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On Three Marine Collembola in Hokkaido¹⁾

By

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(With 3 Text-figures)

Although a few species of marine Collembolan insects have been recorded from Honshu and Kyushu (Kinoshita, 1932; Uchida, 1950; Yosii, 1958), no species have been reported from intertidal zone of Hokkaido. In 1965 and 1966, junior author (H.T.) tried to sample springtails at some parts of sea-shores of Hokkaido for his ecological survey, and a great number of specimens apparently consisting of several species were collected. In this paper three species among them, including a new one, are first reported. Most of the specimens used here are deposited in the Zoological Institute, Hokkaido University, and a part of them are kept in the Department of Biology, Hirosaki University.

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Friesea pacifica (Yosii) (Fig. 1)

Conotelsa pacifica Yosii, 1958.

Friesea pacifica Salmon, 1964.

Body color greyish blue purple, ventral side of body and furca paler than other parts of body. Body rather slender. Thoracic pleura distinct; acrotergites of body segments on thor. II to abd. V clearly visible. Abd. VI cone-like, posteriorly protruded. Body clothed with short, moderately long, and long, stout setae. Setae arranged in one transverse row on thor. I, three rows on thor. II and III, two rows on abd. I, II and III, three rows on abd. IV and V and two rows (the longest setae) on abd. VI; anterior row of abd. V short, not attaining to lateral side. All body setae smooth, pointed. Skin uniformly densely granulated.

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Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 16, 1966.

Head: Mouth parts anteriorly projected; mandible with eight teeth at apical portion; head of maxilla claw-like, pointed at tip, with one tooth at middle of inner margin. Antenna shorter than head diagonal. Ant. III and IV distinctly separated. Ant. IV with three-lobed retractile sensory papilla at tip, with four olfactory hairs; ant. III with a short olfactory hair. Sense organ of ant. III consisting of two small sensory rods curved slightly in the same direction in a shallow furrow. Postantennal organ absent. Eight ocelli on each side of head; eye-patch with three short setae.

Thorax: Thorax longer than head diagonal. Unguis narrow, moderately curved, untoothed, slightly pigmented at base. Tibiotarsus without unguiculus,

