubular and subequal and remaining two laterals smaller.
Body
Procercus. Absent. Four AS (90 um long and 2.5 um thick) short and thick; anteriolateral seta about half as long.
Remarks. Poor mount made it impossible to describe remaining parts; therefore, to key larva. (Apparently near D. sp.6.)

10. D. clavata Edwards 1933
Distribution. Hudson Strait.

11. D. colenae Hansen (1976).
Distribution. Cordilleran: Alaska, Yukon, Wyoming.

12. D. coquilletti Sublette 1966
Not Nearctic, Russian arctic near Alaska adult related to D. cinerella.

13. D. davisi Edwards 1933 Fig. 17 B-C.
Distribution. Holarctic. Northwest Territories, Alaska, California, Washington, Montana, Utah and New Hampshire.
Ecology. 1800-3000 m alt. Glacier streams.
Description. From Saether (1968, 1969).
Head. Black-brown.
Mentum. Trapezoidal with the three middle teeth subequal. Total of 21 teeth.
Antenna. AR 1.7 (3rd instar AR 1.0) ALAW 3.5. Blade reaches IV.
Labrum. SI short, horn-like, SII fine hairlike, and SIII bifid. Lamellae in four almost inseparable groups with 24 single pointed needles total, and these flanked by a dentate plate chaeta media type 1.
Premandible. Straight stem and 7-8 teeth.

Mandible. First lateral wedge-shaped and subequal to the apical.
Body. Length 4-9 mm. Color brown.
Procercus. H/W about 0.5, the anal sclerotization produced to one strong and two smaller spurs. Four anal setae and a smaller anteriorly and a small posteriorly placed setae.
TA:parapod 3:4. TA rounded distally.

14. D. garretti Sublette and Sublette 1965.
Distribution. British Columbia, Washington, Idaho, Montana, Wyoming..
Ecology. Associated with small, torrential streams at 3000 m alt.
Adult related to D. spinacies Saether and D. arctica Boh.

15. D. geminata Kieffer 1926
Distribution. (Greenland), Northwest Territories

16. D. gregsoni Edwards 1933
Distribution. Holarctic. Northwest Territories, New Brunswick..

17. D. haydaki Hansen (1976)
Distribution. Alaska, Colorado, Wyoming and Minnesota; similar disjunct range as D. heteropus Coq.
Ecology. Wyoming at 3000 m alt.; also, Minnesota, the relict prairie.

18. D. heteropus Coquillett 1905
(= D. banana Garrett; D. onteona Roback.)
Distribution. Cordilleran Alaska to New Mexico, 2100-3000 m alt. and prairie of Nebraska, Minnesota; the most common western species. Adult related to nivoriunda-gp.
Ecology. On rocks in tiny stream near 3000m alt (Specimen label).
Description. Based on reared specimens (Univ. of Minn. Collection: DH 69-265). Determination: D. Hansen.
Head. Mouth parts very dark, head yellow with brown.
Mentum. Near that of D. sp.12 figure 22, but with the first laterals appressed more to median. Remaining seven pairs of lateral teeth robust and subequal. Mental width more than 140 um (Mentum not completely flat).
Antenna. AR 2·2; ALAW about 3.5; Seg. I is 73 um. Blade and peg sensillum reaching V. Ant:mand:premand 1·1:1·8:1.
Labrum. The S-setae simple. SIII hairlike but not clearly discerned. Lamellae composed of 15 type 1 hooks appressed closely together; these flanked by the chaetae mediae of type 1 (fig.5A).
Premandible. Normal.
Mandible. First lateral large, wedge-shaped and subequal to the apical.
Body.
Procercus. A low ring H/W approaching 50%. Four AS 320 um long. The anteriolateral setae about 80 um long.
TA: parapod about 0.4 to 0.5.
Post. parapod. About 700 um; the strong ventrobasal bristle, 60-70 um.

19. D. incallida Walker 1856 Fig. 7-8.
Distribution. Holarctic. Alaska, Yukon, Washington, Wyoming, Utah, (Colorado) and Manitoba, Ontario.

Ecology. Alpine or lower in springs. Found near springs, splash zones about 3000 m alt. Utah specimen found with D. insignipes. Species-pair with D. aberrata.
Description based on Wuelker (1959) and an update by Rossaro (1980) and the Utah specimen and then the Wyoming specimens (collected by D. Hansen; in Univ. of Minn. Collection).
Head. Yellow (Rossero, 1980); black (Wuelker, 1959).
Mentum. Notched median and the first pair of laterals subequal in height and, as a group, separate from the remaining 9 pairs of lateral teeth. The Utah specimen obviously had the median and first laterals worn to a wide, convex median which is about 4.5 times as wide as second lateral (the first lateral tooth in worn specimens).
Antenna. One fifth the head length.
Seg. III sparsely annulated, consisting of a half circular and a circular band which gives a six-segmented appearance to the antenna.
Seg. ratio 85:19:6:6:5 um; AR 2.3 (Wuelker, 1959). Blade reaching IV; RO in basal fourth, and a smaller pit beside RO and another above middle of I; peg sensillum and several small humps on II.
Labrum. Variously described: SI very strong and dark. SII and SIII simple and similar (Wuelker, 1959) or SIII bifid (Rossaro, 1980 and specimens). Lamellae with about 12 hooks darkened distally (Wuelker, 1959). Lamellae in two groups of five, several of which have 2-4 teeth (Rossaro, 1980). Utah specimen having two triple forked (type 3) followed by 5 lancet-like (type 2), followed by one or two more type 3 lamellae. Wyoming specimens with both types of lamellae, ie., hooks with fused bases forming two groups of 5-9 hooks (fig. 7B), but most with individually discernable bases in two narrowly separated groups (fig. 7C).
Chaetae mediae which flank the lamellae are strong, dark hooks (Wuelker, 1959 and Utah specimen) but are spinulose plates near type I (figs. 7B,C) for the Italian specimens (Rossaro 1980) and Wyoming specimens). The variation was elucidated by the Wyoming specimens: the chaeta media is spinulose but with a strong central axis (plumose). It may be light or dark. The lateral branches may be absent from wear, sometimes to the form of a dark sickle as described in Wuelker and seen on the Utah specimen.
Premandible. Normal.
Mandible. First lateral large, wedge-shaped but nearly all teeth can be worn subequal. Si with about 21 branches.
Body. Without conspicuous abdominal setae (Wuelker, 1959). With strong, yellowish lateral and dorsal setae (Utah specimen). Length 8-10 mm. Color brown.
Procercus. Variously described: absent; four long, blackish anal setae (250-300 um) and an anteriorly placed seta (Wuelker, 1959); or with a very low anterior sclerotization and setae as in Wuelker and Utah specimen; or pictured with a low ring and 4AS, 250-350 um long (Rossaro, 1980).
The Wyoming specimens showed most of these variations. In summary, the procercus is a very low ring, sometimes apparently absent (artifact) with four, long, strong AS that are dark brown (sometimes blackish) and about 300 um long.
TA: parapod 1:3 or 4. TA ends slightly pointed.
Post.parapod. Longer than preanal segment. Claws blackish.
Remarks. I believe all specimens, Wuelker, Rossaro and the Utah and Wyoming specimens are incallida. The Rossaro description is grounded in many associations on an Italian population; Wuelker's on Schwarzwald specimens.

