J. Acarol. Soc. Jpn., 32(1): 1-12. May 25, 2023

[ORIGINAL PAPER]

A new water mite species in the genus *Feltria* (Acari: Hydrachnidia: Feltriidae) from Japan

Shizuko MORIMOTO*

Museum of Nature and Human Activities, 6 Yayoigaoka, Sanda, Hyogo 669-1546, Japan

(Received 30 August 2022; Accepted 27 March 2023)

ABSTRACT

A new water mite species from Japan in the genus *Feltria* is described under the name *Feltria* (*Feltriella*) *takachiho* sp. nov. The species was discovered in seepage-wetted mosses on the face of a cliff along a roadway in Miyazaki Prefecture, southern Japan. *Feltria* (*Feltriella*) *takachiho* sp. nov. is similar to *Feltria* (*Feltriella*) *multiscutata* Cook, 1961; *Feltria* (*Feltriella*) *crassipalpis* Lundblad, 1941; and *Feltria yinjiangensis* Li & Guo, 2022. However, the new species can be distinguished from *F*. (*F*.) *multiscutata* by the more separated postocularia in both sexes. Females of the new species can be distinguished from those of *F*. (*F*.) *crassipalpis* by its small dorsal plate D, and from those of *F*. *yinjiangensis* by its small dorsal plate D and roundish anteromedial plate.

Key words: new species, *Feltria* (*Feltriella*) *takachiho*, Feltriidae, Hydrachnidia, Japan

INTRODUCTION

The family Feltriidae, in the superfamily Hygrobatoidea, consists of a single genus, *Feltria*, which contains four subgenera: *Neofeltria*, *Azugofeltria*, *Feltria*, and *Feltriella* (Cook, 1974; Gerecke, 2012; Smit, 2020). The family inhabits streams, springs, interstices, and wet mosses in the Holarctic realm and the Oriental (India, Burma/Myanmar) and Neotropic (Mexico) regions (Cook, 1974; Gerecke, 2012; Smit, 2020). Thus far, ten species in three *Feltria* subgenera have been recorded in Japan (Abé, 2005): *F.* (*Azugofeltria*) *miurai* Imamura, 1957; *F.* (*Feltria*) *minuta* Koenike, 1892; *F.* (*Feltria*) *conica* Imamura, 1957; *F.* (*Feltria*) *japonica* (Imamura, 1954); *F.* (*Feltria*) *ezoensis* Imamura, 1954; *F.* (*Feltria*) *ishikariensis* Imamura, 1954; *F.* (*Feltria*) *matsumotoi* Imamura, 1959; *F.* (*Feltria*) *obihiroensis* Imamura, 1962; *F.* (*Feltriella*) *macroplata* Imamura, 1954; and *F.* (*Feltriella*) *rubra* Piersig, 1898.

Recently I collected several specimens of *Feltria* from seepage-wetted mosses on the undersurface of a cliff along a roadway in the town of Takachiho in Miyazaki Prefecture, Japan.

* Corresponding author: e-mail: smorimo@iris.eonet.ne.jp
DOI: 10.2300/acari.32.1

The diagnostic characteristics identified in these specimens did not coincide with those of any species described so far. Accordingly, this paper describes a species previously unknown to science in the genus *Feltria* from Japan.

MATERIALS AND METHODS

Specimens were collected in Takachiho Town, West Usuki County, Miyazaki Prefecture (Fig. 1), on 31 December 2019 and 24 October 2021. Seepage-wetted moss—*Rhynchostegium riparioides* (Hedw.) Cardot, 1913—on the undersurface of a cliff along a side road of Prefectural Road 50 was collected (Fig. 2). At my home, I rinsed the moss with tap water in a polyethylene bucket and retrieved water mite specimens from the rinse water. The specimens were preserved in Imamura's fluid (Imamura, 1965). They were mounted in glycerin jelly and the cover slips were sealed with Canada balsam under a stereomicroscope. They were observed under a light microscope. Photos of unmounted specimens were taken with a digital microscope. Illustrations

