

**Article III.—COLLEMBOLA FROM THE CROCKER LAND
EXPEDITION 1913–1917¹**

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PLATES XVI TO XXIII

The insects of the order Collembola that were collected in Greenland by M. C. Tanquary and W. E. Ekblaw, of the Crocker Land Expedition, and form the subject of this report, consist of the following eight species:

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| 1. <i>Achorutes tullbergi</i> Schäffer. | 5. <i>Isotoma diplophthalma</i> Axelson. |
| 2. <i>Achorutes armatus</i> (Nicolet). | 6. <i>Isotoma besselsi</i> Packard. |
| 3. <i>Onychiurus grælandicus</i> (Tullberg). | 7. <i>Isotoma olivacea</i> Tullberg. |
| 4. <i>Tetracanthella wahlgreni</i> Axelson-Linnaniemi. | 8. <i>Isotoma violacea</i> Tullberg. |

A ninth species, *Orchesella cincta* (Linnæus), var. *vaga* (Linnæus), from Newfoundland, though not collected by the Expedition, is also treated of.

Although none of these species are new, all of them except *Orchesella cincta* are here described and illustrated, for the reason that the existing descriptions of these species are scattered in many languages, and are often incomplete and insufficiently illustrated; while most of the literature of these forms is available only to specialists.

The Expedition brought back the little-known *Onychiurus grælandicus* and the interesting *Tetracanthella wahlgreni*, and added four species to the faunal list of Greenland.

It should be said that the descriptions and figures given here (with the exception of figure 38) have been made from the Greenland specimens.

The material upon which this report is based has been divided between The American Museum of Natural History, New York City, and the University of Illinois.

¹Scientific Results of the Crocker Land Expedition.

Achorutes tullbergi Schäffer

Plate XVI, Figures 1 to 8

Achorutes dubius TULLBERG, 1876. UZEL, 1890. SCHÖTT, 1894. DALLA TORRE, 1895. SCHÄFFER, 1896. SKORIKOW, 1900.

Achorutes dubius var. *concolor* CARPENTER, 1900.

Achorutes tullbergi SCHÄFFER, 1900a.

Achorutes tullbergi var. *concolor* SCHÄFFER, 1900a. WAHLGREN, 1907. FOLSOM, 1916.

Uniform blackish blue. Eyes eight on each side. Postantennal organs (Figs. 1, 2) with four (sometimes five) peripheral tubercles. Antennæ shorter than the head; sense organ of third segment as in figure 3. Ungues (Fig. 4) stout, slightly curving; inner margin unidentate beyond the middle. Unguiculi with setaceous prolonged outer margin and with basal inner lamella, which is smallest on the front feet. Tenent hairs long; 2, 3, 3, as a rule; occasionally 3, 3, 3, or 1, 3, 3; when three hairs are present the middle hair is the stoutest. Mucrones (Figs. 5, 6) one-third denticles in length, with lamella narrow or of moderate width, somewhat variable in form, but more often apically rounded and upturned. Rami of tenaculum tridentate. Anal spines (Fig. 7) from two-fifths to two-thirds as long as hind ungues, arcuate, on prominent contiguous papillæ. Clothing (Fig. 8) of sparse, short, curving, simple setæ, with longer setæ on the posterior part of the abdomen. Length, 2 mm.

The specimens collected by the Expedition belong to the variety *concolor* Carpenter, in which the dark blue pigment is distributed uniformly.

The typical form of the species is known from Nova Zembla, Spitzbergen, Siberia, and Bohemia; the variety *concolor* from Franz Josef Land, the vicinity of Ellesmere Land, and from Massachusetts.

Abundant (No. 45) Saunders Island, Greenland, June 15, 1914, crawling on ground on sunny slope. (M. C. Tanquary)

Achorutes armatus (Nicolet)

Plate XVII, Figures 9 to 13

Podura armata NICOLET, 1841.

Achorutes armatus GÉRAVIS, 1844. NICOLET, 1847. LUBBOCK, 1868, 1873. TULLBERG, 1871, 1872, 1876. PARONA, 1879, 1882, 1888, 1895. TÖMÖSVÁRY, 1883. OUDEMANS, 1890. UZEL, 1890, 1891. MACGILLIVRAY, 1891. SCHÖTT, 1891, 1894, 1896a, 1902. MONIEZ, 1894. DALLA TORRE, 1895. REUTER, 1895. MEINERT, 1896. SCHÄFFER, 1896, 1897, 1900a, 1900b. CARPENTER, 1897. LIE-PETTERSEN, 1896, 1898. POPPE AND SCHÄFFER, 1897. SCHERBAKOW, 1898b, 1899a. CARL, 1899, 1901. CARPENTER AND EVANS, 1899. WAHLGREN, 1900a. BÖRNER, 1901b. KRAUSBAUER, 1902. WILLEM, 1902. ÅGREN, 1903, 1904. AXELSON, 1905a, 1905b, 1906. LINNANIEMI (Axelson), 1907, 1909. COLLINGE AND SHOEBOOTHAM, 1910. IMMS, 1912. SHOEBOOTHAM, 1914. FOLSOM, 1916.

Achorutes boletivorus PACKARD, 1873. MACGILLIVRAY, 1891. DALLA TORRE, 1895. GUTHRIE, 1903.

Achorutes marmoratus PACKARD, 1873. MACGILLIVRAY, 1891. HARVEY, 1893.
Achorutes texensis PACKARD, 1873. MACGILLIVRAY, 1891. DALLA TORRE, 1895.
Achorutes pratorum PACKARD, 1873. MACGILLIVRAY, 1891. DALLA TORRE, 1895.
Hypogastrura armata LINNANIEMI (Axelson), 1911, 1912. CAROLI, 1914.

Very variable in coloration. General color vinaceous, pale violet, greenish gray, or dark blue. The specimens in hand, from Greenland, are dark blue, pale ventrally. Eyes (Fig. 9) eight on each side. Postantennal organ (Fig. 9) large, with four unequal peripheral tubercles. Antennæ shorter than the head; segments in relative lengths as 5:4:5:6; fourth segment with seven olfactory hairs: two outer, two inner, and three dorsal. Between the third and fourth antennal segments is a large ventral eversible bilobed sac. Body stout; abdomen feebly dilated. Unguis (Fig. 10) long, slender, slightly curving, unidentate near the middle of the inner margin; lateral margins each unidentate one-fourth from the base. Unguiculus with basal lamella and setaceous apex, extending about as far as the tooth of the opposite claw. One long simple hair, in place of a tenent hair. Dentes stout, subcylindrical. Mucro (Fig. 11) half as long as dens, apically rounded; inner lamella narrow, simple; outer lamella with a large subtriangular dorsal lobe. Anal spines (Fig. 12) long, a little longer than the ungues in adult specimens, slender, curving, on large contiguous papillæ, which are one-third to one-half as long as the spines. Clothing (Fig. 13) dense, consisting of abundant short curving setæ and numerous long hairs and setæ, which are frequently serrate. Length, 1.5 mm.