The differences are probably due to the observer or intraspecific variability of the Diamesa. This seems to be an easily separable species by the long, dark anal setae and the long, nearly unannulated antenna. The key represents the Rossaro populations by incallida-form A and the Wuelker version by incallida-form B.

20. D. insignipes Kieffer 1908
(= D. prolongata Kief.)
Distribution. Wyoming, Utah: 39°41' N 110°53' W and 38°52' N 111°06' W.
Ecology. Only Diamesa widely distributed in the lowlands of Europe. Utah specimens found about 1800 m alt. in streams.
Description. From Pankratova (1970).
Head. Yellow with wide, black postoccipital margin.
Mentum. Wide flat median that may be notched with wear. First laterals same height as median, followed by 8 more pairs of lateral teeth.
Antenna. Segment ratio 10:2.5:2:1:1. AR 1.5. RO in basal fourth and a circular pit near it, and another pit in the last fourth. Blade unequally bifid reaching IV.
Labrum. As in D. thienemanni Kief. However, clearly depicted with two lamellar groups, each having 7 simple spines (type 1A?); chaetae mediae near type 1A.
Premandible. Six teeth not deeply incised. (Form is unique.)
Mandible. Normal. Si with 35-40 branches (believe this to be erronous and the number being about 20).
Maxillary palp not noticeable (relative term).
Body. Length 10-12 mm; color green.
Procercus. Low ring with 4 strong anal setae. Two small anteriolateral setae, one twice the other.
TA: parapod 1:5; TA ends rounded.
Post. parapod. Twice the length of the penultimate body segment.
Remarks. The Utah specimens, D. cf. insignipes (figs. 1,26-28) differs slightly from the above as follows:
Head. To dark brown.
Mandible. Five subsequent stubby teeth-worn rounded and subequal; Si with 20+ branches.
Body. 7-8 mm. Brownish in mount.

21. D. leona Roback 1957
(= D. pieta Rob. and D. caena Rob).
Distribution. Cordilleran: Montana, Idaho, Wyoming, Nevada, Utah, Colorado; eastern: Minnesota, Quebec, Nebraska.
Ecology. Adults collected near large streams.
Description. From associated specimen (Univ. of Minn. Collection: DH 69.249); determination: D. Hansen.
Head. Black-brown with clear eyefield.
Mentum. Near D. heteropus but with 9-10 lateral teeth.
Antenna. Seg. ratio 41:18:9:2.5:4um; AR 1.2; ALAW 2.75. Segment I with basal RO and two circular pits. (see D. sp.3 below).
Labrum. S-setae apparently simple. Lamellae composed of a central group with 6 hooks and on each side a group with 4 hooks. Flanking the lamellar groups, a wide dentate plate type 2 chaeta media.
Premandible. Normal.

Mandible. Worn (apparently normal).
Body. Length 7.5 mm.
Procercus. A discernable ring but sclerotized orally only. Four AS (217um) and an anteriolateral seta (38um).
TA: Parapod about 40%.
Post. parapod. 800um long. Conspicuous ventrobasal bristle, 30um.

22. D. leoniella Hansen (1976)
Distribution. California, Washington, Montana, Wyoming.
Ecology. Small streams 1800-3000 m alt.
Description. From paratype specimens Univer. of Minn. Collection.
Head. Black-brown.
Mentum. Median tooth worn. The first laterals small and closely appressed to the median (may be obliterated); 8-9 additional saw-toothed, subequal lateral teeth curving away from median section. About 140um wide.
Antenna. Seg. ratio 41:13:7.5:2.5:2.5um. AR 1.5. ALAW 2.5-3.0.
Labrum. SI spike-like; SII?; SIII fine and bifid. Lamellae a group of 20 close-set, type 1 hooks; these flanked by dentate plate, type 1, chaetae mediae.
Premandible. Normal.
Mandible. First lateral large and wedge shaped, but, in general, normal.
Si with about 25 branches.
Body. Length 6.5-8mm.
Procercus. A low ring with four AS 180um long; the anteriolateral seta about 20% as long.
TA:parapod 1:2.
Post. parapod. About 550um long.

23. D. lindrothi Goetghebuer 1931
Distribution. Holarctic. Boreoalpine. Greenland. Once considered northern and separate from its sister species, D. latitarsis Goetgh.
Description. From Saether (1968).
Antenna. AR 1.5. Ant:mand. 1:2. Antenna length 81 um. Blade reaching IV.
Labrum. SII subdivided into eight branches as in D. valkanovi Saether.
Mandible. As in gp- latitarsis (see below).
Procercus. As in gp- latitarsis, i.e., absent, 4 anal setae 50-70 um long and one anteriorly placed, small seta.
TA 160 um x 90 um.
Remarks. The species discussed in Saether (1968) as lindrothi may be D. bertrami Edw. (Rossaro, 1980).

24. D. mendotae Muttkowski 1915 Fig. 17A.
Distribution. Wisconsin, Minnesota, South Dakota.
Ecology. Lake inlets in gravel, rock and vegetation. Spring fed stream (Hudson, 1971).
Description. From Johannsen (1937)
Head.
Mentum. Median tooth low and wide ("paired") and six pairs of laterals.
Body. Length 10-11 mm. Color, cream-yellow, dorsum with ochre flecks.
Procercus. Present with 3-4 anal setae.

25. D. nivicavernicola Hansen (1976).
Distribution. Alaska, Washington.
Ecology. Alpine snowfield.

26. D. nivoriunda Fitch 1847
Distribution. Widespread eastern U.S.: Newfoundland to Alabama. and midland: Ontario, Quebec, Michigan, Minnesota.
Ecology. Rheophil. Perhaps tolerant to a wide range of environmental conditions. Description. From Johannsen (1937)
Head. Dark brown.
Mentum. An even convex arc with 19 rounded teeth.
Labrum. Lamellae composed of many simple spines.
Mandible and Premandible normal.
Body. Length 10-12 mm. Color pale greenish.
Procercus. A low ring bearing 4-5 anal setae and a small anteriorly placed seta.
Remarks. D. nivoriunda is perhaps the best known eastern Diamesini. Johannsen felt that the then known adults of the D. nivoriunda-gp. should be synonyonized. Larvae seem similar to D. cinerella Mg. except for its AR. It would most probably key at D. sp.12.