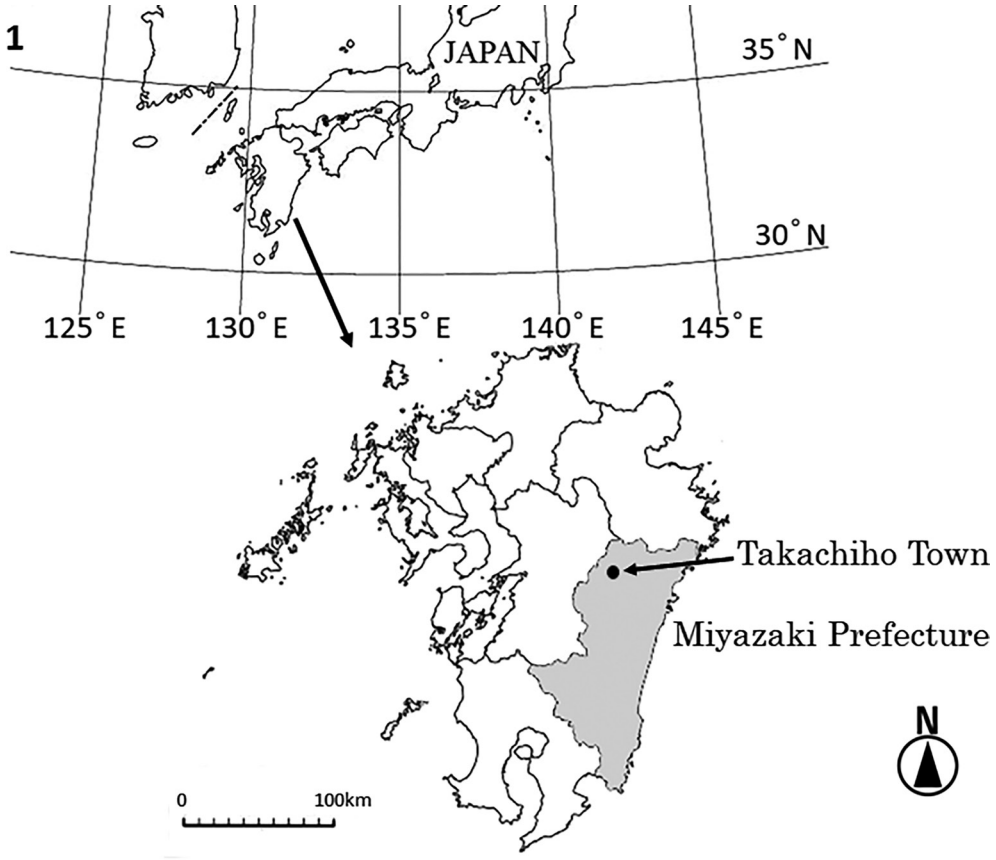


Fig. 1. Map showing the provenance of the material used in the present study.

were drawn with the aid of a camera lucida, and measurements were made with an ocular micrometer.

The terms for body parts generally follow those of Cook (1961) (Fig. 3).

The following abbreviations are used in the description and figure legend: Dp-A–E, dorsal plates A–E; Dgl-A–D, dorsoglandularia A–D; Cx-I–IV, first to fourth coxal plates; P-1–5, first to fifth palp segments; I–IV-L-1–6, first to sixth segments of the first to fourth legs; L, length; W, width.

The body parts were measured in the following format: (1) Idiosoma: ventral length (i.e., total length), from the anterior-most margin of the first coxal plate to the terminal end of the idiosoma; dorsal length, from the anterior-most margin to the terminal end of the idiosoma; width, at the widest point. (2) Anteromedial plate: length, from the anterior- to posterior-most margins along the longitudinal median axis; width, at the widest point. (3) Anterior coxal group (Cx-I–II): length, from the anterior- to posterior-most margins including apodemes along the longitudinal median axis. (4) Total coxal group (Cx-I–IV): length, from the anterior- to posterior-most margins along the longitudinal median axis. (5) Genital plate in males: length, from the anterior- to posterior-most margins along the longitudinal median axis; width, at the widest point of the fused right and left plates. (6) Genital plate in females: length, from the anterior- to posterior-most

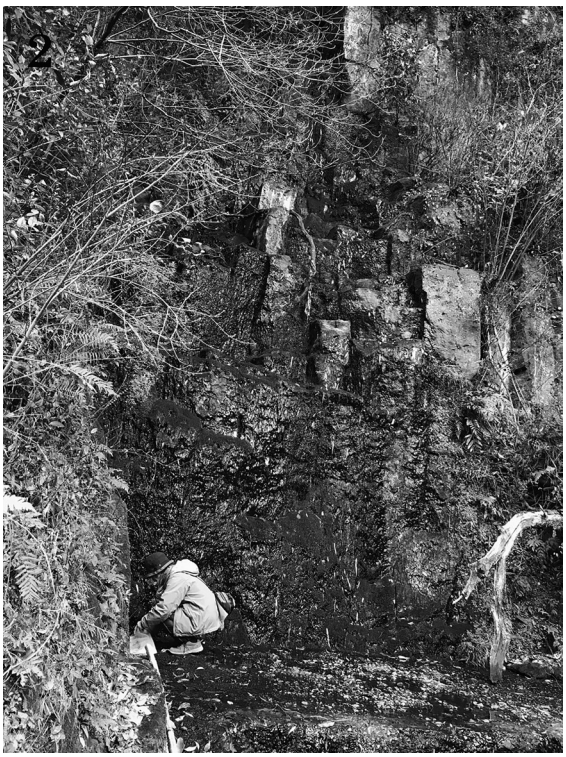


Fig. 2. Landscape of the collection site.