Achorutes armatus, one of the most abundant and best known species of Collembola, occurs in large colonies in a great variety of situations: under the loose moist bark of logs, on damp soil under wood or dead leaves, underground among the roots of grasses or other plants, in moss, and on pools of fresh water. This species is the one commonly found on fungi, particularly agarics, though it occurs on *Boletus*, *Polyporus*, *Morchella*, and other genera as well.

Achorutes armatus is one of the most widely distributed species of Collembola. It is known from all parts of Europe, from Siberia, Spitzbergen, Greenland, northern Africa (Tripoli), Sumatra, Ceylon, New Zealand, Brazil, Paraguay, Uruguay, and Chile. Our present records (see Folsom, 1916) indicate that it occurs throughout the United States.

Five specimens (No. 119), Umanak, Greenland, July 22, 1914, in mushroom. (W. E. Ekblaw and M. C. Tanquary)

***Onychiurus grœnlandicus* (Tullberg)**

Plate XVII, Figure 14; Plate XVIII, Figures 15 to 23

Lipura grœnlandica TULLBERG, 1876. SCHÖTT, 1894. LUBBOCK, 1898. CARPENTER, 1900.

Lipura Schötti LIE-PETERSEN, 1896.

Aphorura grœnlandica SCHÄFFER, 1900a.

White. Subcylindric; abdomen not dilated laterally (Fig. 14). Postantennal organs (Figs. 15-18) small, simple, each consisting of three or four simple peripheral tubercles, borne on a central stalk, and set in a small elliptical depression. Pseudocelli of head (Figs. 14 and 18) as follows: antennal base, 3+3, arranged in a triangle on each side; posterior border of head, 3+3; ventral surface of head, 1+1. Antennæ shorter than the head; third and fourth segments stout, separated by an oblique suture. Sense organ of third antennal segment (Fig. 19) with five papillæ, five guard setæ, two tuberculate sense clubs in form as in figure 19, and a pair of sense rods. Pseudocelli of body (Fig. 14) as follows, in dorsal aspect: prothorax—pronotum, 1+1; proximal precoxal, 1+1. Mesothorax—mesonotum, 3+3; proximal precoxal, 1+1. Metathorax—metanotum, 3+3; proximal precoxal, 1+1. First to fourth abdominal segments, inclusive, 3+3. Fifth abdominal, 4+4; sixth, 0.

Unguis (Fig. 20) curving, untoothed. Unguiculus extending three-fifths as far as unguis; basal half with inner lamella; apical half acuminate. Anal spines (Figs. 21 and 22) two, a little longer than hind unguiculi, feebly curving, on widely separated papillæ that are reduced to rings. Clothing (Fig. 23) of sparse short simple setæ. Maximum length, 1.7 mm.

The tubercles of the postantennal organ are usually three, occasionally four, in number.

One specimen had three pseudocelli on the antennal base of the left side, but only two on the right side, the absent pseudocellus being the anterior inner one.

Though Tullberg (1876, p. 41) mentions but one tubercle for the postantennal organ, his figure shows two—one on each side of the central stalk. The same appearance is presented in my material under moderately high magnification; the remaining one or two tubercles being as a rule less evident, and appearing clearly only under much higher magnification.

Aphorura quadrituberculata Börner (1901a, p. 4) is probably this species. *Onychiurus affinis* Ågren (1903, p. 128), a detailed account of which is given by Linnaniemi (1912, p. 89) is closely related but apparently distinct.

The postantennal organs of *O. grænlandicus* and its few allies are simple in structure as compared with those of other species of *Onychiurus* and are, at least in external appearance, essentially like those of many species of *Achorutes*.

Onychiurus grænlandicus is a little-known Arctic species, which has been reported hitherto from Greenland, Spitzbergen, Franz Josef Land and Norway.

Nine specimens (No. 44), Saunders Island, Greenland, June 15, 1914, in moss. (M. C. Tanquary)

***Tetracanthella wahlgreni* Axelson-Linnaniemi**

Plate XIX, Figures 24 to 28

Tetracanthella pilosa SCHÖTT, 1891 (part), 1894 (part), 1902 (part). LIE-PETERSEN, 1896. WAHLGREN, 1899, 1900b, 1906b. AXELSON, 1900.

Tetracanthella cærulea SCHÄFFER, 1900a, 1900b.

Tetracanthella wahlgreni LINNANIEMI (Axelson), 1907, 1912. BAGNALL, 1914.

Dark blue. Body elongate, narrowing posteriorly. Eyes on black patches, 8+8 (Fig. 24); the two inner posterior eyes of each side smaller than the others; the five anterior eyes in a group apart from the three posterior. Postantennal organ (Fig. 24) narrowly elliptical, four times as long as the diameter of an adjacent eye, often with a constriction near the middle. Antennæ shorter than the head (as 10:13); segments in relative lengths about as 9:13:10:19 or 17:24:23:38. Sense organ of third antennal segment in an oblique groove, with a pair of oblique, basally bent sense rods, subtended by a thick chitinous ridge, and covered with an integumentary fold. Fourth antennal segment with curving slender olfactory setæ. Unguis (Fig. 25) stout, untoothed. Unguiculus extending half to three-fifths as far as unguis, lanceolate, acuminate. Clavate tenent hairs two, extending as far as, or farther than the unguis. Femur with a single long clavate hair. Second, third and fourth abdominal segments subequal in length dorsally. Anus ventral. Genital and anal segments confluent, bearing two pairs of spines (Fig. 26). Posterior spines a little longer than hind unguis, feebly curving, on stout papillæ almost half as long as the spines. Anterior spines similar to posterior spines, but a little shorter. Anogenital segment with many long stiff hairs, many of which extend backward beyond the end of the abdomen and are often apically bent and minutely clavate. Furcula quite short, appended to the fourth abdominal segment and extending to the posterior margin of the third abdominal segment. Manubrium stout, with several pairs of setæ. Mucro and dens confluent. Mucrodentes convergent, in form as in figure 27, each with three setæ. Rami of tenaculum bidentate; corpus with a single stout curved seta. General clothing (Fig. 28) of short equal curving simple setæ across the middle of the segment, with a transverse row of long erect simple sensory setæ. Cuticula not tuberculate, but figured. Length, 2 mm.

According to Linnaniemi (1912) the rami of the tenaculum are tridentate, sometimes bidentate; and the corpus bears at times two setæ.

The two specimens collected by the Crocker Land Expedition are small individuals, measuring 0.82 and 0.91 mm. in length, respectively. These agree in all essentials with the account of *T. wahlgreni* given by Linnaniemi (1912), who has separated this species from *T. pilosa* Schött.

The genus *Tetracanthella* is of special systematic importance as forming a link between Achorutinæ and Isotominæ.

This species, *wahlgreni*, has been taken usually under moss, lichens, or stones, and sometimes on the surfaces of pools. It is arctic or sub-arctic in distribution, and has already been reported from Spitzbergen,

Bear Island, Finland, Norway, and Sweden. I have recently studied three specimens from Bernard Harbour, N. W. T., that were brought back by the Canadian Arctic Expedition, 1913-1916.

Two specimens (No. 126), Umanak, Greenland, July 22, 1914, in moss. (W. E. Ekblaw)

***Isotoma* (*Folsomia*) *diplophthalma* Axelson**

Plate XX, Figures 29 to 34

Isotoma diplophthalma AXELSON, 1902.