27. D. simplex Kieffer 1926
Distribution. Arctic through Alaska to British Columbia and Wyoming; the northern most occurring insect.
Ecology. Borealpine. Adult near D. aberrata Lund.

28. D. sommermani Hansen (1976)
Distribution. Alaska.

29. D. spinacies Saether (1969) Figs. 18-21.
Distribution. Alaska, Alberta, California, Idaho, Wyoming, Colorado, Utah.
Ecology. Large mountain streams, 2400-3000 m alt.; springs.
Adult near D. arctica Kief.; pupa near D. spitzbergensis Kief.; larva near D. davisi Edw.
Description. From Saether (1969).
Head. Brownish-black.
Mentum. Two forms: (1) a simple median, slightly elevated from 10 pairs of lateral teeth. (2) a notched, wide median, lower than first laterals; mentum could appear as having 22 teeth (fig. 21).
Antenna. Segment ratio 62:18:8:4:4 um. AR 1.9. ALAW 3.1.
Blade reaching IV; peg sensillum reaching near apex.
Labrum. As in davisi.
Premandible. With 7 digits, 89 um long.
Mandible. With large teeth, the first lateral subequal to the apical tooth (see sp.12).
Body. Length 6.5-9 mm. Color brown.
Procercus. H/W 0.5, no spurs; four anal setae 270 um long and a small seta in front of procercus, 55 um, and one behind.
TA:parapod 1:2.

Remarks. Fig. 21 represents a specimen from AK, Kwalina (see sp. 13). It fits D. spinacies; however, the SIII may be simple, the body has noticeable setae as sp.13, and the median of mentum is definitely bifid.

30. D. vockerothi Hansen (1976)
Distribution. Ontario, Quebec.
Ecology. Semipermanent, lowland stream. Adult in the D. nivoriunda-gp.

Unnamed species 1-16

D. sp. 1. Figs. 10 A-B.
(= D. sp.A Saether (1970); he implies this may be D. ursus Kieffer, a member of the D. cinerella -gp.)
Distribution. Colorado, N. Boulder Cr.(D. ursus northern in distribution).
Ecology. Mountain brook, snowfield
Description. From Saether (1970)
Head. Fuscous
Mentum. Median notched and equal to the first lateral teeth. 19 teeth total.
Antenna. Seg. ratio 37:9:5:3:3. AR 1.8; ALAW 3. Blade nearly reaching apex. Peg sensillum small.
Labrum. SIII bifid. Lamellae, a compact row of spines with the median ones with 2-3 points and most lateral ones with 5 points; 16 spines in all (probably type 1; see fig. 5).
Premandible. Brown; 7 teeth.
Mandible. depicted as narrow, first lateral not as long as apical, i.e, rather normal in form. Si with 20 branches, inner ones longer.
Body. Length 6.5 mm. Color brown; partly brownish marbled.
Procercus. Absent with one anal seta, 45 um.
TA: parapod about 1:1.

D. sp.2 Figs. 10 C-D.
(= D. sp.B Saether(1970): considers larva with the D. latitarsis-gp, but see below).
Distribution and Ecology same as sp.1.
Description. From Saether (1970)
Head. Brown.
Mentum. Depicted with median notched and twice as wide as the first lateral; 9 pairs of lateral teeth, in all, forming a smooth convex arc.
Antenna. Seg. ratio 21:6.5:4.5:4:4. AR 1.1, ALAW 2.5. Blade reaching about half way to apex. Peg sensillum reaching IV.
Labrum. SIII very fine, simple. SI horn-like. Depicted with lamellae of 8 spines with 3-4 teeth, and these flanked by wide dentate plate chaeta media.
Premandible. Normal.
Mandible. The three distal teeth are subequal and pointing with the longitudinal axis; two small and one false tooth at shoulder. Base of mandible broad. Si with 18 branches, the inner five longest.
Body. Length 6.5 mm. Color olive and brown.
Procercus. As in sp.1: one seta, 45um long.
TA: parapod 1:2. TA rounded.

D. sp. 3 Fig. 14.
(= D. latitarsis Goetgh. (var.1) (Tilley, 1978))
Distribution. Alaska: arctic, as for sp. 5; subarctic, Valdez at Canyon Slough and L. Tonsina R.
Ecology. Arctic and mountain streams.
Description. From Tilley (1978) and supplemented.
Head. Dark brown or dark amber. 430 x 310 um.
Mentum. Arc of 24 teeth. Median with two teeth which are equal in height but half the width of the first laterals; these four teeth sit above the remaining teeth. (The two median teeth vary in separation.)
Antenna. AR 1.3 ALAW 2.2 RO in basal fifth; nearby a small circular pit and then another pit just above the middle of the segment.
Ant: mand: premand. about 1:2:1.
Labrum. SIII arising from base as two equal spines (and frayed distally?). SI blade-like; SII hairlike. Lamellae, three central groups of type 2 spines making about 11 points; flanking these on each side, a broad dentate plate (type 2) chaeta media.
Premandible. Normal.
Mandible. First lateral longest, subequal to the apical and the three remaining teeth reduced.
Body. Length 3-10.5 mm. Color dark yellow to brownish.
Procercus. Absent. Four stout anal setae (75-140) um). Anteriorly placed seta about one-third as long.
Remarks. Tilley's D. latitarsis Goetgh.-variation species do not fit the descriptions and notes of Pankratova and Saether for D. latitarsis Goetgh. This species most closely resembles D. valkanovi Saet. The remaining D. latitarsis variation species of Tilley (1978) do not even belong in the latitarsis-gp. (See D. latitarsis-gp. below).

D. sp.4. Figs. 10E-F.
(= D. sp. C. Saether (1970)
Distribution and Ecology as for sp.1.
Description. From Saether (1970).
Head. Black-brown
Mentum. Divided median into two teeth that are equal in height but half as wide as the first laterals; second laterals subequal to the first but stand lower; and the remaining eight pairs of lateral teeth are smaller and slope off. Twenty-two teeth in all.
Antenna. Seg. ratio 23:8:5:3:3. AR 1.2 ALAW variable. Blade as in D. latitarsis Goetgh. Peg sensillum reaching IV. Ant: mand: premand. 42:78:43.
Labrum. SI large, hornlike, SII and SIII simple, hairlike. Labral lamellae with six groups of spines (reportedly as in D. latitarsis).
Premandible. Normal.
Mandible. First lateral largest, subequal to apical tooth; remaining three teeth reduced. Si with about 20 branches, inner group larger.
Body. Length 7 mm. Color brownish marbled.
Procercus. Absent. Four anal setae and an anteriorly placed seta that is half as long (as in D. lindrothi/latitarsis).