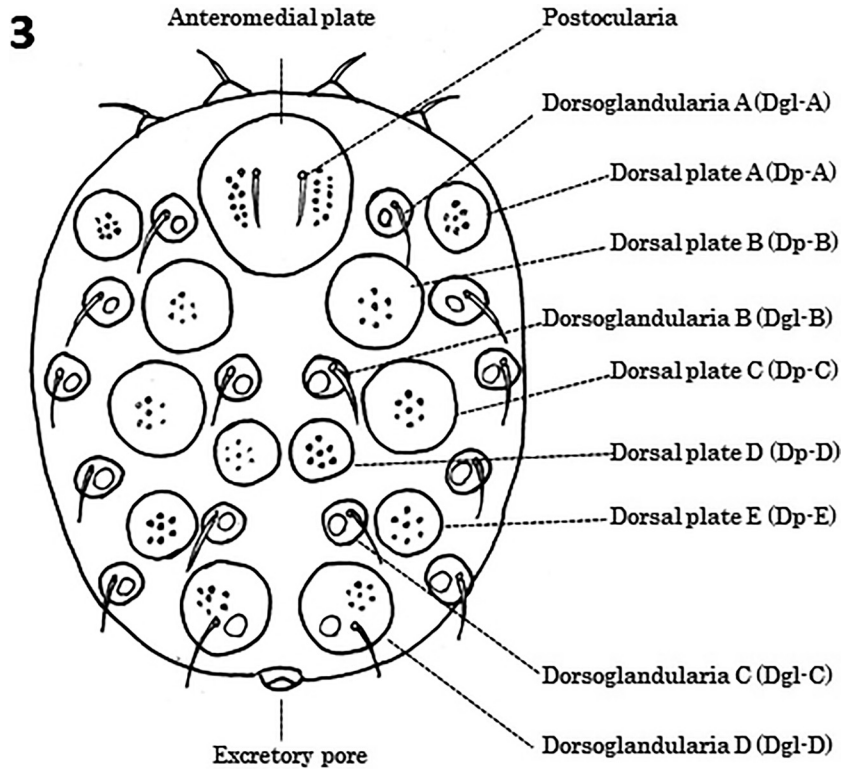


Fig. 3. Schematic drawing of basic dorsal plates and dorsoglandularia in *Feltria* (modified from Fig. 33 in Cook (1961)).

margins of each right or left plate along the longitudinal median axis; width, at the widest point of each right or left plate. (7) Palp segments: length, straight dorsal length from the proximal base to the distal end. (8) Leg segments: length, straight dorsal length from the proximal base to the distal end. In the description, measurements are always given in micrometres (μm).

The material is deposited in the Museum of Nature and Human Activities, Sanda, Hyogo (MNHAH), Japan.

RESULTS

A new species of the subgenus *Feltriella* in the genus *Feltria* was discovered in Takachiho Town in Miyazaki Prefecture, Japan.

Family Feltriidae Viets, 1926
Genus *Feltria* Koenike, 1892
Subgenus *Feltriella* Viets, 1930
(New Japanese name: Nishiki-hōsekidani azoku)

Diagnosis: Gnathosoma with short posterior apodemes, medial suture line of coxae always visible, Dgl-D large, P-5 distinctly shorter than P-4, III-L-6 without modified ventral setae in male (Cook, 1974; Gerecke, 2012; Smit, 2020).

Feltria (*Feltriella*) *takachiho* sp. nov.
(New Japanese name: Kagura-hōsekidani)

Type series

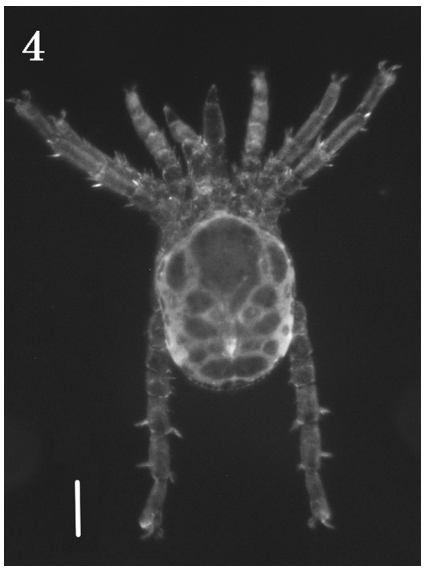
Holotype: Male (MNHAH A2-013575), in seepage-wetted moss (*R. riparioides*), on a cliff (32°42′0.43″N, 131°18′0.75″E) along a side road of Prefectural Road 50, Takachiho Town, West Usuki County, Miyazaki Prefecture, Japan, 24 October 2021, S. Morimoto leg; Allotype: Female (MNHAH A2-015619), the same data as for holotype; Paratypes: one male (MNHAH A2-015620) and one female (MNHAH A2-15621), the same data as for holotype; two females (MNHAH A2-015622, MNHAH A2-015623), the same locality as holotype, 31 December 2019, S. Morimoto leg.