Folsomia quadrioculata var. *diplophthalma* LINNANIEMI (Axelson), 1907, 1909.

COLLINGE AND SHOEBOOTHAM, 1910.

Isotoma binoculata COLLINGE AND SHOEBOOTHAM, 1909.

Folsomia diplophthalma LINNANIEMI (Axelson), 1911, 1912.

Elongate, white. Eyes (Fig. 29) 1+1, appearing as a round black spot on each side of the head. Postantennal organ (Fig. 29) close to eye, four to five times as long as the diameter of the eye, subelliptical, constricted near the middle of the anterior margin, with thick chitinous wall. Antennæ slightly longer than the head, with segments in relative lengths about as 5:10:11:21 or 5:10:10:18. Unguis (Figs. 30 and 31) simple, without lateral or inner teeth. Unguiculus lanceolate, untoothed, extending half as far as the unguis on the fore feet (Fig. 30) and two-thirds as far on the hind feet (Fig. 31). Tenent hairs absent. Last three abdominal segments ankylosed, with sometimes a trace of a dorsal suture between the fourth and fifth abdominal segments. Anus ventro-caudal. Furcula appended to the fourth abdominal segment, short, extending not quite to the posterior margin of the second abdominal segment. Manubrium stout, longer than dens (manubrium: dens: mucro=5:4:1). Dens (Fig. 32) stout, with a few minute dorsal crenulations near the middle, and a long erect dorsal proximal seta. Each dens bears a basal inner pair of strong chitinous hooks. Mucro (Figs. 32 and 33) three-fifths as long as hind unguis, bidentate; apical tooth hooked; antepical tooth subequal to apical or slightly larger, suberect or feebly hooked. Rami of tenaculum quadridentate; corpus with a single stout curving ventral seta. General clothing (Fig. 34) of dense short stiff setæ, absent on the anterior and posterior regions of most of the body segments. Sensory setæ long, outstanding, simple. Length, 1.1 mm.

The examples from Greenland agree accurately with Axelson's description of the species, except in regard to the second antennal segment, which in these two specimens happens to be not longer than the third—an unimportant difference.

In this paper I have followed Linnaniemi (1912) in regarding *diplophthalma* Axelson as specifically distinct from *quadrioculata* Tullberg, although the two forms are almost exactly alike, except as regards the number of eyes. Linnaniemi (1912) observes that in *diplophthalma* the olfactory setæ of the fourth antennal segment (as many as eight of

which may be present) are clearly differentiated; while in *quadrioculata* they are difficult to distinguish from ordinary setæ.

This species is found on the ground under wood or dead leaves, and in moss. It has been reported hitherto only from Russia, Finland, Norway, Sweden, and England; but I have taken it abundantly in Illinois under damp logs and dead leaves in swampy places.

Two specimens (No. 44), Saunders Island, Greenland, June 15, 1914, in moss. (M. C. Tanquary)

***Isotoma (Archisotoma) besselsi* Packard**

Plate XXI, Figures 35 to 43

Isotoma Besselsii PACKARD, 1877. MACGILLIVRAY, 1891, 1896.

Isotoma besselsi SCHÄFFER, 1900a. FOLSOM, 1901. AXELSON, 1905b. WAHLGREN, 1906c.

Isotoma besselsii DAVENPORT, 1903. BACON, 1912, 1914.

Isotoma spitzbergenensis LUBBOCK, 1898. CARPENTER AND EVANS, 1899. SKORIKOW, 1900.

Isotoma arctica SCHERBAKOW, 1899a, 1899b.

Isotoma janmayensis WAHLGREN, 1900a.

Proisotoma besselsi LINNANIEMI (Axelson), 1907, 1911. BAGNALL, 1909.

Archisotoma besselsi LINNANIEMI (Axelson), 1912.

Gray, bluish gray, blue, or blackish; in alcohol more or less greenish. Borders of body segments pale or white, giving the insect a banded appearance. Posterior region of head and sides of body with unpigmented spots. Body slender. Head broad, long and low-arched. Eye spots elongate. Eyes 8+8 (Fig. 35), the two inner proximal eyes on each side being much smaller than the others. Postantennal organs (Fig. 35) elongate, narrowly elliptical, one and one-half to four times as long as the diameter of an adjacent eye. Antennæ usually as long as, or slightly longer than, the head; in some specimens 1.7 times as long, however. Antennal segments in relative lengths about as 3:4:5:4 or 8:10:9:12; the last segment being, therefore, relatively short. Sense organ of third antennal segment consisting of two feebly curving rods subtended by a chitinous ridge. Fourth antennal segment with a few curving blunt sensory setæ. Femur and tibiotarsus each with a distal subsegment (Figs. 36-38) on all the legs. Hind femur with a distal outer thornlike process (Fig. 38). Unguis (Figs. 36 and 37) narrow, curving, without lateral teeth and without an inner tooth; often with a small inner tooth according to Linnaniemi (1912, p. 120). Unguiculus extending three-fourths as far as unguis, broadly sub lanceolate, apically setaceous, untoothed, with outer lamella absent. Tenent hairs absent. Third and fourth abdominal segments subequal, or third a little shorter than fourth (as 7:8). Fifth and sixth abdominal segments almost or completely ankylosed; there being, however, in some specimens, particularly in small individuals, a faint, short, dorsal suture between the two segments. The last two abdominal segments project conspicuously beyond the base of the furcula, which arises (apparently) from both the fourth and the fifth abdominal segments. Furcula stout, of almost uniform thickness, extending

not quite to the ventral tube. Manubrium long, slender, with long coxal, or basal, segment; with small ventral setæ and many longer or shorter stiff dorsal setæ. Manubrium equal to dens plus mucro in length. Dentes stout, not tapering distally, rounded apically, not crenulate or tuberculate dorsally, with many short setæ dorsally and ventrally. Mucrones (Figs. 39-41) about as long as hind unguiculi, tridentate, with a large apical tooth and a pair of large dorso-lateral basal teeth. Apical tooth shaped like the end of a canoe; basal teeth subtriangular, subequal and opposite. Rami of tenaculum (Fig. 42) quadridentate; corpus with a large subconical anterior accessory lobe, and without setæ. General clothing of dense short setæ (Fig. 43), becoming longer on the posterior part of the abdomen. Long outstanding setæ occur also on all the body segments. Two exceptionally long, slender, naked hairs, known as bothriotricha, are present dorsally on the genital segment. All the setæ are simple. Length usually 1-1.5 mm.; maximum, 2.1 mm.

The postantennal organs vary considerably in length, but in the Greenland specimens are about three times as long as the diameter of an adjacent eye.

The antennal segments vary greatly in relative lengths, but the fourth is characteristically short in relation to the third.

In specimens from Massachusetts some of the stiff outstanding setæ of body, legs, and antennæ are thickened and spinelike, as in figure 38—a condition not found as yet in the Arctic material that I have studied.

Some years ago, through the courtesy of Dr. A. S. Packard, I examined eighteen cotypes of this species, the property of the United States National Museum. These were collected by Dr. Bessels at Polaris Bay, Greenland, Lat. $81^{\circ} 20'$ – $81^{\circ} 50'$ N.