D. sp.5 Fig. 16.
(=D. latitarsis Goetgh. (var.2) (Tilley, 1978))
Distribution. Alaska, Brooks Range about 68°00'N 149° 00'W.
Ecology. Arctic stream
Description From Tilley (1978) and supplemented.
Head. Dark brown. 440 x 320 um.
Mentum. Single median that may be slightly notched and 9-10 pairs of lateral teeth curving away in smooth arc.
Antenna. AR 1·5. ALAW 2.2. Seg. I short 40 um. RO and pits as in sp.3. Blade reaching IV. Ant: mand: premand. about 1:2:1.
Labrum. SI and SII spine-like. SIII simple, hairlike. Lamellae a tight group of simple spines (type 2) about 12 in number; flanked by a spinulose plate (type 1) chaeta media.
Premandible. Stout.
Mandible. Two distal teeth subequal and the remaining three lateral teeth reduced.
Body. Length 5 mm. Color grey in alcohol.
Procercus. Present, a very low ring H/W 0.3. Four anal setae (160 um); anteriorly placed seta one-third as long.
Remarks. See remarks for sp.3.

D. sp.6 Fig.12.
(= D. latitarsis Goetgh. (var.3) (Tilley, 1978)).
Distribution and Ecology as in sp.5.
Description. Tilley (1978) and supplemented.
Head. Amber to dark brown. 480 x 350 um.
Mentum. Median notched and twice the width of first lateral; 10 pairs of laterals fall off regularly in size and position to form an arc.
Antenna. Seg. ratio 58:13:9:3:3 um. AR 2.0:ALAW 2.7.
Labrum. SI blade-like; SII and SIII hairlike. Lamellae a group of about 20 hooks (type 1), flanked by a paddle-like, dentate plate (type 1A).
Premandible. Curved stem and 7 teeth.
Mandible. The distal three teeth are somewhat larger than the remaining two lateral teeth. Similar to D. sp.2.
Body. Length 6 mm. Color grey in alcohol.
Procercus. Absent. Four anal setae (85-95 um long, 4 um wide) short and thick; anteriorly placed seta about one-third as long.
Remarks. See remarks for sp.3.

D. sp.7. Fig. 29A
(= D. cineriella Mg. (sic) in Tilley (1978)).
Distribution and Ecology as for sp.5
Description. Tilley (1978) and supplemented.
Head. Amber to dark brown. 560 x 400 um.
Mentum. Median single, notched and flared apically, forming a triangular shaped mentum with the 9 pairs of lateral teeth.
Antenna. Seg. ratio 52:18:10:3:3 um. AR 1.5. ALAW 2.1. RO and pits as in sp.3.
Labrum. S-setae simple. Lamellae, only about three simple hooks (type 1), flanked by a dentate paddlelike chaeta media (as seen on 3rd instar).
Premandible and mandible normal.
Body. Length 6.5-10.5 mm. Color white in alcohol.
Procercus. Low ring bearing 4 anal setae (240 um); the anteriorly placed seta about one-fifth as long.
TA: parapod about 1:1.
Remarks. This does not fit D. cinerella Mg. as described in Pankratova (1970).

D. sp.8 Fig. 6.
Distribution. Alaska, Valdez, Little Tonsina R.
Description.
Head. Brown
Mentum. Trapezoidal. The notched median and first three pairs of laterals forming a straight line; the remaining seven or eight pairs of lateral teeth sloping obliquely.
Antenna. AR 2.1; ALAW 2.5. RO and pits as in D. sp.3.
Labrum. SI thick blade; SII hairform; SIII hair-like, bifid.
About 25 type 1 lamellae bounded on each side by a dentate plate (type 1) chaeta media.
Premandible. Normal.
Mandible. Large wedge-shaped teeth; all but the proximal appearing subequal. Si with 21 branches.
Body. Length 4 mm. Color creamy in alcohol.
Procercus. Absent. Five AS about 280 um long; no anteriorly placed seta seen.
Post. parapod. Claws brown.

D. sp.9 Fig. 13.
Distribution. Alaska, Galbraith Camp. 68° 27'N 149° 28'W
Description. (3rd instar?)
Head. Brown.
Mentum. Middle three teeth appressed together and standing above the remaining seven or eight pairs of equal lateral teeth, forming a wide arc.
Antenna. AR 1.0. ALAW 1.5. RO and pits as in sp.3.
Labrum. S-setae simple. Lamellae in three groups (type 1A with about five points each); flanking these, a dentate plate (type 1) chaeta media.
Premandible. Normal.

Mandible. First lateral subequal to apical and three proximal teeth subequal and about one-half as large as apical.
Body. Length 3 mm. Color brownish in alcohol.
Procercus. Absent. Four AS about 100 um long and an anteriorly placed seta that is about one-fourth as long.
TA rounded ends and one-third as long as post. parapod.
Post. parapod. Elongate, twice the preanal body segment. Claws dark brown.

D. sp.10 Fig.15.
Distribution. Alaska, Valdez, Canyon Slough, with D. sp.3.
Description.
Head. Brown.
Mentum. The three median teeth sagittate and standing above the remaining 8 or 9 pairs of laterals.
Antenna. AR 1.2; ALAW 2.0 Blade to mid V. Peg sensillum reaching to V. RO at base and smaller circular pit above middle.
Labrum. SI blade; SII short spine; SIII simple hair. Lamellae, with about 16 type 2 spines and flanked by a broad spinulose plate (type 1) chaeta media.
Premandible. Normal.
Mandible. First lateral subequal to apical and the three proximal teeth reduced.
Body. Length 3-4 mm. Color brownish in alcohol.
Procercus. Absent. Four AS (130 um) and a short anteriorly placed seta.
Post. parapod. Elongate (600-700 um). Claws brown.

D. sp.11. Fig. 24.
Distribution. Alaska, Valdez, L. Tonsina R.
Description.
Head. Yellow.
Mentum. Median notched and first laterals appressed to it; seven additional pairs of lateral teeth arching downward; the 2d, 3d, 4th pairs, wide, wedge-shaped.
Antenna. AR 2.0 ALAW 2.6 RO and pits as in sp. 3. Blade and peg reaching IV.
Labrum. SI blade-like, SII hairlike, SIII hairlike, bifid or trifid.
Lamellae in 3 narrowly separated groups (type 1A): center groups with 4 hooks; lateral groups with 5 hooks. The flanking chaeta-media, narrow with only three points.
Premandible. Normal.
Mandible. Normal. Si with 20^{+} branches.
Body.
Procercus. Very low ring with 4 AS (300 um) and a very short anteriorly placed seta.
TA: parapod 1:3.
Post.parapod. Longer than preanal segment of body; claws dark.