Etymology

The specific epithet is derived from the type locality, Takachiho (genitive noun).

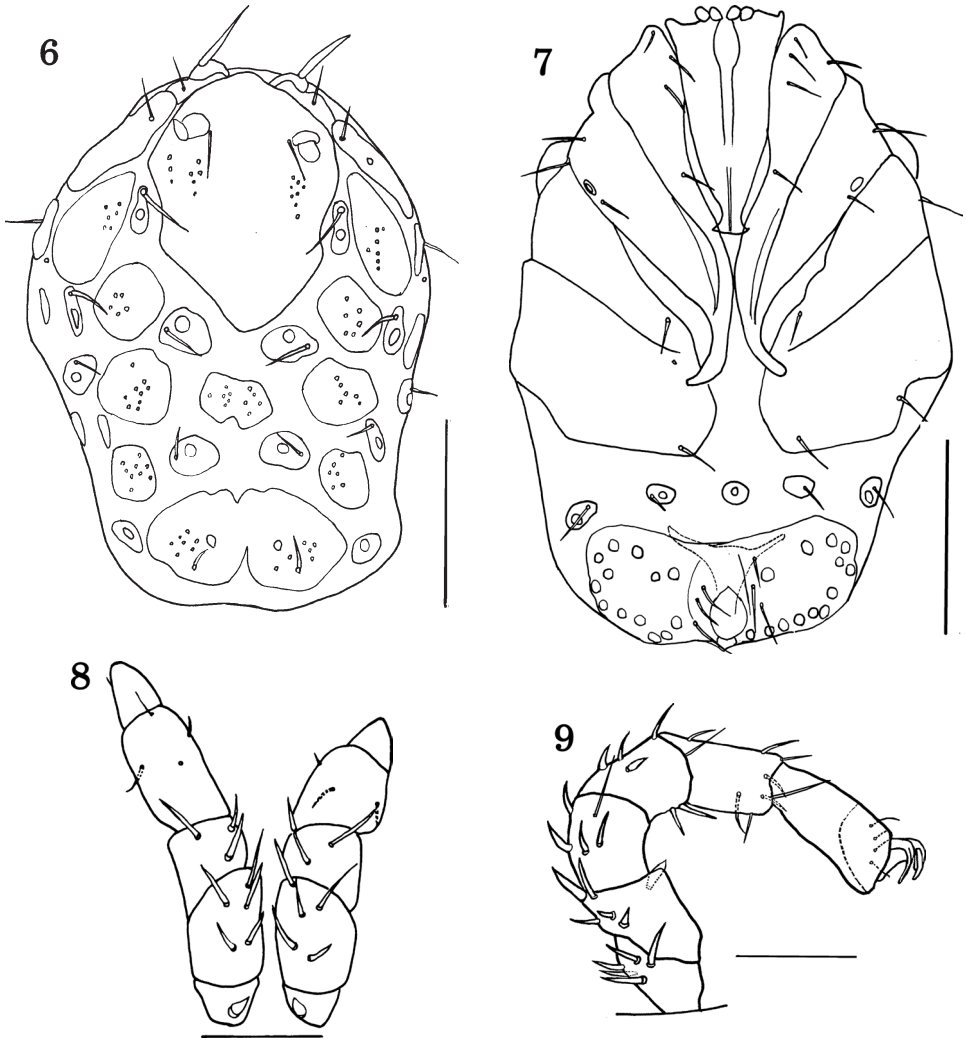
Descriptions

Color of dorsal and ventral plates reddish, striated membranous integument yellowish in living specimens (Figs. 4, 5).



Figs. 4–5. *Feltria* (*Feltriella*) *takachiho* sp. nov. Unmounted specimens. 4. Dorsal view of the male. 5. Dorsal view of the female. Scale bars: 100 µm.

