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# NEW RECORDS FOR *CORYNOTHRIX BOREALIS* AND A STUDY OF ITS VARIABILITY (COLLEMBOLA: ENTOMOBRYIDAE: ORCHESELLINAE)

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*Abstract.* Five new locality records for *Corynothrix borealis* are reported. Specimens from Colorado, USA, represent the southernmost record for the species. Intraspecific variation of important taxonomic characters is discussed, with emphasis on differences in color pattern, number of setae on the tenaculum, and the presence of a conical papilla on the apex of the 4th antennal segment of specimens from near the northernmost shores of Lake Baykal, USSR. A peculiar arrangement of the bothriotricha of the 4th abdominal segment is reported for the first time in the Entomobryidae. Twenty-two figures complement the discussions on morphology.

Through the courtesy of Dr Andrzej Szeptycki, Institute for Systematic and Experimental Zoology, Polish Academy of Sciences, I have received 3 specimens of *Corynothrix* Tullberg collected near the northern shores of Lake Baykal, USSR. Study at first suggested that they represented a new species distinguished from the only other species of the genus, *C. borealis* Tullberg, 1876, by having violet-black pigmentation on the body, only 2 setae on the tenaculum, and a conical horseshoe-shaped papilla on the apex of the 4th antennal segment.

In order to verify the presence or absence of these characters in various populations of *C. borealis*, I reexamined the specimens from Banks Island, Canada, used in my previous study of this species (Mari Mutt 1980). I also had access to material from the Soviet Union that Dr E.F. Martynova lent to Dr Szeptycki and to specimens from Prudhoe Bay, Alaska, and the Rocky Mountain National Forest, Colorado, collected by Mr Arne Fjellberg, Tromso Museum, Norway. Thorough study of this material suggests that all the samples belong to a single, variable species, *C. borealis*.

To avoid needless repetition in the section on analysis of characters, the material studied is listed below and a locality number is assigned and used throughout the text. All localities except 3 and 5 represent new records for the species.

Morphological abbreviations used in this paper are as follows: Ant. 2, Th. 2, Abd. 2, etc. = 2nd antennal segment, 2nd thoracic segment, 2nd abdominal segment, etc.

## LOCALITIES, MATERIAL EXAMINED, AND SPECIMEN DEPOSITORY

I. USSR, northern shore of Lake Baykal, Malaja Siennaya Bay (small bay about 25 km NE of Angara outlet, nr Bolschyje Koty Vill), dry grassy slope (S exposure) with *Thymus* and *Sempervivum*, 29.VI.1974, under stones (Szeptycki, coll. no. 74/133), 3 spec. (1 dissected

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and mounted on 3 slides). Two spec. in the Institute for Systematic Zoology, Polish Academy of Sciences, Krakow, Poland (PAS); other spec. is in my collection.

II. As preceding locality but Listvianka Vill, about 3 km of [sic] Angara outlet, dry pasture on southern slope, 30.VI.1974, in old dry cow manure (Szeptycki, coll. no. 74/137), 1 spec. mounted on slide in PAS.

III. USSR, Wrangel Island, Rodgers Bay, gravel desert, 1.VII.1966 (K.B. Gorodkov), 6 spec. (3 on slides), 3 in PAS, the remaining 3 in my collection.

IV. USSR, Magadansk Prov, upper reaches of Kolyma Riv, Annytsak Range, mountain tundra, 600 m, 15.VIII.1976, 4 spec. (3 on slides), 2 in PAS, other 2 in my collection.

V. Canada, Northwest Territories, Banks Island, 2 km E of village of Sachs Harbour, stony well-drained ridge of coastal escarpment, 5.VII.1970, on flowers of *Lesquerella arctica* (P.G. Kevan), 9 spec. mounted on slides. Seven spec. in the collection of Dr Kenneth Christiansen, Department of Biology, Grinnell College, Iowa; other 2 spec. in my collection. This material was used for my 1980 description of *C. borealis.* At that time I was unaware of a paper by Kevan (1972) that detailed the complete collection data for these specimens.

VI. Alaska, Prudhoe Bay, 16.VIII.1976, thick dryas turf on pingo (A. Fjellberg, coll. no. 608), 8 spec. (4 on slides) deposited in my collection.