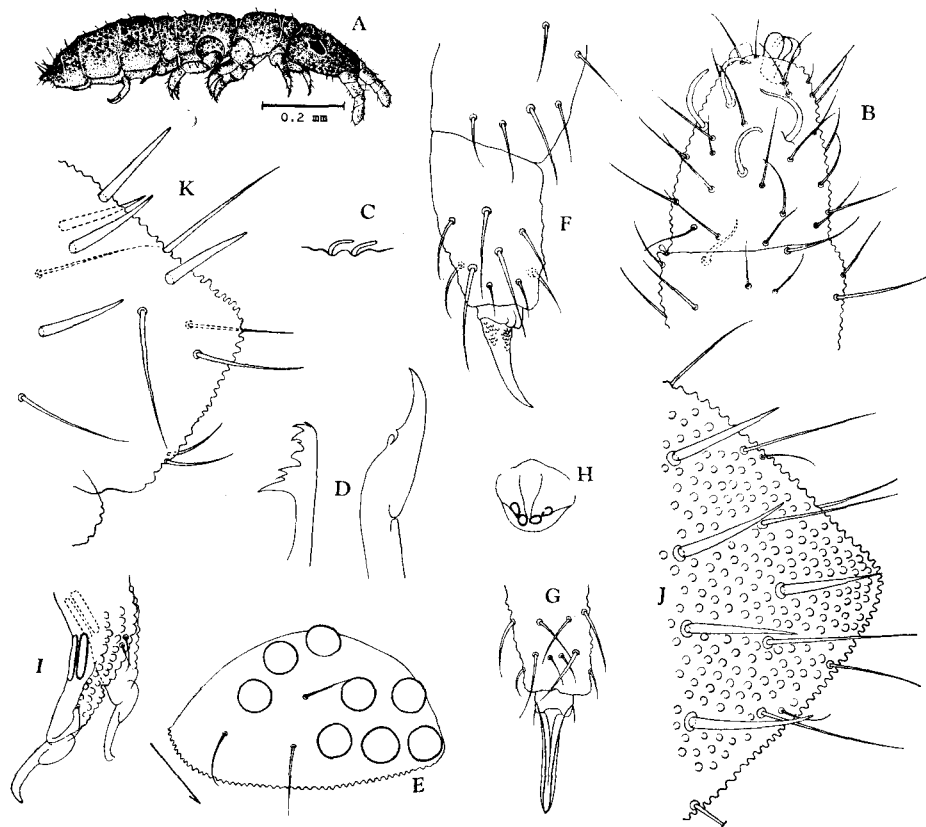


Fig. 1. *Friesea pacifica* (Yosii). A. The animal from the side; B. Distal part of antenna, dorsal, left; C. Sense organ of ant. III; D. Apical portions of mandible and maxilla; E. Left eye; F. Hind leg, from outside; G. Ditto, from ventral side; H. Tenaculum; I. Dens and mucro; J. Abd. VI, from dorsal side; K. Ditto, from obliquely lateral side.

with empodial papilla. All tibiotarsal hairs sharply pointed; the longest one slightly longer than ventral margin of unguis.

Abdomen: Abdomen about as long as head and thorax together. Tenaculum with two barbs on each ramus, the apical barb larger; corpus with no setae. Furca relatively developed, longer than half of antenna, nearly attaining to anterior ridge of abd. III. Manubrium broad, nearly as long as mucrodens; without ventral setae, with three pairs of dorsal setae of which distal two pairs are short and proximal pair is moderately long. Dens densely granulated dorsally, with a distal short seta subdorsally, two proximal short setae dorsally; dens ventrally unctaceous. Mucro not distinctly separated from the dens, but the mucronal part distinguishable by a ventral notch at base; mucro hook-like, bent at nearly right angle, ending in a rounded apex, with a relatively large, target-like lobe dorsobasally; the lobe about as long as half of mucro. Abd. VI with six long, stout and two moderately long bristles, and five long bristle-like anal spines; four anterior anal spines arranged in a transverse row, one posterior anal spine situated on dorsal median line of segment. All anal spines rather straight, sharply pointed, inserted directly into integument, of equal length except for the shortest posterior one.

Body length: 1.1 mm exclusive of antennae.

Ratio of length of body segment: Body length: antenna, 44: 7; antenna: head diagonal, 10: 7; antennal segment I: II: III: IV, 9: 10: 8: 10; head diagonal: prothorax: mesothorax: metathorax, 18: 5: 9: 9; thorax: abdomen, 23: 42; abdominal segment I: II: III: IV: V: VI, 7: 6: 7: 11: 6: 5; antennal segment IV: inner margin of hind unguis, 2: 1; inner margin of hind unguis: anal spine: long bristle of last abdominal segment: ocellus, 11: 12: 17: 3; antenna: furca, 42: 25; manubrium: dens: mucro, 13: 8: 4; mucro: mucronal lobe, 2: 1.

Locality: Akkeshi, Hokkaido, 28-VI-1965, H. Tamura leg., 24 specimens taken from the intertidal zone of sea-shore which consists of moderately coarse sand particles. Akkeshi, 5-VIII-1966, H. Tamura leg., 11 specimens at the same place.

Remarks: *Friesea pacifica* was originally described on the basis of specimens collected from the surface of sea in Beppu, Japan by Yosii (1958), and this is the second record of this species in Japan. The present form fits well with the Yosii's original description except for the length of furca, the proportion of the mucronal lobe to the mucro (Yosii, Plate LXIV, fig. 9 and 10), the shape of the head of maxilla and the number of setae on the area ocularis. This species is similar to *Friesea montana* Cassagnau from France in number of anal spines of abdominal segment VI, but is different from the latter in having eight ocelli on eye patch (Cassagnau, 1958).