Male (holotype, MNHAH A2-013575): Dorsum with several plates and glandularia (Fig. 6). Anteromedial plate approximately hexagonal, protruding posteriorly, with a pair of postocularia. Dgl-D fused medially into a large plate. Dp-D fused medially. Other dorsal plates and glandularia separate. Venter with coxal plates, glandularia, and a single genital plate (Fig. 7). Apodemes of Cx-I–II extending posteriorly to reach Cx-IV. Posterior end of Cx-IV distant from genital plate. Genital plates fused into a single plate, surrounding a gonopore, with 13 acetabula on each side. Excretory pore located on a genital plate. P-1–5 with 1, 5, 3, 4, and 1 spiniform setae,

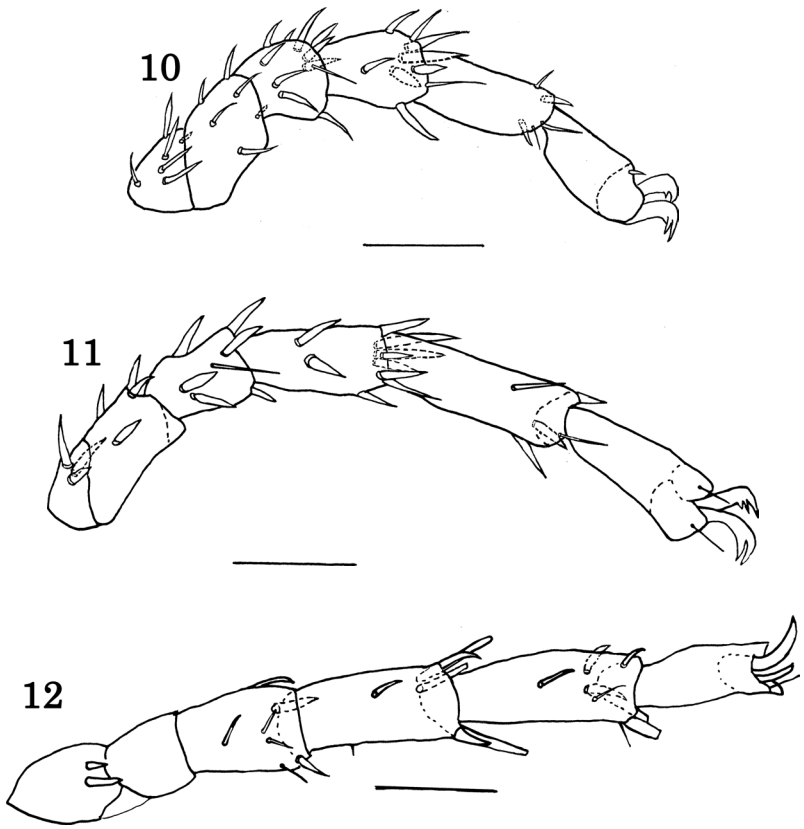


Figs. 6–9. *Feltria* (*Feltriella*) *takachiho* sp. nov. Male (holotype, MNHAH A2-013575). 6. Idiosoma (dorsal view). 7. Idiosoma (ventral view). Scale bars: 100 μm. 8. Right and left palps (dorsal view). 9. First right leg. Scale bars: 50 μm.

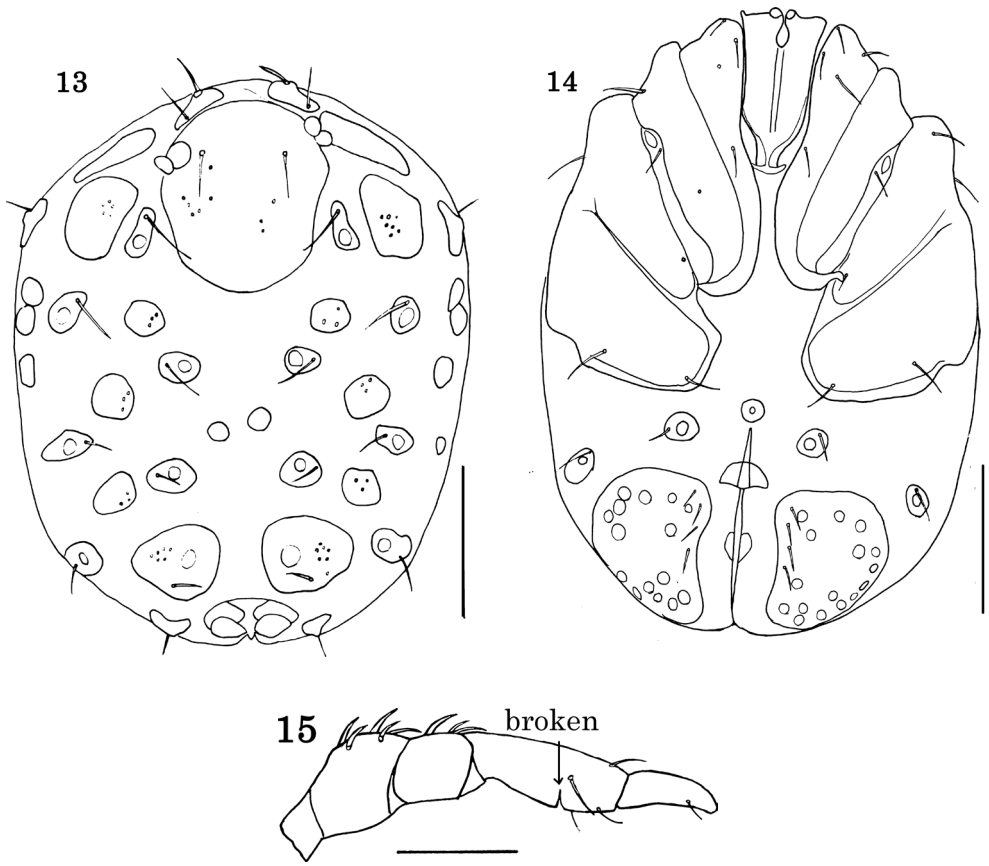
respectively (Fig. 8). P-5 distinctly shorter than P-4. Legs without swimming setae (Figs. 9–12). III-L-6 without modified ventral setae (Fig. 11).