VII. Colorado, Rocky Mountain National Forest, above Lava Cliffs, about 3700 m, 7.VIII.1980, dry polygon fell fields, *Carex rupestris, Kobresia* (A. Fjellberg, coll. no. 262/80), 3 spec. on a slide in Mr Fjellberg's collection. This record will also be included in Mr Fjellberg's forthcoming paper on Collembola from the Colorado Front Range (in prep.).

## ANALYSIS OF CHARACTERS

*Pigmentation*

The typical color pattern consists of a light to dark olive-green background with dark blue-violet pigment on the eye patches, around the bases of the antennae, and on the dorsum of the head, where a V-shaped or trapezoidal spot of pigment is present. When placed in Nesbitt's fluid for clearing, the background pigmentation diffuses as light yellow-green pigment. Specimens from localities I, II, and IV have the body thoroughly covered by dark pigment (Fig. 1), which in Nesbitt's fluid disperses as violet-purple in color. In addition, these specimens have the antennae and legs thoroughly covered by dark pigment.

Martynova (1970) reported the presence of 2 color forms in samples from the mountains of Kirghiz SSR: some individuals were bright green and others light yellow. These phenotypes are present in the sample from locality VI.

*Apex of 4th antennal segment*

A papilla is absent from the apex of Ant. 4 (Fig. 6) in all the specimens except those from localities I and II, which bear a conspicuous, conical, horseshoe-shaped papilla (Fig. 4, 5) on the center of which is inserted a smooth seta (not shown in the figures). The open end of the horseshoe faces the large 2- or 3-pointed pin seta found in all the specimens.