D. sp.12 Figs. 22-23.
Distribution. Alaska, Valdez, L. Tonsina R.; PA, E. Brandywine Cr. nr. Cupola.
Ecology. Rhoicosphenia (diatom) in gut of PA specimen.
Description.
Head. Light brown.
Mentum. Median tooth simple and not much wider than first lateral tooth.

The 17-19 teeth form a gentle, continuous, convex arc.
Antenna. AR 2.0. ALAW 2.6. Blade reaching IV. RO and circular pits as in sp.3. Peg sensillum reaching V.
Labrum. SI blade-like; SII and SIII simple. Lamellae, about 20 type 1 hooks with a spinulose plate chaeta media flanking them.
Premandible and mandible normal. Si 20^+ branches.
Body. Length about 6 mm. Color brownish in alcohol.
Procercus. A low ring with 4 AS, 300 um long and an anteriorly placed seta about one-fourth as long.
TA: parapod 1:4. TA ellipsoidal.
Post.parapod. Longer than preanal body segment; claws brown.

D. sp 13. Fig. 25.
Distribution. Alaska, Kivalina, Kaurorak spring.
Description. (3d instar?)
Head. Brown
Mentum. Median notched and with the first 3 or 4 pairs of laterals forming a straight line, then, the remaining 5 or 6 pairs sloping off. 19 teeth total
Antenna. AR 1.5. ALAW 2. Blade and peg reaching IV. RO and circular pits as in sp. 3.
Labrum. SI horn-like; SII and SIII hairlike. A continuous row of 22 type 1 hooks under the SI and flanking these lamellae, a spinulose plate (type 1)chaeta media.
Premandible. Normal.
Mandible. As sp. 6. Si with 21 branches.
Body. Abdominal segments with conspicuous setal pattern (75-100 um long and yellow). Length 7.5 mm. Color brownish in alcohol.
Procercus. Ring (H/W 0.4). Four or five AS 250 um long and an anteriorly placed seta about one-fourth as long.
TA: parapod 1:2.
Post.parapod. 1.5 times longer than preanal body segment; claws brown.
D. sp.14.
Distribution. Delaware, near Newark, Christina R.
Ecology. Typical periphytic diatoms in gut. Sewage influent present.
Description
Head. Luteous.
Mentum. Width 129 um. Median notched; median three teeth largest; only 8 pairs of laterals. Generally as depicted for D. sp.12.
Antenna. AR 1.6 ALAW 3.0. Seg. I is 53 um. Blade reaching mid IV. RO and pits as in sp.3. Peg sensillum reaching V. Ant: mand: Premand. 1:2:1.
Labrum. As in D. spinacies/davisi.
Premandible and mandible normal; generally as that depicted for sp.12.
Body. No conspicuous setae.
Procercus. Very small ring H/W 0.25. Four AS (280 um) and an anteriorly placed seta that is about one-fourth as long.
TA parapod 1:2.
Post.parapod. Longer than the preanal segment of body; claws brown.
Ventrobasal bristle 48 um.
Remarks. D. sp.14 separable from davisi on minor differences of head color, mentum, and procercus.

D. sp.15 Figs. 29 B-D.
Distribution. Wyoming.
Ecology. Small streams about 3000 m alt.
Description. From WY specimens collected by Hansen and in Univ. of Minn. Collection.
Head. Dark brown with noticable eye field surrounding eye spot.
Mentum. As in D. aberrata, but the median tooth simple (worn so?) and only 21 teeth total.
Antenna. Seg. I 69 um, and as in aberrata. Blade and peg sensillum often reach mid IV. Ant: mand: premand. 1·1:1·9:1.
Labrum. As in aberrata except only about 30 type I lamellae counted. The flanking chaetae mediae as described for sp.16.
Premandible. Normal.
Mandible. As in aberrata.
Body. Length about 8 mm. Color brownish in alcohol.
Procercus. As in aberrata; no anterior spurs seen; AS as described for aberrata but somewhat longer, 120 um.
TA:parapod about 25-30%.
Post. parapod. As in aberrata.
Remarks. This species is extremely close to D. aberrata.

D. sp.16. Figs. 29 E-F.
Distribution. Wyoming, Powder R. Pass; collected by Hansen and in the Univ. of Minn. Collection.
Ecology. Spruce forest zone, 2900 m alt. Found with D. incallida.
Description.
Head. Luteous.
Mentum. The first laterals appressed to the median; 8 additional pairs of lateral teeth decending regularly.
Antenna. AR 2.2. ALAW 3.5-4. Seg. I, 77 um. RO in basal fifth; a smaller circular pit near RO and another in the upper part of the second third. Blade and peg sensillum reach mid IV. Ant: mand: premand about 1·1:1·8:1
Labrum. SI strong, sometimes colored; SII hairlike; SIII hairlike and bifid. Lamellae a tight cluster of about 16 type 1 (single pointed) hooks. The spinulose chaeta media is strongly bilateral as in incallida: the number of lateral dissections on the central axis reduced and the four or five medial ones are strongly parallel and cut one-third to one-half into its total length.
Premandible. Normal.
Mandible. Approximately normal, but the first lateral large and wedge-shaped.
Body. Length 8-11 mm. Color, yellow-brown in alcohol.
Procercus. Barely noticable and often with a small invagination in the anal sclerotization. Four AS 250-300+ um; anteriorly placed seta about one-fourth as long.
TA:parapod 1:3-4; TA with rounded ends.
Post.parapod. 700-800 um. Claws dark.
Remarks. Many aspects of this species resemble D. incallida and D. sp.11, but it is very similar to D. zernyi in Ferrarese and Rossaro (1981).

D. cinerella and D. latitarsis groups

The following are brief notes on two palaearctic groups that relate to some possible and some definite nearctic species. These group names refer to similarity in adults, but they have also been frequently used in the literature reviewed.

D. cinerella - group
This group is closely related to the D. nivoriunda-gp., and it contains, for example, the palaearctic species D. cinerella Mg., D. thienemanni Kief., D. ursus Kief., and the holarctic D. bohemani Goetgh.

D. cinerella Meigen 1838.
(= D. waltlii Mg.)
Type species for the genus. It can not be separated from thienemanni or bohemani (Pankratova, 1970 and Rossaro, 1980).

D. thienemanni Kieffer 1909
Distribution. Palaearctic
Ecology. Upland spring streams.
Description. From Pankratova (1970) and Ferrarese and Rossaro (1981).
Head. Brown mottled, with typical dark triangle on frontoapotome. Eye spots coalesced.
Mentum. Median rounded and slightly below the first laterals; median and 9 pairs of lateral teeth form even arc.
Antenna. Antenna I 54-80 um; AR 2.0-2.1 (Pankratova gives 2.3) RO and a small sense pit in basal fourth; another pit in apical fourth. Blade and peg sensillum reach IV.
Labrum. SIII bifid. Chaetae mediae apparently dentate type 1A; labral lamellae composed of 16-20 separate hooks with denticulations apically.
Premandible. 7-8 teeth.
Mandible. Normal.
Body. Length 8-10 mm. Color brown.
Procercus. Very low ring with four long, 250-300 um hairlike anal setae and an antero-laterally placed seta on body.
Post. parapod. As long as preanal body segment, 600-700 um.
Remarks. Inseparable from D. cinerella, D. bohemani, D. zernyi.