Measurements: Idiosoma ventral L/W 315/226, dorsal L 287. Anteromedial plate L/W 137/105, distance between postocularia 44. Dp-D L/W 31/40. Anterior coxal group L 185. Total coxal group L 220. Legs L: I-L-1 38, I-L-2 27, I-L-3 42, I-L-4 44, I-L-5 55, I-L-6 59; II-L-1 38, II-L-2 29, II-L-3 38, II-L-4 46, II-L-5 61, II-L-6 53; III-L-1 38, III-L-2 38, III-L-3 42, III-L-4 65, III-L-5 90, III-L-6 76; IV-L-1 46, IV-L-2 38, IV-L-3 55, IV-L-4 65, IV-L-5 82, IV-L-6 61. Palp L: P-1 19, P-2 48, P-3 25, P-4 53, P-5 27. Genital field L/W 59/139. Distance between Cx-IV and genital plate 40. Gnathosoma L 120.

Female (allotype, MNHAH A2-015619): Dorsum with several plates and glandularia. Dorsal plates and glandularia widely separated from each other (Fig. 13). Anteromedial plate roundish without posterior protrusion, with a pair of postocularia. Venter with coxal plates, glandularia, and genital plates (Fig. 14). Apodemes of Cx-I–II extending posteriorly to reach Cx-III.



Figs.10–12. *Feltria* (*Feltriella*) *takachiho* sp. nov. Male (holotype, MNHAH A2-013575). Second to fourth right legs. Scale bars: 50 μm.



Figs. 13–15. *Feltria* (*Feltriella*) *takachiho* sp. nov. Female (allotype, MNHAH A2-015619). 13. Idiosoma (dorsal view). 14. Idiosoma (ventral view). Scale bars: 100 μm. 15. Right palp (lateral view). Scale bar: 50 μm.

Posterior end of Cx-IV distant from genital plate. Genital plate placed on both sides of gonopore, with 15 or 16 acetabula on each side. Excretory pore located on the terminal end of dorsum. Characteristics on palp (Fig. 15) and legs are the same as those for the holotype male.

Measurements: Idiosoma ventral L/W 405/294, dorsal L 371. Anteromedial plate L/W 124/111, distance between postocularia 54. Right Dp-D L/W 15/15, left Dp-D L/W 17/17. Anterior coxal group L 189. Total coxal group L 252. Legs L: I-L-1 not measured, I-L-2 31, I-L-3 40, I-L-4 56, I-L-5 67, I-L-6 69; II-L-1 44, II-L-2 29, II-L-3 42, II-L-4 61, II-L-5 67, II-L-6 69; III-L-1 not measured, III-L-2 34, III-L-3 44, III-L-4 61, III-L-5 80, III-L-6 78; IV-L-1 not measured, IV-L-2 46, IV-L-3 65, IV-L-4 78, IV-L-5 88, IV-L-6 86. Palp L: P-1 16, P-2 48, P-3 25, P-4 61, P-5 38. Genital field L/W 99/82. Distance between Cx-IV and genital plate 53. Gnathosoma L 111.

Size and morphological variation

Males (*n* = 2: MNHAH A2-013575 [holotype], MNHAH A2-015620 [paratype]): Idiosoma

ventral L/W 315–347/226–258, dorsal L 287–304. Anteromedial plate L/W 137–162/105–124, distance between postocularia 44–50. Ratio of distance between postocularia to dorsal length of idiosoma 0.15–0.16.