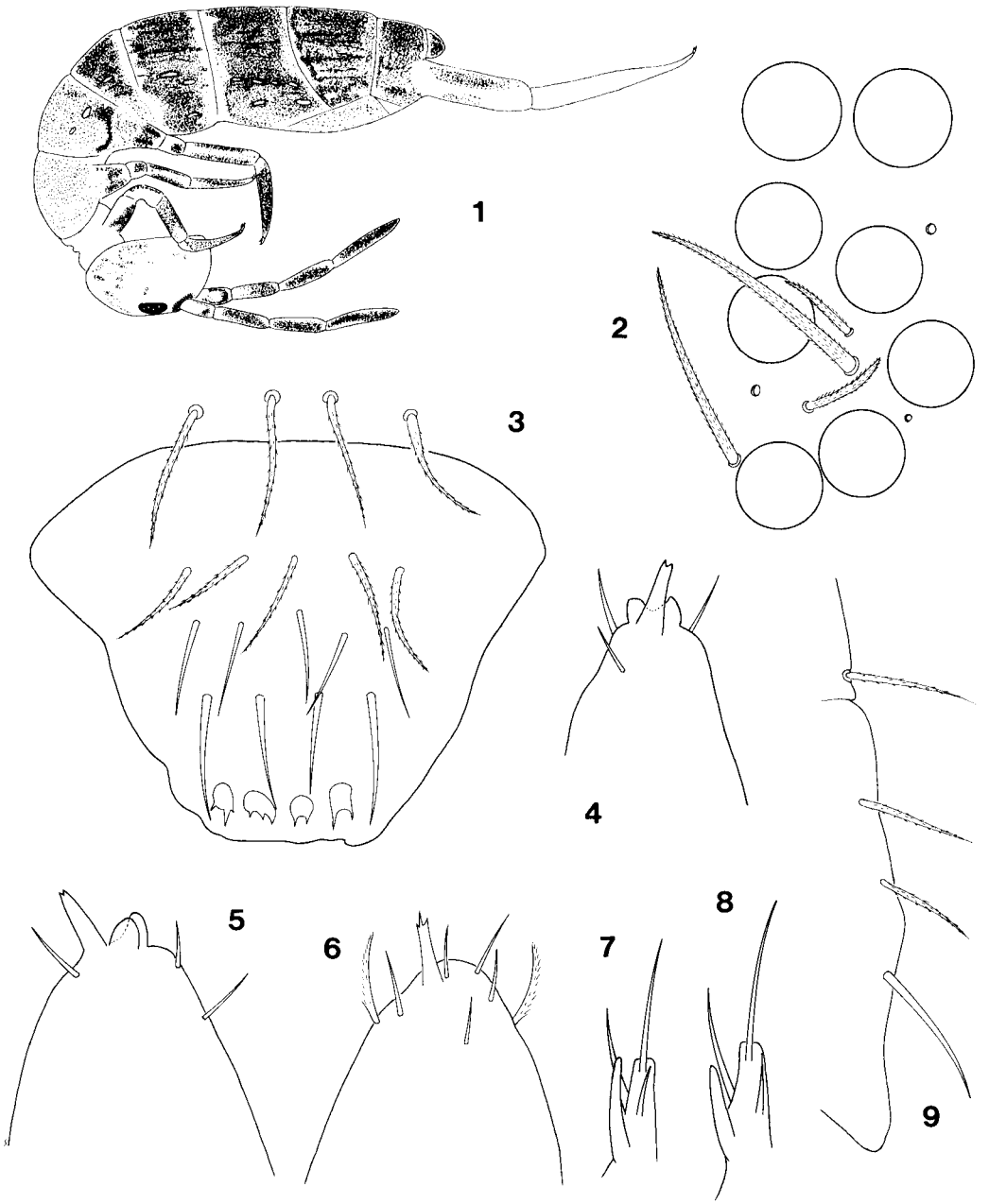


FIG. 1–9. **1,** habitus and distribution of violet-black pigment (specimens from locality I). **2,** eyes and distribution of interocular setae (loc. I). **3,** labral chaetotaxy and labral papillae (loc. V). **4,** apex of Ant. 4, dorsal view (loc. II). **5,** apex of Ant. 4, lateral view (loc. I). **6,** apex of Ant. 4 (loc. V). **7–8,** differentiated seta of outer labial papilla and associated setae (loc. I). **9,** lateral view of labrum, prelabral seta at top (loc. V).

*Type of labral setae*

My previous paper on *Corynothrix* (Mari Mutt 1980) reported the prelabral setae and setae of the 1st 2 labral rows as ciliated. The ciliations are very fine and in frontal view (Fig. 3) it is very difficult to see them on the setae of the 2nd row. In lateral view the hairs appear ciliated (Fig. 9). Ciliated labral setae were observed only on the 1st labral row of 2 specimens from locality VI. Setae of the 3rd labral row are always smooth.

*Labial chaetotaxy*

The number of setae on the posterior labial row up to seta E varies with the lengths of the specimens. As few as 3+3 setae (3 setae on the left labial base and 3 setae on the right base) are present in an immature from locality VII that measures 0.88 mm. At the other extreme, 10+10 setae are present in a specimen from locality IV and another from locality VI measuring, respectively, 2.25 and 2.30 mm. The average number of setae for all the specimens is 7. Most specimens possess a different number of setae on both labial bases; the difference is usually only 1 seta, but an individual from locality VI has 9+6 hairs.

All the setae of the anterior labial row ($a_1$–$a_5$) are smooth. Setae $a_4$ and $a_5$ are reduced in all the specimens. Setae E, $L_1$, and $L_2$ are always ciliated.

*Body chaetotaxy*

Figures 17–22 present the distribution of macrochaetae and bothriotricha on the body segments of a specimen from locality I. Two factors render difficult the accurate determination of setal patterns and their variation in this species. Th. 2, Th. 3, and Abd. 1 possess a large number of setae and when most of these setae are present on slide-mounted specimens they usually tumble over each other and obscure the insertions of many of the hairs. When most are absent, on the other hand, a large degree of variation in socket diameter is observed, because macrochaetae and other setae range considerably in length and, hence, in socket diameter (Fig. 19, 20). Only the patterns for Abd. 2 to Abd. 4 were studied for most of the specimens and here the positions of almost all the macrochaetae is constant irrespective of the geographic origin of the specimens.

Christiansen & Bellinger (1980: 792) state that the bothriotricha of *C. borealis* are "... slightly anomalous in position but have the segmental arrangement of other Entomobryinae." The authors do not describe the nature of the anomaly. The distribution of bothriotricha on Abd. 2–3 (Fig. 20, 21) is identical to that of other entomobryids (cf. Szeptycki 1979). On the other hand, Abd. 4 has the usual 2 bothriotricha, but their position is unique (Fig. 22). Instead of being located one below the other (e.g., Szeptycki 1979: Fig. 261–294), one bothriotrichum is placed towards the outer margin of the segment and inserted higher than the inner hair.