Isotoma besselsi is strictly a littoral species, being limited to the seashore between tide marks, where it occurs under stones, seaweed or driftwood, or burrowing in the sand, or exposed on the shore. It is an agile species and a vigorous jumper, as mentioned by Davenport (1903) in his interesting account of the distribution and movements of littoral Collembola.

Isotoma besselsi has been recorded from Greenland, Jan Mayen Land, Spitzbergen, Nova Zembla, Russia (Kola Peninsula), Finland, Norway, Scotland, England, Massachusetts, New York, California, and Tierra del Fuego. The species is known to range from northern Greenland almost to the Antarctic Circle and, in my opinion (Folsom, 1901), owes its exceptional distribution to marine currents.

Thousands of specimens (Nos. 68, 138), Umanak, Greenland, June 28, July 26, 1914, under stones along beach. (M. C. Tanquary)

***Isotoma olivacea* Tullberg**

Plate XXII, Figures 44 to 52

Isotoma olivacea TULLBERG, 1871, 1872. UZEL, 1890. SCHÖTT, 1894, 1896b, 1902.

REUTER, 1895. LIE-PETTERSEN, 1896. SCHERBAKOW, 1898a, 1898b. WAHLGREN, 1900a, 1906a, 1906b. BÖRNER, 1901b. AXELSON, 1904, 1905b, 1906.

LINNANIEMI (Axelson), 1907, 1909, 1911, 1912.

Isotoma voraginum UZEL, 1890.

Olivaceous greenish, in alcoholic specimens, as the effect of a blue pigment with a yellowish ground color. Head and body with many pale spots of the ground color. Legs and furcula pale, or pigmented basally. Antennæ pigmented distally, paler proximally. Eyes (Fig. 44) 8+8, subequal. Postantennal organ (Fig. 44) elliptical, two and one-half to three times as long as the diameter of an adjacent eye. Antennæ longer than the head; third segment usually a little shorter than the second; occasionally equal to second or even slightly longer. Sense organ of third antennal segment as in figure 45, subtended by a chitinous ridge. Fourth antennal segment without olfactory setæ. Unguis (Fig. 46) curving, with a pair of small lateral teeth; inner margin unidentate near the middle, though the tooth is sometimes minute or absent, especially in small individuals. Unguiculus extending half as far as unguis, broadly sublanceolate, apically acuminate, with usually a minute angle-tooth. Tenent hairs absent; in place of these a single long seta. Abdominal segments without ankylosis. Third abdominal segment slightly longer than the fourth (as 12:11); occasionally equal to fourth. Furcula appended to the fifth abdominal segment and extending to the ventral tube. Dentes more than twice as long as manubrium (as 44:19), slender, gradually tapering, dorsally crenulate, the crenulations disappearing a little in advance of the mucro. Mucro three-fourths as long as hind unguiculus, quadridentate (Figs. 47-50). Apical tooth the longest, hooked. Anteapical tooth a little shorter, conical, erect or slightly inclined. Third and fourth teeth subequal, almost opposite, oblique or suberect, one being lateral and the other mesal in position. Rami of tenaculum (Fig. 51) quadridentate; corpus with several setæ (five to eight seen in various specimens). Clothing (Fig. 52) of dense stiff simple setæ, becoming longer posteriorly; with a transverse row of longer suberect simple setæ across the middle of most of the body segments. Length, 1.5 mm. (2 mm. in large European specimens).

The antennal segments vary greatly in relative lengths, which may be expressed approximately, however, as 8:11:10:17 or 7:16:13:21; occasionally there occurs such a formula as 4:7:7:12.

The specimens from Greenland agree with my European examples of *olivacea*, which were determined by Schött and sent to me by Schäffer. This is evidently the *forma principalis* of Linnaniemi (1912, p. 149).

In Europe, this species is found on the ground under stones, wood, or dead leaves, on pools and often in moss. It is known from Norway, Sweden, Russia, Germany, and Bohemia. Although *olivacea* is one of the most abundant collembolans in parts of northern Europe (Finland, for

example), it has been reported but once from the Polar region, when Wahlgren (1900a, p. 367) recorded a single individual taken under moss near the seashore in East Greenland (Lat. 72° 46' N.).

Fourteen specimens (No. 126), Umanak, Greenland, July 22, 1914, in moss. (W. E. Ekblaw)

Isotoma violacea Tullberg

Plate XXIII, Figures 53 to 60

Isotoma violacea TULLBERG, 1876. SCHÖTT, 1894, 1902. REUTER, 1895. LIE-PETTERSEN, 1896. SCHÄFFER, 1896, 1900a, 1900b. POPPE AND SCHÄFFER, 1897. SCHERBAKOW, 1898b. SKORIKOW, 1900. BÖRNER, 1901b. ÅGREN, 1903, 1904. AXELSON, 1904, 1905b, 1906. LINNANIEMI (Axelson), 1909, 1911, 1912. WAHLGREN, 1906a, 1906b. SHOEBOOTHAM, 1911.

Isotoma violacea var. *mucronata* AXELSON, 1900. LINNANIEMI (Axelson), 1912. WAHLGREN, 1906b.

Isotoma mucronata AXELSON, 1904, 1905b, 1906. LINNANIEMI (Axelson), 1907, 1909, 1911. ÅGREN, 1904.

Clear violet or blackish violet. Legs and furcula white, or pigmented basally; antennæ violet. Body with many pale spots. Anterior borders of body segments pale, giving the effect of narrow bands; head frequently pale laterally. Postantennal organ (Fig. 53) situated close to the eyes, elliptical, slightly longer than the diameter of an adjacent eye (as 7:6 or 10:9), with a wide border. Eyes (Fig. 53) 8+8, subequal. Antennæ longer than the head, with segments in relative lengths about as 11:15:18:30 or 9:14:15:29. Sense organ of third antennal segment as in figure 54, with a chitinous ridge. Fourth antennal segment without olfactory setæ. Unguis (Fig. 55) curving, with a pair of lateral teeth, and without an inner tooth (present, however, in some European specimens). Unguiculus extending a little more than half as far as the unguis, broadly sub lanceolate, acuminate, with an inner tooth, usually evident but occasionally obscure. Tenent hairs absent. Abdominal segments without ankylosis. Third and fourth abdominal segments subequal, or third slightly shorter than the fourth (as 6:7). Furcula appended to the fifth abdominal segment, extending to the ventral tube. Dens two and one-half times as long as manubrium, slender, gradually tapering, crenulate dorsally, the crenulations becoming gradually smaller distally and disappearing some distance in advance of the mucro. Mucro slightly shorter than hind unguiculus, quadridentate (Figs. 56-58). Apical tooth usually the longest. Anteapical tooth suberect, occasionally as large as the apical tooth. Third and fourth teeth proximal, almost opposite; one being lateral in position. A subapical ventral bristle on the dens extends beyond the middle of the mucro in some specimens; in others it is short. Rami of tenaculum quadridentate (Fig. 59); corpus with a few stout ventral setæ (as many as 16 in large European examples). General clothing (Fig. 60) of numerous strong, stiff or curving setæ, moderately long; with long stout outstanding setæ, numerous and bowed on the last two abdominal segments. These large setæ are simple in typical *violacea*, but feathered in the variety *mucronata*. Length, 1.3 mm. (maximum, 3.1 mm. in European specimens).