***Friesea oshoro* sp. nov.**

(Fig. 2)

Body, with antennae, legs and furcula, greyish blue purple due to irregularly

scattered spots which are composed of clumps of fine granules of blue pigments. The coloration pale on ventral side of abdomen, intersegmental portions and mouth parts. Body rather slender; abdomen more thickened dorsoventrally than thorax. Acrotergites of body segments clearly visible on thor. II to abd. V. Abd. V gradually narrowed towards the distal end; abd. VI small, flat, cone-like. Body sparsely clothed with short setae on dorsum of head up to abd. III, with short, moderately long and long, stout setae on dorsum of abd. IV and V, with some long, stout bristles on dorsum of abd. VI; the long, stout bristles of abd. VI over twice longer than usual short setae; antennae and legs provided with moderately long setae. These dorsal setae arranged in one transverse row on thor. I, in two rows

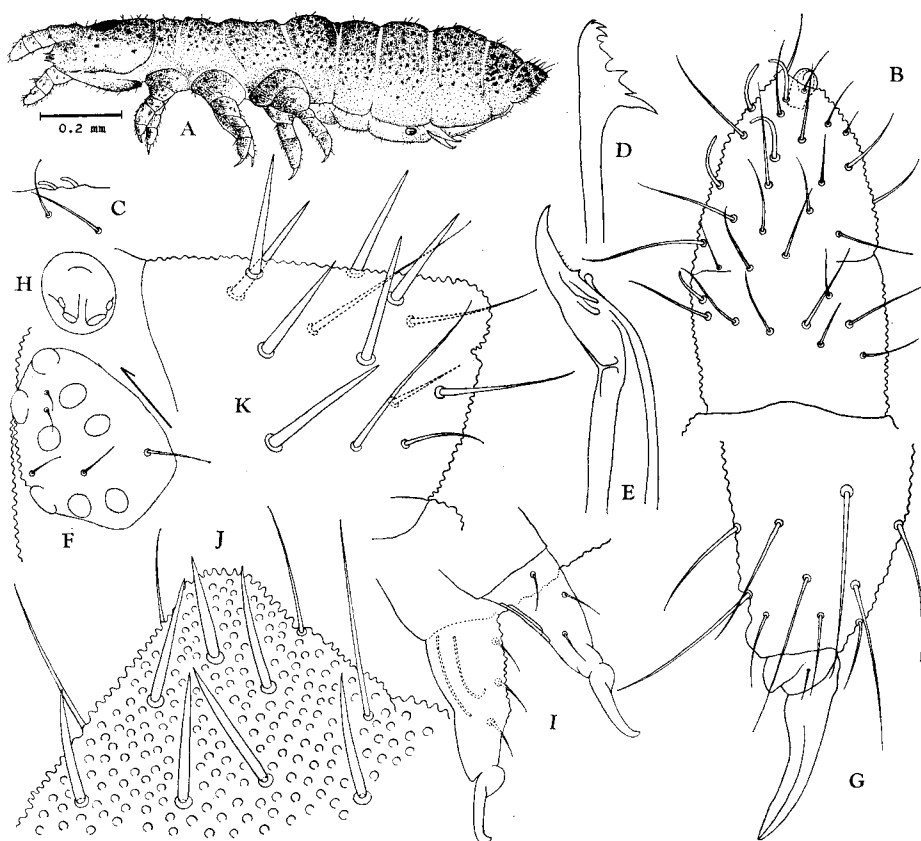


Fig. 2. *Friesea oshoro* sp. nov. A. The animal from obliquely lateral side; B. Distal part of antenna, dorsal, left; C. Sense organ of ant. III; D. Apical portion of mandible; E. Apical portion of maxilla; F. Left eye; G. Hind leg, left; H. Tenaculum; I. Dens and mucro; J. Abd. VI, from dorsal side; K. Ditto, from obliquely lateral side.

on thor. II to abd. III, in three rows on abd. IV to VI. All body setae smooth, pointed. Skin uniformly covered with dense granules.

Head: Mouth anteriorly projected; mandible with eight teeth of different shapes distally; head of maxilla claw-like, apically pointed; the inner margin with a tooth and a minute comb-like structure at middle. Antenna shorter than head diagonal; the suture between ant. III and IV visible only on ventral side. Sense organ of ant. III consisting of two sensory rods curved slightly in the same direction, set in an integumentary recess which situates on distal extremity of ant. III. Ant. (III+IV) with a three-lobed retractile sensory papilla at apical end; five olfactory hairs: four hairs on region of ant. IV, one hair on distal edge of ant. III; all olfactory hairs fairly long, strongly curved. Postantennal organ absent. Eight ocelli on each side of head, similar to those of the genus *Oudemansia* (Uchida, 1965): anterior four ocelli forming a square, posterior three ones more or less in line, one remaining ocellus rather near the former group; each eye-patch with four short and one moderately long setae.