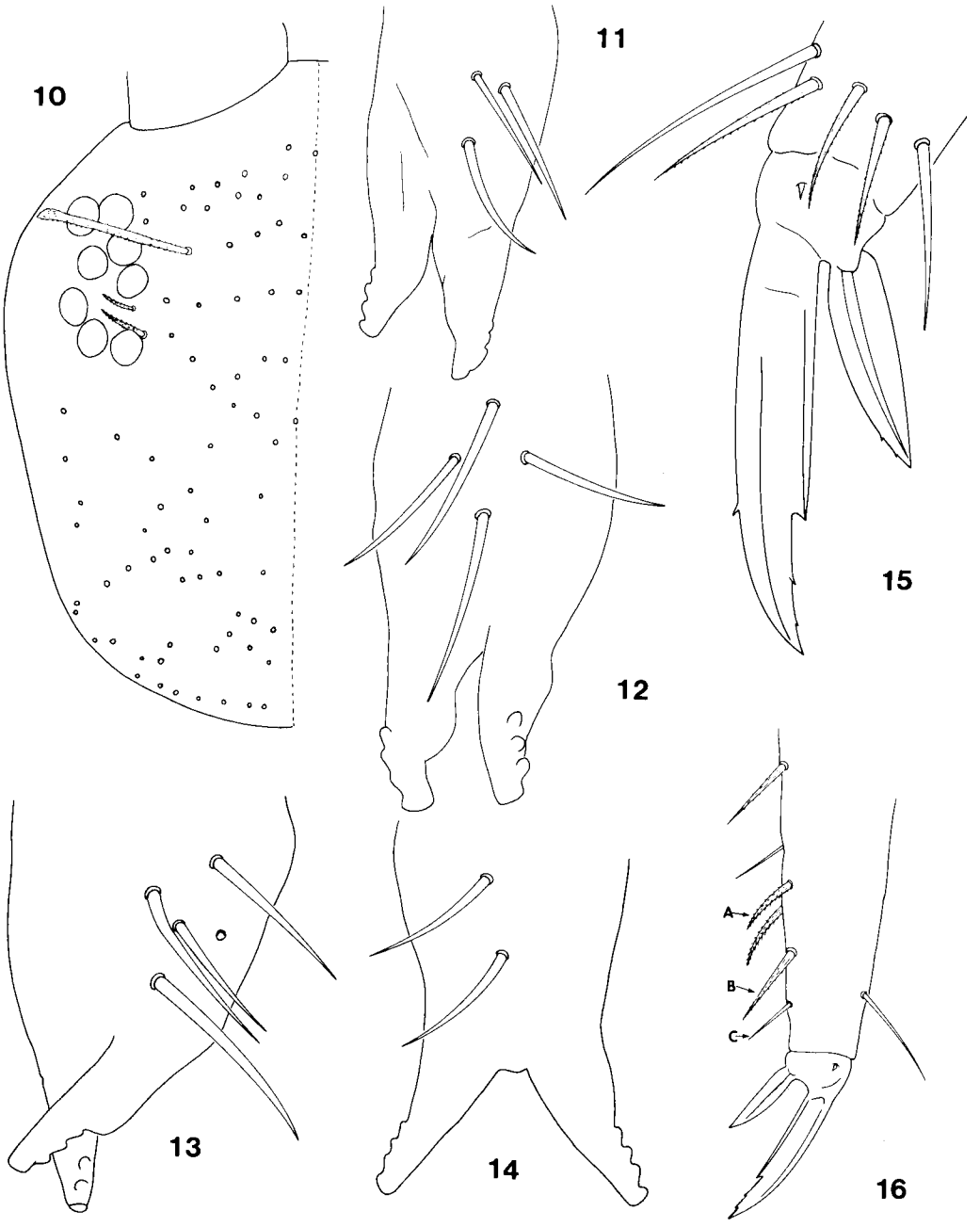


FIG. 10–16. **10,** head macrochaetotaxy (specimen from locality I). **11–14,** setae on tenaculum of specimens from loc. V, VI, VI, and I, respectively. **15,** claw structure (loc. I). **16,** types of setae along inner margin of tibiotarsi (loc. V) (see section on tibiotarsal chaetotaxy for explanation).

*Trochanteral organ*

The number of setae on the trochanteral organ is roughly proportional to the length of the specimens and ranges from 8 in an individual measuring 1.5 mm from locality III, to 20 setae in a large specimen (exact length cannot be determined) from locality VI. The average number of setae for all the specimens is 13. Very frequently the number of setae on both metatrochanters of the same specimen differs, sometimes by as much as 4 setae.