The inner tooth of the unguis is said by some European writers to be present, and by others to be absent; it doubtless varies in its occurrence, as it does in many other species of *Isotoma*.

Thirteen of the specimens collected by Mr. Ekblaw have the pinnate setæ that distinguish the variety *mucronata*; the remaining specimen, without feathered setæ, is typical *violacea*.

In Europe, *Isotoma violacea* is a common species under loose bark, stones, or dead leaves, and in moss. The typical form is known from Norway, Sweden, Russia, Finland, Siberia, Germany, Switzerland, England, and Spitzbergen; the variety *mucronata* from Norway, Sweden, and Finland.

Fourteen specimens (Nos. 122, 126), Umanak, Greenland, July 22, 1914, in moss. (W. E. Ekblaw)

***Orchesella cincta* (Linnæus) var. *vaga* (Linnæus)**

Podura vaga LINNÆUS, 1767.

Heterotoma vaga BOURLET, 1839. GÉRAIS, 1844.

Orchesella cincta var. *vaga* REUTER, 1895. SCHÄFFER, 1896, 1900b. SCHERBAKOW, 1898b. CARL, 1899, 1901. CARPENTER AND EVANS, 1899. BÖRNER, 1901b. KRAUSBAUER, 1901. VOIGTS, 1902. ÅGREN, 1903. AXELSON, 1905b, 1906. LINNANIEMI (Axelson), 1907, 1912. WAHLGREN, 1906b. LIE-PETTERSEN, 1907. COLLINGE AND SHOEBOOTHAM, 1910.

Among the material received for study from The American Museum of Natural History was one specimen from Newfoundland which, though not collected by the Crocker Land Expedition, may appropriately be recorded here.

This specimen, mounted on a card point, was shrunken and somewhat mutilated, but still recognizable as the black variety *vaga* of the common *Orchesella cincta*.

Head and body black with these exceptions: second abdominal segment white; mesonotum and metanotum each with a lateral elongate oblique white mark. First and third antennal segments black; second segment black on proximal half, white on distal half. Femora black; tibiotarsi white, or slightly pigmented apically. Furcula white. Length, 3.4 mm.

Orchesella cincta, which is found on the ground under dead leaves, wood or stones, as well as in moss and under loose bark, is a conspicuous collembolan on account of its size, coloration, activity, and abundance. The species is highly variable in coloration, but nevertheless easily distinguishable.

Throughout Europe, *Orchesella cincta* is a common species, and in all parts of Europe its dark variety *vaga* occurs, being in Switzerland (Carl, 1899) much more numerous than the typical form of the species. Notwithstanding the abundance of the species in Europe, the only evidence of its presence in the Arctic region is one record of its occurrence in northwestern Siberia (Reuter, 1891). A single individual was taken in Newfoundland in 1871 (Tullberg, 1876).

In this country, the species is common in eastern Massachusetts, and has been recorded by Packard (1873) from New York, Tennessee, and Texas.

One specimen (F3122), Bay of Islands, Newfoundland, July 21-24, 1912. (C. W. Leng)

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PLATE XVI

- Fig. 1. *Achorutes tullbergi*, left postantennal organ, with adjacent eyes, $\times 757$.
Fig. 2. *Achorutes tullbergi*, left postantennal organ, $\times 1260$.
Fig. 3. *Achorutes tullbergi*, sense organ of third antennal segment of left side,
 $\times 735$.
Fig. 4. *Achorutes tullbergi*, right hind foot, $\times 592$.
Fig. 5. *Achorutes tullbergi*, right mucro, $\times 735$.
Fig. 6. *Achorutes tullbergi*, left mucro, $\times 735$.
Fig. 7. *Achorutes tullbergi*, left anal spine, $\times 735$.
Fig. 8. *Achorutes tullbergi*, dorsal setæ of first abdominal segment, $\times 390$.

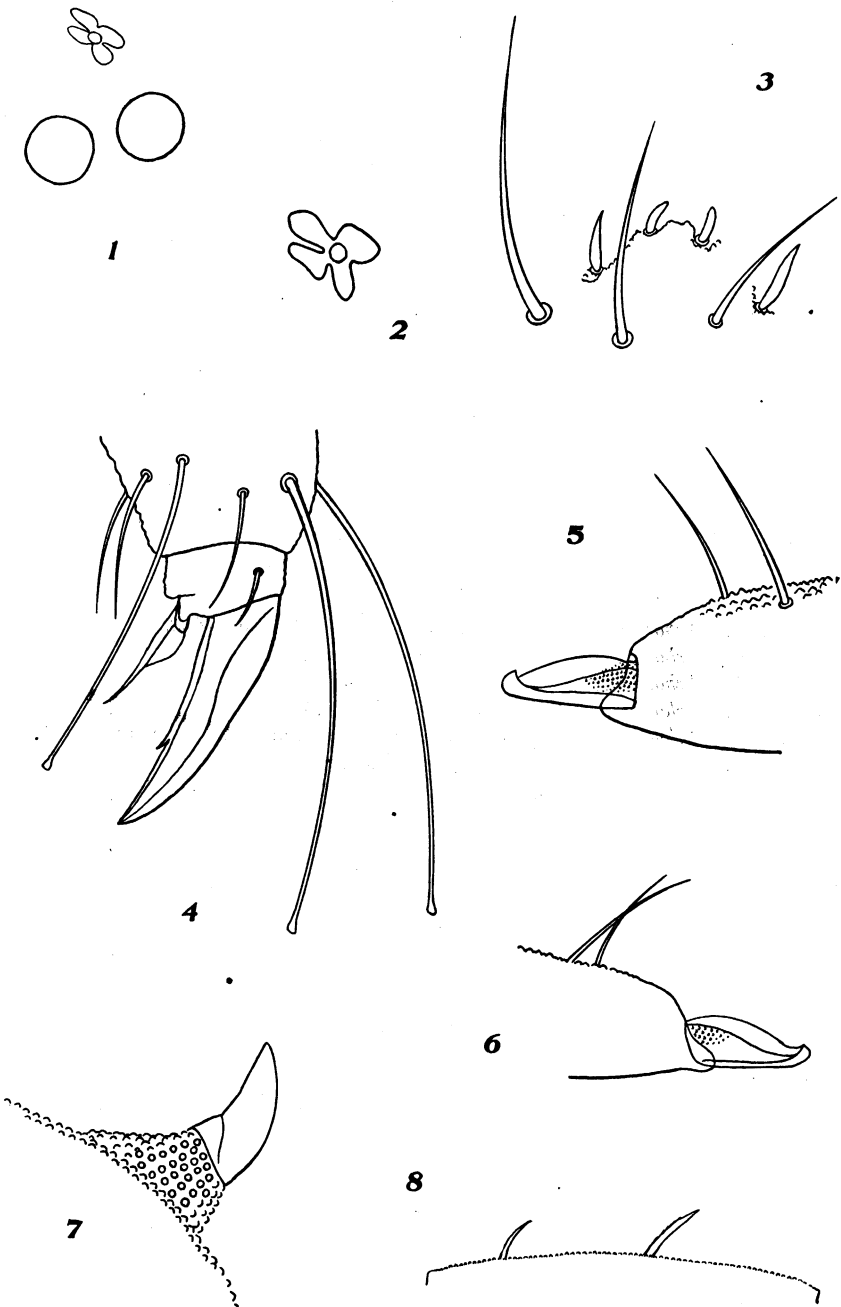
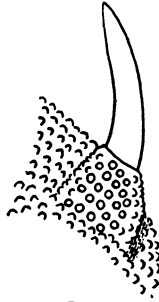
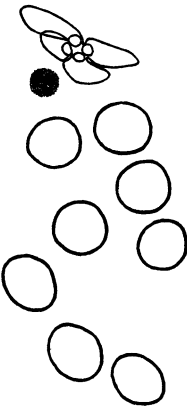
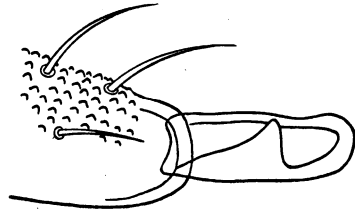
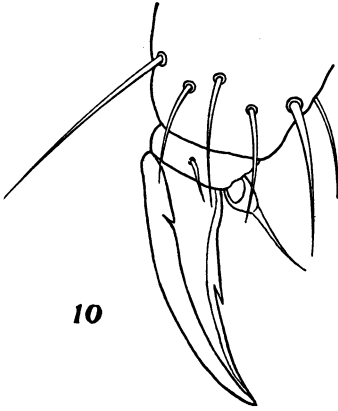