Thorax: Thorax longer than head diagonal. Unguis narrow, moderately curved, untoothed. Unguiculus (empodial appendage) absent, empodial papilla very small, conical. All tibiotarsal hairs sharply pointed; the longest hair somewhat longer than ventral margin of unguis.

Abdomen: Abdomen about as long as head and thorax together. Tenaculum provided with two barbs on each ramus, without setae on corpus. Furca relatively developed, about half of antenna in length, reaching nearly to anterior one fourth of abd. III. Manubrium nearly as long as mucrodens; the venter unsetaceous, the dorsum with three pairs of setae, of which two pairs are distal, short and one pair is proximal, moderately long. Dens densely granulated on dorsal side, with one distal, subdorsal and two proximal, dorsal short setae; the venter with no setae. Mucro not distinctly separated from the dens; the mucronal part distinguishable by a ventral notch at base; mucro hook-like, gradually tapering towards the distal end; the apex slightly bluntly ended, bent at nearly right angle; the mucro with a relatively large, target-like lobe dorsobasally which is shorter than half of mucro. Abd. VI provided with four long and two moderately long bristles, with seven bristle-like long anal spines of which four are lined in anterior transverse row, two in middle transverse row, and one is located on dorsal median line of segment posteriorly, forming an isosceles triangle together with the two previous spines. All anal spines more or less straight, sharply pointed, inserted directly on integument, of equal length except for the slightly shorter posteriormost spine.

Body length: 1.4 mm excluding antenna.

Ratio of length of body segment: Body length: antenna, 55:8; antenna: head diagonal, 9:11; antennal segment I: II: (III+IV), 4: 5: (9); head diagonal: prothorax: mesothorax: metathorax, 22:5:11:14; thorax: abdomen, 17:32; abdominal segment I:II:III:IV:V:VI, 11: 10:11:13:9:7; antennal segment (III+

IV): inner margin of hind unguis, 41:13; inner margin of hind unguis: anal spine: long bristle of last abdominal segment: ocellus, 15:16:23:5; antenna: furca, 8:5; manubrium: dens: mucro, 14:11:5; mucro:mucronal lobe, 13:5.

Holotype. Oshoro, Hokkaido, 14-X-1965, H. Tamura leg., taken from the intertidal zone of sea shore, which consists of moderately coarse sand particles devoiding algae pieces. *Paratypes*. Fifteen specimens, data same as holotype; five specimens, Zenibako, Hokkaido, 18-VIII-1966, H. Tamura leg., collected on sandy beach of the nearly same condition as in Oshoro.

The holotype (mounted in Neo-Shigaral medium) and ten paratypes (mounted and alcoholic) are preserved in the Department of Biology, Hirosaki University, and other ten paratypes (mounted and alcoholic) are kept in the Zoological Institute, Hokkaido University.

Remarks: *Friesea oshoro* sp. nov. is closely related to *F. pacifica* (Yosii), but is distinguishable from the latter in number and arrangement of anal spines and long bristles on last abdominal segment, the length of furca and the relative size of the basal mucronal lobe to the total length of the mucro. It seems that two anal spines of middle transverse row of *F. oshoro* sp. nov. correspond to two long bristles on the same position of *F. pacifica*. *Friesea oshoro* sp. nov. is also similar to *Friesea acuminata* Denis from France, England, Germany and Costa Rica, but the latter is easily separable from the former by having six anal spines on abdominal segment VI (Delamare Deboutteville, 1953; Gisin, 1960); *Friesea brevicaudata* (Schäffer) from Argentina and Costa Rica has seven anal spines on the last abdominal segment same as the new species, but it differs from the new species in its very large body size (2.3 mm long), the six eyes, the rudimental button-like mucro and the arrangement of the anal spines (Stach, 1949).