*Tibiotarsal chaetotaxy*

Three types of setae are present along the inner margin of the tibiotarsi (Fig. 16). Most hairs are conspicuously ciliated (A) and somewhat curved. A fairly large number of setae are stout, erect, apically pointed and very finely ciliated (B). Smooth setae (C) are present only on the metathoracic tibiotarsi; 1 seta is placed immediately opposite the tenent hair and the other is located some distance above the first. Martynova (1970) states that the tibiotarsi of the 3rd pair of legs possess several smooth setae, but she probably refers to type B setae; I have found only 2 smooth setae in every specimen examined.

*Chaetotaxy of tenaculum*

The number of setae on the tenaculum varies from 2 to 5. Specimens from localities I–III and VII possess 2 setae (Fig. 14). Specimens from localities IV and V exhibit 3 or 4 setae (Fig. 11, 12) and individuals from locality VI possess 3–5 setae (Fig. 13). There is no relation between number of setae on the tenaculum and the length of the specimens.

*Additional characters*

Head macrochaetotaxy (Fig. 10) was determined only for the specimen from locality I. The difficulties encountered in the study of the chaetotaxy of Th. 2, Th. 3, and Abd. 1 also apply to the distribution of setae on the head. Cephalic bothriotricha are absent in all the specimens examined. Interocular chaetotaxy (Fig. 2) is constant in all the specimens.

Denticles (secondary papillae) are always present on the labral papillae but their number per papilla ranges from 2 to 4. The differentiated seta of the outer labial papilla (Fig. 7, 8; Mari Mutt 1980: Fig. 2) is the thickest yet observed in the Orchesellinae. Its apex falls short of the apex of its papilla by about ¼ of the seta's length or it can barely surpass the apex of the papilla.

Claw structure (Fig. 15) is constant. The inner margin of the unguis has 3 unpaired teeth, the inner lamellae fusing to form a single proximal tooth. The unguiculus lacks teeth on its outer margin, small subapical denticles on the inner margin were seen in the specimen from locality I, 2 individuals from locality VI, and in several specimens from locality V. In 1 individual from locality VI these denticles are present on a mesothoracic unguiculus, but in all other specimens with these teeth, they are present only on metathoracic legs.