PLATE XVII

- Fig. 9. *Achorutes armatus*, eyes and postantennal organ of left side, $\times 757$.
Fig. 10. *Achorutes armatus*, left fore foot, $\times 757$.
Fig. 11. *Achorutes armatus*, left mucro, $\times 757$.
Fig. 12. *Achorutes armatus*, right anal spine, $\times 450$.
Fig. 13. *Achorutes armatus*, dorsal setæ of first abdominal segment, $\times 757$.
Fig. 14. *Onychiurus grænlandicus*, dorsal aspect to show pseudocelli, $\times 76$.



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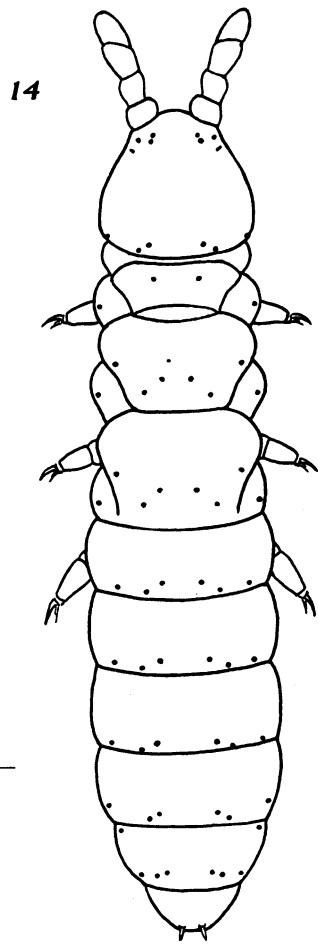


PLATE XVIII

- Fig. 15. *Onychiurus grænlandicus*, right postantennal organ, $\times 800$.
Fig. 16. *Onychiurus grænlandicus*, right postantennal organ, $\times 800$.
Fig. 17. *Onychiurus grænlandicus*, left postantennal organ, $\times 800$.
Fig. 18. *Onychiurus grænlandicus*, pseudocelli of left antennal base, with postantennal organ, $\times 365$.
Fig. 19. *Onychiurus grænlandicus*, sense organ of third antennal segment of right side, $\times 1260$.
Fig. 20. *Onychiurus grænlandicus*, left hind foot, $\times 505$.
Fig. 21. *Onychiurus grænlandicus*, anal spines, $\times 295$.
Fig. 22. *Onychiurus grænlandicus*, right anal spine, $\times 505$.
Fig. 23. *Onychiurus grænlandicus*, dorsal setæ of first abdominal segment, $\times 260$.



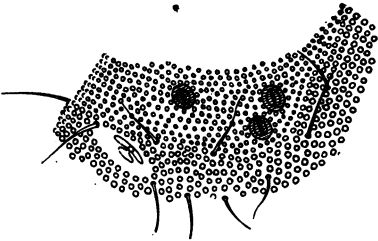
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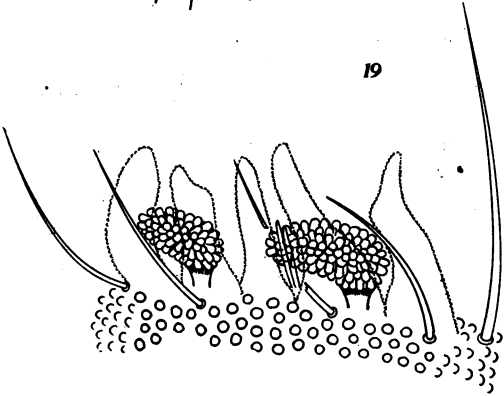
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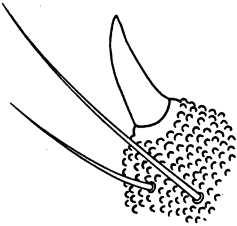


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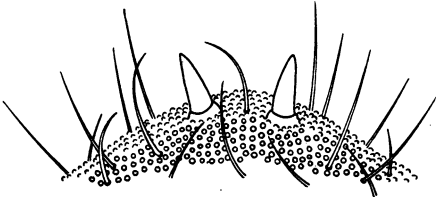


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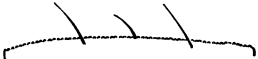
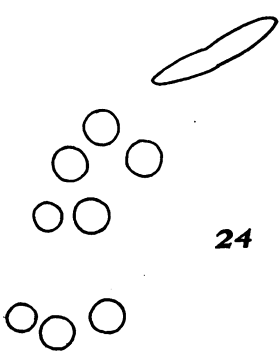
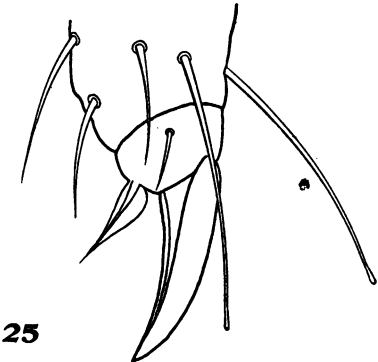