D. latitarsis-group.
This group consists of palearctic mountain populations (Rif-Blanc, High Tatra) that are near D. latitarsis Goetghebuer 1921, (e.g., D. valkanovi Saether in part (Rossaro (1980), its sister species, D. lindrothi Goetgh. and herein, D. steinboecki Goetgh.) The most useful evaluation of this group is given by Rossaro (1980). Larvae have elongated posterior parapods, very short anal setae, about the length of a post. parapod claw, the SIII split into many branches, and a scale at the base of the SII. These characters are variable, however, and it is difficult to separate the larvae. The key of Thienemann (1952) is in error on this group (Wuelker, 1959).

D. latitarsis Goetghebuer Fig. 11A inset.
Distribution. Palaearctic.
Description. Very close to D. steinboecki and separable only by procercus; see key.

Remarks. Saether (1968) describes two forms of D. valkanovi, one normal and one stunted form. The stunted form looks more like that described in Wuelker (1959), Pankratova (1970), Thienemann (1952), Rossaro (1980, in part) and Ferrarese and Rossaro (1981) as D. latitarsis Goetgh.

D. steinboecki Goetghebuer 1933 Fig. 9.
Distribution. Holarctic? AK: Galbraith Camp, Atigun River basin.
Ecology. Alpine torrents, free living, epilithic - the glacier-fly.
Description.
Head. Dark brown; fused eye spots in a bright field; head held at 45 degrees, like Cryptochironomus (Thienemann, 1952).
Mentum. Median bifid and subequal to first lateral teeth, forming a straight line; the 8 or 9 additional pairs of laterals slope off obliquely, forming a trapezoidal mentum. Median teeth may be obliterated.
Antenna. AR 1.5 $\pm$0.2; ALAW about 2.2. Seg. I 39 $\pm$3 um; RO in basal fourth and one circular pit nearby, another at middle. Blade and peg sensillum reaching IV or V. Ant:mand:premand:27:52:22 (Tilley, 1978).
Labrum. SI strong, hooked-shaped. SII simple with a scale attached to each socket. SIII shown split to base in three parts (Wuelker 1959) and shown split in four parts (Rossaro 1980); the distal ends of these parts may be further dissected. Between the SII an additional, often dark, scale. Lamellae in three groups of 5-6 hooks (type 1A) and on each side a broad dentate plate (near type 1A). Chaetae mediae depicted in Wuelker (1959) as oval, toothless plates and an additional pointed spine across from the SI - an elongated labral rod?.
Maxilla. Palp cup-shaped; H/W about 1; portions of rim bearing many fine hairs.
Premandible. Distinctive, distal portion lighter than stem, bearing 7 irregular, weak teeth, figure 9.
Mandible. Five teeth worn? subequal Pankratora (1970), Wuelker (1959) and Rossaro (1980), or with the 3rd lateral largest (Ferrarese and Rossaro, 1981), or with the distal three teeth large and subequal and the remaining two reduced Tilley (1978) and Si with 20 branches (fig. 9).
Body. Length 6-9 mm. Color brown.
Procercus. No trace; and only with careful microscopy can one discern the two 20-30 um hooks and a third needle-like anal seta (diagnostic). TA fingerlike.
Post. parapod. Elongate, 700-1000 um and ventrobasal bristle, 13 $\pm$ 9 um (Rossaro, 1980; Ferrarese and Rossaro, 1981).
Remarks. It is believed that all descriptions correctly relate to steinboecki based on the diagnostic character, the procercus, that ties them together. There is no previous evidence that this species is Nearctic.

PROTANYPINI

PROTANYPUS Kieffer 1906 (Edwards, 1929)

(= Didiamesa Kieffer).

Protanypus is a unique Diamesinae, reminiscent of the tanypods. The larvae are free-living, predatory, dwelling in the profundal zone of oligotrophic lakes of the boreal/alpine and the littoral zone in the arctic. The genus is an important member for lake typology studies Saether (1975b). From the palaearctic, high, cold lakes it is listed as having a 2-year life cycle. Dr. Mozley relates to me that in the Alaskan arctic, the cycle is perhaps 3 years with perhaps 3 cohorts present. However, Dr. Hansen states he has specimens from a small stream in Wisconsin where he has found D. mendotae and P. orthogonia; he has even found Protanypus in the mud of a tiny springhole (D. Hansen, personal communication).

A general description of Protanypus is composed from Saether's two nearctic species and P. saetheri:

Head. Roundish, covered with short setae. The black postoccipital margin with lateral, posterior directed, projections (diagnostic). Gular area with two longitudinal black bands.

Mentum. A broad light colored, irregular median plate flanked by a few dark, inclined dorsomental teeth. ~~The pharyngeal area with a "ligula-like" appendage.~~ The hypopharyngeal area has a ligula-like structure that is bilaterally dissected into a 6-7 side branches and terminated by two subequal blades. These two terminal blades are the median lamellae (ML). See figure 2C.

Antenna. Four segmented. AR 2-3. Segment I with two blades of near equal length; RO in basal fifth. Segment II with a pair of peg sensilla.

PE area. With serrated and dissected flat scales; the PE composed of three of the largest, anteriomedial ones.

Labrum. No lamellae on the anterior edge, but a V-row of overlapping lamellae present in the middle of the labrum.

Premandible. About 6 weak teeth oriented on the same axis as the stem.

Mandible. Distinctive with a black apical tooth longer than the combined width of the five equally reduced laterals. Possesses no seta interna; the seta subdentalis small, splinter-like.

Body. Length 7-12 mm. Body brown.

Procercus. H/W 3. Six anal setae and two weak lateral setae.

TA triangular and about one-third as long as parapod.

Posterior parapod. Claws yellow, the majority blade-like, but two short claws hook over a finely serrate anterior portion of its base.