Dp-D L/W 31–34/40–44. Anterior coxal group L 185–204. Total coxal group L 220–256. Legs L: I-L-1 38, I-L-2 25–27, I-L-3 38–42, I-L-4 44–55, I-L-5 55–65, I-L-6 53–59; II-L-1 38–46, II-L-2 29, II-L-3 36–38, II-L-4 46–57, II-L-5 61–69, II-L-6 53–67; III-L-1 38–42, III-L-2 38, III-L-3 42, III-L-4 65, III-L-5 86–90, III-L-6 76–80; IV-L-1 46–53, IV-L-2 38–42, IV-L-3 53–55, IV-L-4 65–69, IV-L-5 82–88, IV-L-6 61–84. Palp L: P-1 17–19, P-2 48–59, P-3 21–25, P-4 53–57, P-5 27–34. Genital field L/W 59–69/139–166. Number of acetabula on right and left side 10–13/12–13. Distance between Cx-IV and genital plate 21–40.

Ratio of distance between Cx-IV and genital plate to idiosoma ventral length 0.06–0.13. Gnathosoma L 120–132.

Females (n = 4: MNHAH A2-015619 [allotype], MNHAH A2-015621, MNHAH A2-015622, MNHAH A2-015623 [paratypes]): Idiosoma ventral L/W 347–441/250–312, dorsal L 331–391. Anteromedial plate L/W 116–145/103–111, distance between postocularia 50–54. Ratio of distance between postocularia to dorsal length of idiosoma 0.13–0.16.

Right Dp-D L/W 13–19/15–21, left Dp-D L/W 13–19/15–21. Anterior coxal group L 181–189. Total coxal group L 241–252. Legs L: I-L-1 38–44, I-L-2 31–36, I-L-3 29–40, I-L-4 48–56, I-L-5 59–67, I-L-6 69–71; II-L-1 34–44, II-L-2 29–36, II-L-3 40–42, II-L-4 53–61, II-L-5 65–74, II-L-6 67–78; III-L-1 42, III-L-2 34–42, III-L-3 44–53, III-L-4 61–78, III-L-5 80–99, III-L-6 78–92; IV-L-1 46–69, IV-L-2 44–53, IV-L-3 63–67, IV-L-4 78–92, IV-L-5 88–107, IV-L-6 86–103. Palp L: P-1 16–21, P-2 46–48, P-3 25–29, P-4 59–65, P-5 34–40. Genital field L/W 78–99/76–84. Number of acetabula on right and left side 9–16/12–16. Distance between Cx-IV and genital plate 40–92.

Ratio of distance between Cx-IV and genital plate to idiosoma ventral length 0.12–0.21. Gnathosoma L 108–113.

The diameter of the excretory pore and Dgl-D is the same and the distance between dorsal plates and glandularia is rather shorter in paratype female (MNHAH A2-015621). Right and left Dp-D are fused into a single small Dp-D in paratype female (MNHAH A2-015622). These appear to be intraspecific variations. The ratio of distance between Cx-IV and genital plate to idiosoma ventral length varies considerably in both sexes. This discrepancy is due to transformations of the body shape in the process of slide preparation.

Remarks

Character comparisons for *F.* (*F.*) *takachiho* sp. nov. and congeners are provided in Table 1.

The female of *F.* (*F.*) *takachiho* sp. nov. most resembles that of *F.* (*F.*) *multiscutata* Cook, 1961 in having a roundish anteromedial plate and smaller Dp-D than Dgl-C. However, the female of the new species can be distinguished from the latter species by having more separated postocularia. Similarly, the male of the new species is also distinguishable from the latter species by having more separated postocularia. The female of the new species also resembles that of *F.* (*F.*) *crassipalpis* Lundblad, 1941 in having a roundish anteromedial plate and separated Dp-B, Dp-C, and Dgl-B. However, the female of the new species differs from the latter species in

Table 1. Character comparison among *F.* (*Feltriella*) *takachiho* sp. nov., *F.* (*F.*) *multiscutata*, *F.* (*F.*) *crassipalpis*, and *F. yinjiangensis*.