PLATE XIX

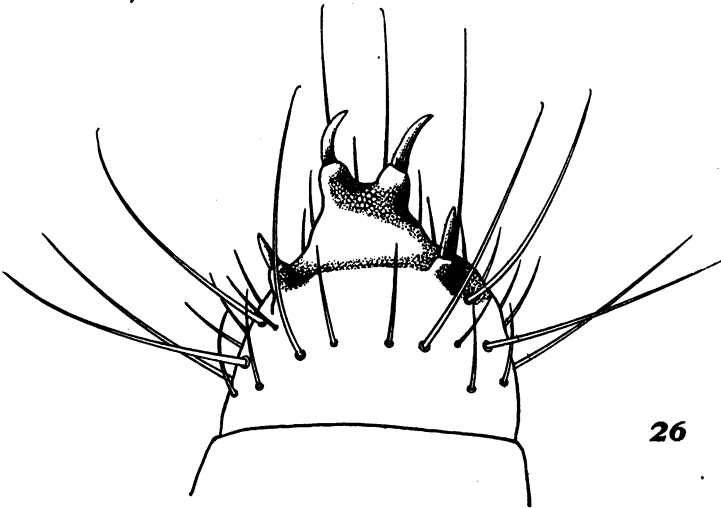
- Fig. 24. *Tetracanthella wahlgreni*, eyes and postantennal organ of right side, $\times 757$.
Fig. 25. *Tetracanthella wahlgreni*, right hind foot, $\times 1192$.
Fig. 26. *Tetracanthella wahlgreni*, abdominal spines, $\times 337$.
Fig. 27. *Tetracanthella wahlgreni*, left aspect of mucro-dentes, $\times 757$.
Fig. 28. *Tetracanthella wahlgreni*, dorsal setæ of third abdominal segment, $\times 450$.



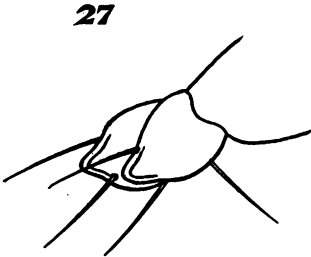
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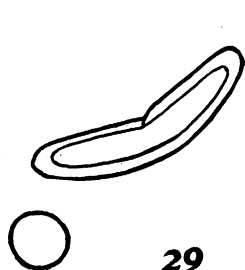
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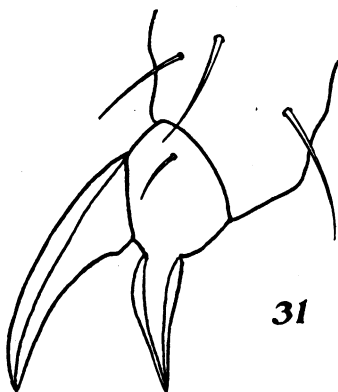
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PLATE XX

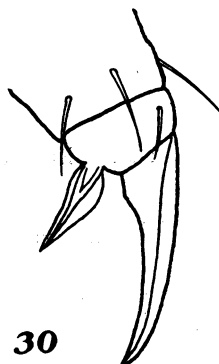
- Fig. 29. *Isotoma diplophthalma*, eye and postantennal organ of right side, $\times 882$.
- Fig. 30. *Isotoma diplophthalma*, right fore foot, $\times 1143$.
- Fig. 31. *Isotoma diplophthalma*, left hind foot, $\times 1143$.
- Fig. 32. *Isotoma diplophthalma*, right dens and mucro, with basal teeth showing through the dens, $\times 684$.
- Fig. 33. *Isotoma diplophthalma*, left mucro, $\times 1231$.
- Fig. 34. *Isotoma diplophthalma*, dorsal setæ of first abdominal segment, $\times 684$.



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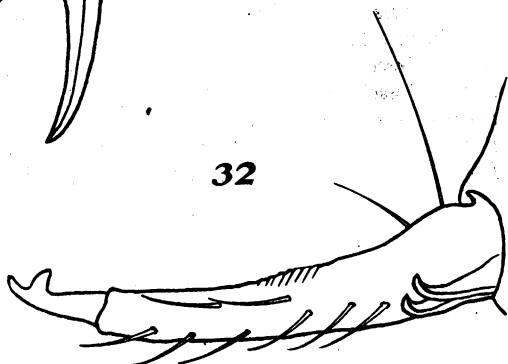


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PLATE XXI

- Fig. 35. *Isotoma besselsi*, eyes and postantennal organ of left side, $\times 480$.
Fig. 36. *Isotoma besselsi*, left hind foot, $\times 673$.
Fig. 37. *Isotoma besselsi*, left hind foot, $\times 793$.
Fig. 38. *Isotoma besselsi*, portion of left hind femur and tibiotarsus (from Massachusetts specimen), $\times 673$.
Fig. 39. *Isotoma besselsi*, left mucro, $\times 1045$.
Fig. 40. *Isotoma besselsi*, left mucro, $\times 793$.
Fig. 41. *Isotoma besselsi*, right mucro, $\times 653$.
Fig. 42. *Isotoma besselsi*, left aspect of tenaculum, $\times 793$.
Fig. 43. *Isotoma besselsi*, dorsal setæ of first abdominal segment, $\times 480$.