KEY TO THE SPECIES OF PROTANYPUS MODIFIED FROM SAETHER (1975[a]):

1. 16-22 medial, labral lamellar-scales.....2
- 10-12 labral scales.....4
2. About 22 lamellar-scales. AR 2; peg sensilla equal. Smooth terminal blades of prementum (ML). P. sp.A Saether (1975).
- Less than 19 labral scales.....3
3. Antennal blade surpassing terminal segment. Premental ML smooth. AR 3. Possessing 16 labral scales. Palaearctic..... .....P. morio Zetterstedt 1840. (=Didiamesa miriforceps Kieffer).
- Blade just overreaching Seg. II; peg sensilla not equal. ML notched or serrated.....6
4. AR 2.0. Perhaps Holarctic.....P. cf. caudatus Edwards 1924; Zavrel, 1926. (Differientiation not made between larvae of caudatus and forcipatus Egger 1863.)
- AR 2.2 - 2.7; one peg sensillum about twice the second and reaching the apex of the antenna.....5
5. Ratio of maximum width to the basal width of the premental appendage is 2.4-2.5 and the supporting endoskeleton 1.6-1.7 times as wide as the median tooth. AR 2.2.....P. ramosus Saether (1975).
- The maximum to basal ratio being 1.9-2.2 and the endoskeleton being 1.3-1.6 times the median tooth. AR 2.3-2.7..... ....P. hamiltoni Saether (1975).
6. AR 2.9. Apex of ML serrated. Labrum with 17 scales..... ..... P. sp.B Saether (1975).
- AR 2.1-2.5. Apex of ML notched only. Labrum with 16 scales. (figs. 30-31) ....P. saetheri Wiederholm (1975).

Species.

The following area few notes not given in the key and general description that pertain to five Nearctic species. Saether (1975[a]) gives illustrations of larval head parts.

1. P. hamiltoni Saether (1975).

Related to the species pair caudatus-forcipatus, these larvae are very similar. They are differiented in the key by minor differences based on instar IV, so caution is advised.

Distribution. British Columbia, Northwest Territories.

2. P. ramosus Saether (1975)

Distribution. Ontario, Manitoba.

See P hamiltoni.

3. P. saetheri Wiederholm (1975) Figs. 30-31.

Distribution. Subarctic/arctic. AK: Wood R. Lakes and north of Brooks Range, Toolik L., 68°40'N 149°25' W. Mozley believes it to be the only species in the area of Toolik L. Mozley remarks on the ecology: Found in soft sediments under 2.5-20 m. Soft water, 0.6 meg. L^{-1}, pH 7.0 or less. Three year life cycle (S. Mozley, personal communication).

4. P. sp.A Saether (1975)

Description limited to larvae; distribution limited by the single collection. Saether states that these are related to P. morio Zett.

DIAMESINI

PSEUDOKIEFFERIELLA Zavrel 1941
(Laurence) (Brundin (1956))

(= Diplomesa Pagast (1947), erecting new genus but see Cranston (1975).)

A boreoalpine genus, Pseudokiefferiella is found in cold, first order streams in moss and hygropetric places. It is very close to Diamesa and was often considered a subgenus; however, it is easily separated by the usually long, dark bristles on the body, the large procercus and the peculiar labral lamellae (fig. 5J).

The key below contains most of what little information was available.

A general description follows:

Head. Brown to black. Eye of two parts or contigious, sometimes in lighter field.

Mentum. Only 13 teeth. Median area usually composed of a separate group of five small teeth in an elevated semicircle, then flanked by four larger laterals (fig. 32).

Antenna. Basal segment large; RO in first fifth, blade unequally bifid. Peg sensillum long. AR 1.5-2.

PE area. As in Diamesa.

Labrum. S-setae simple. SI subequal SII; SIII fine hair. Labral lamellae, oval based and, apically, finely pectinate plates(fig.5J).

Premandible. Palmate with 5-6 teeth.

Mandible. Normal.

Body. A homogeneous series of long (200 um), dark, bristles, resembling the large supraanal setae, on abdominal segments. Length about 10 mm.

Procercus. Conspicious, H/W equal or greater than one, bearing 7 long, thick anal setae and a large, strong, lateral bristle. Procercus with sclerotization that may possess anally directed spur(s).

Post. parapods. Elongate, ending in 16 brown, simple claws.

KEY TO SPECIES OF PSEUDOKIEFFERIELLA

1. Mentum with a separate and usually lighter median area, composed of the first five teeth forming an independent arc..... 2
- Mentum unicolorous, distributed in a contiguous arc. AR 1.8. Procercus with spur and 6 anal setae; H/W about 1. Eye spots converge. Head brown. Three pairs of pectinate labral lamellae. Labral chaetae ramified. Length 10.5 mm. (Near P. sp.2 Zavrel, 1941). Boulder Cr., Colorado. ..... P. sp.H Saether (1970)
2. Procercus with no spurs; H/W less than 2. Chaetae of labrum simple..... 3
- Procercus with basal and subterminal spurs; H/W 2. AR 1.9. Labral chaetae simple. Labral lamellae as in sp.H? Eye spots separate. Length 4 mm. Boulder Cr., Colorado..... P. sp.J Saether (1970)

3. Mentum with 13 teeth. AR 2.5. Three equally large pectinate labral lamellae. Head brown. Procercus with 7 anal setae; H/W about 1. Alaska 68° 53'N 160° 21'W. (figs. 32-33.).....
..... P. sp.1[2/]