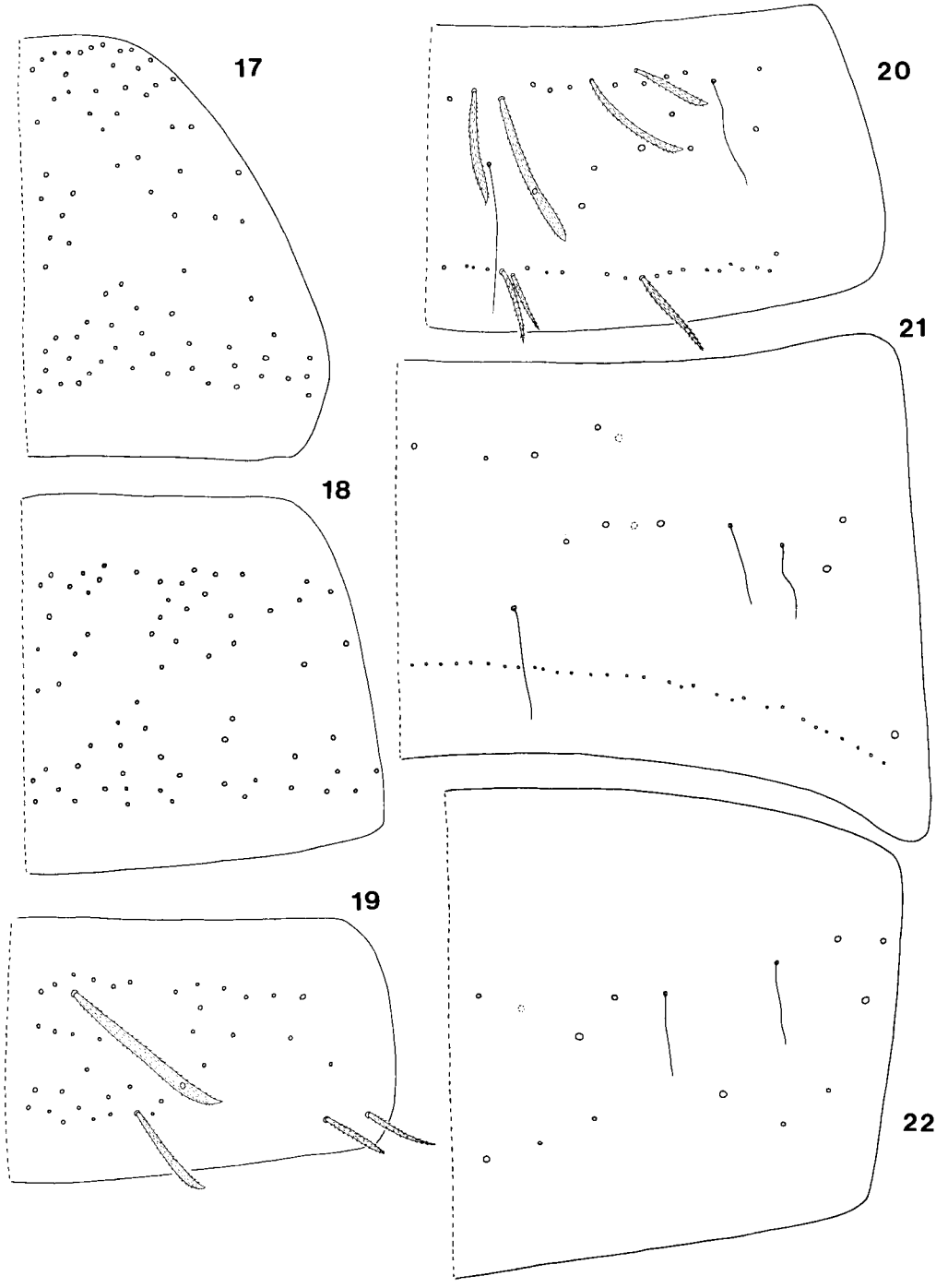


FIG. 17–22. Body macrochaetotaxy and distribution of bothriotricha in a specimen from locality I: **17,** Th. 2; **18,** Th. 3; **19,** Abd. 1; **20,** Abd. 2; **21,** Abd. 3; **22,** Abd. 4. Note the unique position of the bothriotricha on the last segment. Broken circles represent setae absent in some specimens.

## DISCUSSION

A comparison between previous detailed descriptions of *Corynothrix borealis* (Martynova 1970, Mari Mutt 1980) and the observations presented in this paper leave little doubt that all the North American specimens (localities V–VII) belong to the same species. Individuals described by Martynova (1970) and the specimens from locality IV also match the characteristics of the North American specimens.

The individuals from localities I and II differ from the others in possessing a horseshoe-shaped papilla on the apex of Ant. 4 (Fig. 4, 5) and in having the body well covered by violet-black pigment (Fig. 1). Specimens from locality III are also dark but lack the antennal papilla. Since considerable variation in pigmentation occurs in *C. borealis*, excessive importance need not be placed on color. On the other hand, presence and absence of a well-developed antennal papilla is unreported for any species of Collembola. I have chosen not to propose a new name for those specimens with the apical papilla on Ant. 4. It is possible that this structure is an artifact caused by preservation or mounting technique, although its presence in specimens from different localities, its degree of development, and the absence of any trace of this structure in the other specimens strongly argue against this possibility. A larger number of specimens will have to be studied before a final decision on the taxonomic status of these individuals can confidently be reached.

As implied by its name, *C. borealis* is a species of northern lands, with most records being of areas N of the Arctic Circle. Martynova (1970) reported the species from mountains of Kirghiz SSR (approximately 41°N Lat.), where it lives at heights between 3600–3900 m. In Colorado (ca. 40°N Lat.) the species has been collected at close to 3700 m. No information on altitude was provided with the specimens from Lake Baykal, the only other locality S of the Arctic Circle. Evidently, *C. borealis* is adapted to life in cold, northern areas but also occurs in southern localities with ecologically similar habitats.

Kevan (1972) reported specimens of *C. borealis* feeding on pollen of *Lesquerella arctica* on Banks Island. Martynova (1970) reported individuals collected in tetrandrous dryas flowers. I have found pollen in the gut of specimens from localities IV and VI. The intestines of individuals from locality III did not contain pollen but 2 specimens harbored large amounts of setae. These hairs are very similar to those of hypogastrurid Collembola and a large spinelike structure seen in one individual may be an anal spine.

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