Tomocerus (Pogonognathellus) flavescens flavescens (Tullberg)

(Fig. 3)

Macrotoma flavescens Tullberg, 1871.

Tomocerus (Pogonognathellus) flavescens Handschin, 1924; Uchida, 1950, '54, '58; Yosii, 1954; Christiansen, 1964.

Locality: Akkeshi, Hokkaido, 28-VI-1965, H. Tamura leg., 8 adult specimens taken from gravel shore of high-tide level.

T. (P.) flavescens is very common in both the palaearctic and nearctic regions. It is well known that this species shows high morphological variation among populations as well as among individuals and, moreover, according to the age. It is generally accepted that subspecies of *flavescens*, *americanus* Schött, *arcticus* Shött¹⁾ and *separatus* Folsom, are distinguished. The materials now at hand are easily recognized by one large proximal dental spine and two large distal dental

1) This was recorded by Yosii (1940) from Sôunkyo, mountainous region in the center of Hokkaido.

spines, and by four teeth on the inner margin of fore unguis and three teeth on the inner margin of hind unguis.

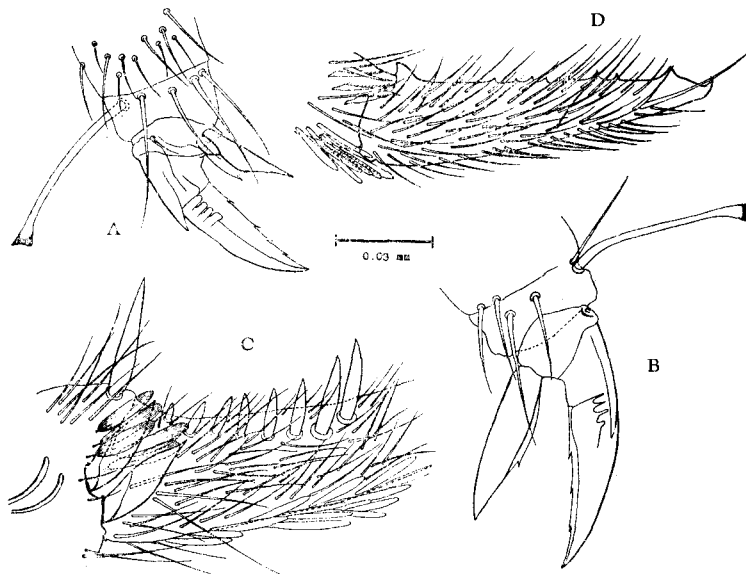


Fig. 3. *Tomocerus (Pogonognathellus) flavescens flavescens* (Tullberg). A. Fore leg, left; B. Hind leg, left; C. Dental spines, left; D. Mucro, left.

In general, the present materials agree with Uchida's specimens (1950, under fallen leaves) except for the following points: the former greenish blue in color, I/6-7, II in dental spine formula, inhabiting intertidal zone of gravel shore, while the latter yellowish white or light brown in color, I-III/3-5, II in dental spine formula, dwelling in soil. According to Christiansen's work (1964) on *T. (P.) flavescens* (s. lat.), his materials from over 400 localities of U.S.A. included forty variational combinations in regard to the dental spine formula, and the numbers of teeth on the hind unguis and on the mucro, which are the most variable among body characters¹⁾. According to his opinion about ranking of these characters, the present materials belong to type 2 of mucro, type d of hind unguis and type E of dens, and they are possibly to be regarded as subspecies *flavescens*. This "morphotype 2dE" was only found in one or two localities among over 400 localities throughout U.S.A. In 1950, the "morphotype 2cD" assigned to *americanus* by Christiansen was recorded from Nopporo, Hokkaido (H.U., no. 1345) by senior author. But so far as the junior

1) As to the variability of these three characters, Christiansen recognized four types (a, b, c, d) of unguis, two types (1, 2) of mucro and five types (A, B, C, D, E) of dental spines.

author sampled using the Tullgren funnels in 1965 and 1966, no specimens of *T. (P.) flavescens* (s. lat.) were found in the soil of broad-leaved forests adjacent to the gravel shore where this morphotype was collected by means of the floating method.

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