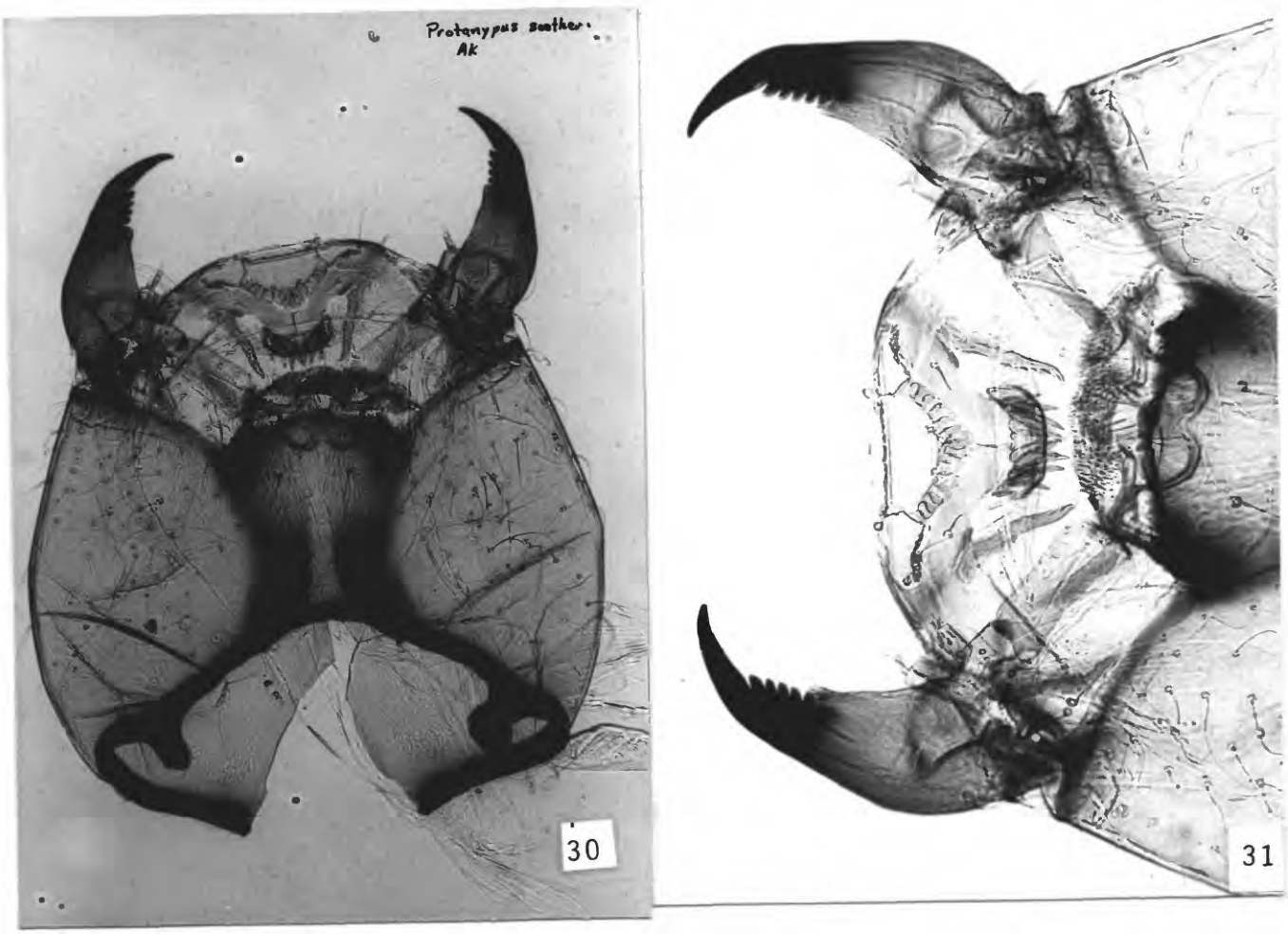
- Mentum with 15 teeth. AR 1.5. Two pairs of pectinate labral lamellae. Procercus with 7 anal setae; H/W 1.7. Eye spots contiguous. Head coal-black. Length 6-7 mm. Holarctic (Northwest Territories), boreoalpine.....P. parva Edwards 1932[3/]

2/ P. sp.I Tilley (1978) would key here except for its AR of 1.7 ± 0.2 (3rd instar?) which conforms more to other species. The keyed P. sp.1 has segments II and III about one-half "normal" length, making the AR much greater.

3/ See Ferrarese and Rossaro (1981) for larval description; also see Pankratova (1970), Saether (1970) Thienemann (1952) and Oliver (1959, 1978). Synonym: Diplomesa lapponica Pagast (1947).

Distribution. British Columbia, L. Marion.

5. P. sp. B Saether (1975)
Distribution. Ontario, L. George.
See P. sp. A.



Figures 30-31--Protanypus saetheri Wiederholm from Alaska. The inside length of the apical mandibular tooth is 113 um.

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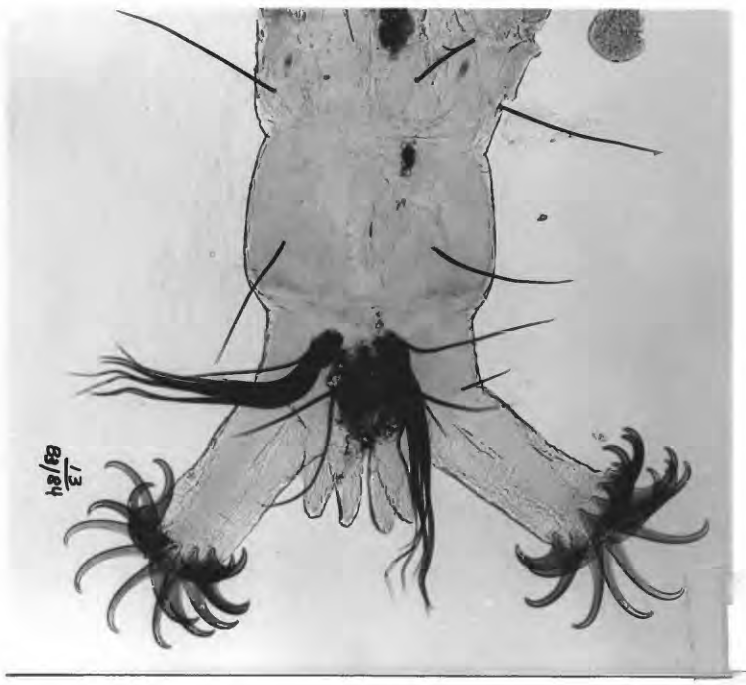

33

Figures 32-33--Pseudokiefferiella from Alaska: 32, Head, mentum width 167 um; 33, Caudal section.

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Summer, 1982.

AFTERWORD

Several important synonomies, range extensions, and new species have belatedly come to my attention.

D. coquilletti = D. tsutsuii Tokunaga (Willassen, Endre, 1982a: Doctor of Science Thesis, University Bergen).

D. leoniella = D. japonica Tok. (Makarchenko, E. A. 1981: BESPOZVONOCHNIE ZHIVOTNYE V EKOSISTEMAKH LOSOSEVYKH REK DALGNEGO VOSTOKA); but D. starmachi Kow. et Kow. nearer to D. leona and under research, Kownacki, 1983, personal communication (specimens of leona appreciated, to NAUK, CRACOW).

D. davisi = D. serratosioi(Willassen, Endre, 1980: Masters of Science Thesis, University Bergen, in part.) Only as described herein after Saether(1963, 1969), i.e.,it is still a valid species as described by Edwards and Hansen and Cook, but not as in Pagast and Serra-Tosio.

D. thienemanni = D. tonsa Haliday (Willassen, 1982a)
D. ursus = D. hyperborea Holmgren (Halvorsen, G. A. and others, 1982: Fauna Norvegica Ser. B, Vol. 29, p. 117, for taxonomic summary).

D. sp. 12 = D. nivoriunda Fitch, having about 16 type 1 LL and symmetrically deep cut ChM.

B. punctulata = B. legeri Goetghebuer (Freeman, Paul, 1959:

D. alpina Tok.,gp.-davisi, Calif. (Willassen, Endre, 1982b: Entomologica Scandinavica)

D. amplexivirilia partially described by Makarchenko, E. A., 1980: FAUNA PRESNYKH VOD DALBNEGO VOSTOKA, showing similarity to D. sp. 5 but procercus similar to D. aberrata; also, nearness to D. sp. 6 but AR 1.0-1.2.

D. lupus, Alaska, and D. sonorae, California, newly described by Willassen (1982b).

12/1983