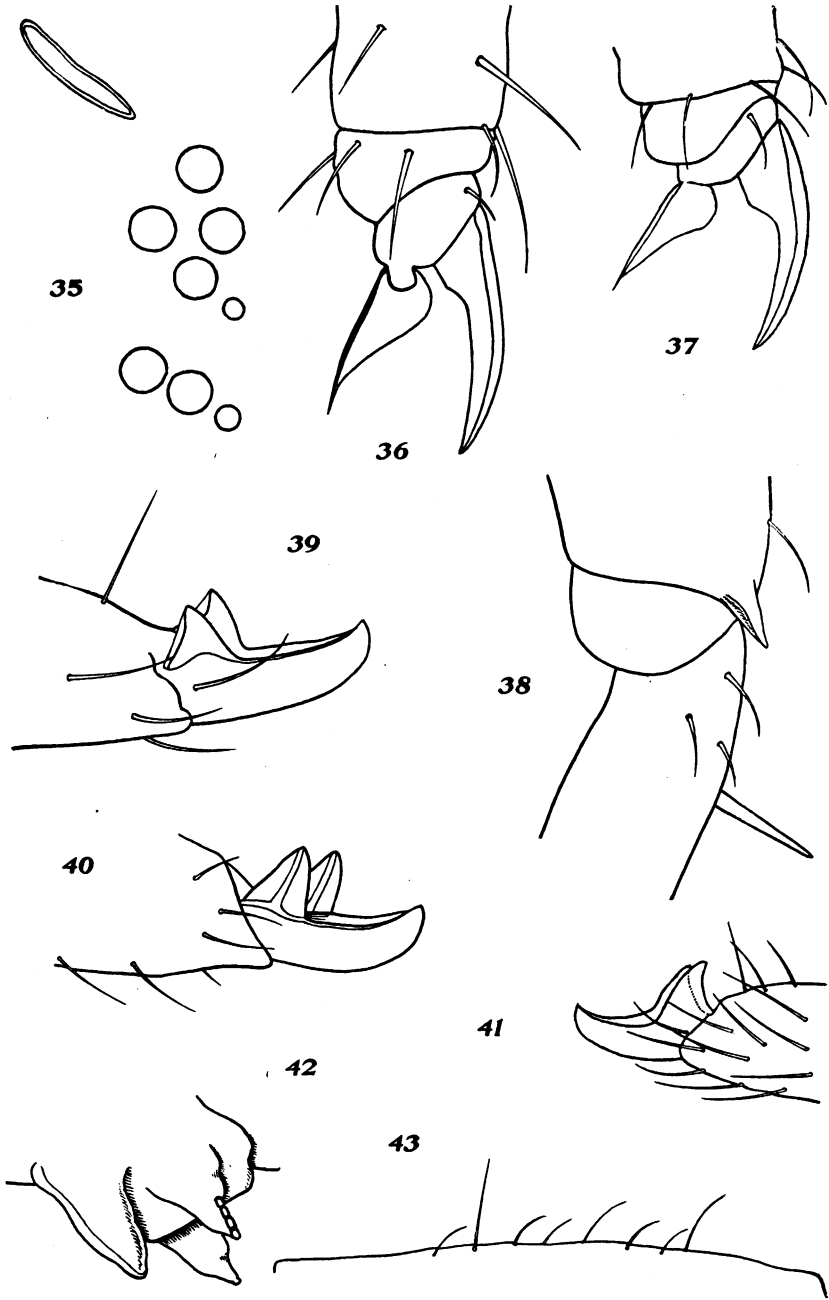


PLATE XXII

- Fig. 44. *Isotoma olivacea*, eyes and postantennal organ of left side, $\times 384$.
Fig. 45. *Isotoma olivacea*, sense organ of third antennal segment of right side,
 $\times 1270$.
Fig. 46. *Isotoma olivacea*, right hind foot, $\times 1016$.
Fig. 47. *Isotoma olivacea*, left mucro, $\times 1272$.
Fig. 48. *Isotoma olivacea*, left mucro, $\times 1272$.
Fig. 49. *Isotoma olivacea*, right mucro, $\times 1333$.
Fig. 50. *Isotoma olivacea*, left mucro, $\times 1272$.
Fig. 51. *Isotoma olivacea*, left aspect of tenaculum, $\times 784$.
Fig. 52. *Isotoma olivacea*, dorsal setæ of second abdominal segment, $\times 472$.

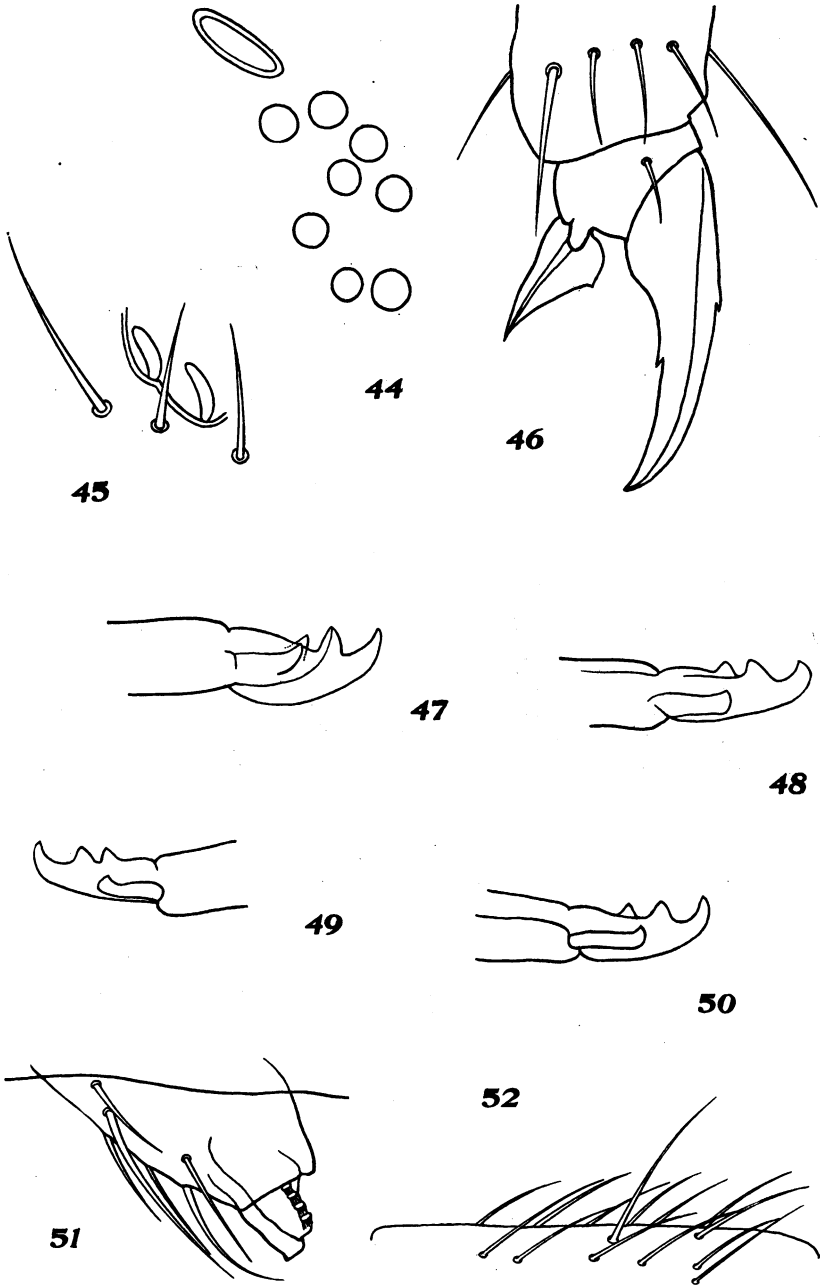
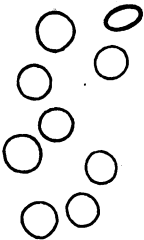
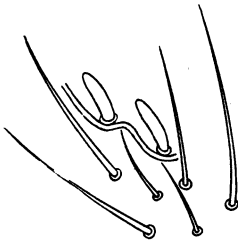


PLATE XXIII

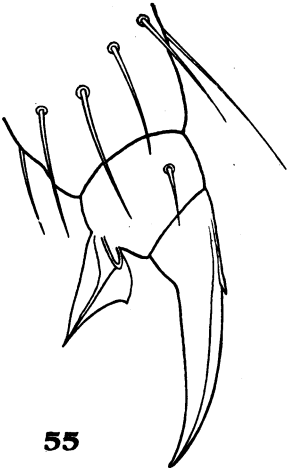
- Fig. 53. *Isotoma violacea*, eyes and postantennal organ of right side, $\times 442$.
Fig. 54. *Isotoma violacea*, sense organ of third antennal segment of right side,
 $\times 952$.
Fig. 55. *Isotoma violacea*, left hind foot, $\times 1192$.
Fig. 56. *Isotoma violacea*, left mucro, $\times 1908$.
Fig. 57. *Isotoma violacea*, right mucro, $\times 1908$.
Fig. 58. *Isotoma violacea*, left mucro, abnormal in having but three teeth, $\times 1908$.
Fig. 59. *Isotoma violacea*, left aspect of tenaculum, $\times 757$.
Fig. 60. *Isotoma violacea*, dorsal setæ of second abdominal segment, $\times 735$.



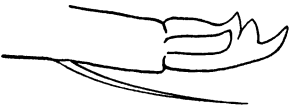
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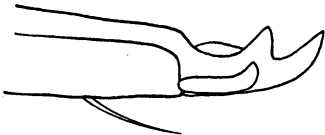
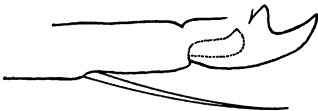


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