Characters	*F.* (*F.*) *takachiho sp. nov.*		*F.* (*F.*) *multiscutata*		*F.* (*F.*) *crassipalpis*		*F. yinjiangensis*	
	Male (n = 2) (holotype and paratype)	Female (n = 4) (allotype and paratypes)	Male	Female	Male	Female	Male unknown	Female
Shape of the anteromedial plate	hexagonal	roundish	hexagonal	roundish	–	roundish	–	hexagonal
Ratio of distance between postocularia to dorsal length of idiosoma	0.15–0.16	0.13–0.16	0.09[a]	0.08[b]	0.15[c]	0.13[d]	–	0.15[e]
State of right and left Dp-D	fused	separate or fused	fused	fused or separate	Anteromedial plate and left and right Dp-B, Dp-C, Dp-D, Dgl-A, Dgl-B, and Dgl-C are fused into a single large plate.	fused	–	fused
Relative size of Dp-D to Dgl-C	large	small	large	small or the same		large	–	large
State of Dp-B, Dp-C, and Dgl-B on each side	separate	separate	holotype: fused; paratypes: separate	separate		separate	–	separate

[a] Based on Fig. 17 in Cook (1961).
[b] Based on Fig. 34 in Cook (1961).
[c] Based on Fig. 58A in Lundblad (1969).
[d] Based on Fig. 79 in Lundblad (1969).
[e] Based on Fig. 21A in Li et al. (2022).

having a smaller Dp-D than Dgl-C. Furthermore, dorsal plates and glandularia, except for Dp-D and Dgl-D, are separated in the male of the new species, while these plates and glandularia are fused in the male of *F*. (*F*.) *crassipalpis*. Additionally, the female of the new species resembles that of *F*. *yinjiangensis* Li & Guo, 2022 in having fused Dp-D and separated Dp-B, Dp-C, and Dgl-B. However, the female of the new species differs from that of the latter species in having a smaller Dp-D than Dgl-C and a roundish anteromedial plate.

ACKNOWLEDGEMENTS

I am grateful to Dr. Toru Kishimoto (Tsukuba International University), who helped with the taxonomic identification of mosses. I am especially indebted to Dr. Hiroshi Abé (Nihon University) for his valuable advice and critical reading of the manuscript. I dedicate my heartfelt thanks to two anonymous reviewers for their valuable comments in improving a previous version of the manuscript.

REFERENCES

Abé, H. (2005) Annotated checklist of Japanese water mites (Acari: Prostigmata: Hydracarina). *Acta Arachnologica*, 54: 111–145.

Cook, D. R. (1961) Water mites of the genus *Feltria* in central and western United States (Acarina: Feltriidae). *Annals of the Entomological Society of America*, 54: 118–133.

Cook, D. R. (1974) Water mite genera and subgenera. *Memoirs of the American Entomological Institute*, 21: 1–860.

Gerecke, R. (2012) Studies on European *Feltria* species (Acari: Hydrachnidia: Feltriidae). *Stuttgarter Beiträge zur Naturkunde A*, 5: 13–47.

Imamura, T. (1954) Studies on water-mites from Hokkaido. *Journal of Hokkaido Gakugei University*, Section B, Supplement, 1: 1–148.

Imamura, T. (1957) Subterranean water-mites of the middle and southern Japan. *Archiv für Hydrobiologie*, 53: 350–391.

Imamura, T. (1959) Water-mites (Hydrachnellae) of subterranean waters in Kanto District, Japan. *Acarologia*, 1: 426–451.

Imamura, T. (1962) Einige neue Arten von troglobiontischen Wassermilben in Japan. *Zoologischer Anzeiger*, 168: 252–261.

Imamura, T. (1965) A case of water mites, 4. Collection and Experimental Techniques. In: Mites, An Introduction to Classification, Bionomics and Control of Acarina (ed., Sasa, M.), p. 34, University of Tokyo Press, Tokyo. (In Japanese)

Koenike, F. (1892) Zwei neue Hydrachniden-Gattungen aus dem Rhätikon. *Zoologischer Anzeiger*, 15: 320–324.

Li, H.-T., Z.-H. Ding, X.-Y. Gu and J.-J. Guo (2022) Studies on Chinese water mites: The genus *Feltria* Koenike, 1892 (Acari: Feltriidae). *Systematic & Applied Acarology*, 27: 410–441.

Lundblad, O. (1941) Neue Wassermilben. Vorläufige Mitteilung. *Entomologisk Tidskrift*, 62: 97–121.

Lundblad, O. (1969) Indische Wassermilben, hauptsächlich von Hinterindien. *Arkiv för Zoologi*, 22: 289–443.

Piersig, R. (1898) Hydrachnidenformen aus Hohen Tatra. *Zoologischer Anzeiger*, 21: 9–13.

Smit, H. (2020) Water mites of the world, with keys to the families, subfamilies, genera and subgenera (Acari: Hydrachnidia). Monografieën van de Nederlandse Entomologische Vereniging, 12: 1–774.

Viets, K. (1926) Versuch eines Systems der Hydracarinen. *Zoologischer Anzeiger*, 69: 188–199.

Viets, K. (1930) Zur Kenntnis der Hydracarinen-Fauna von Spanien. *Archiv für Hydrobiologie*, 21: 359–446.

摘要

日本で見つかったホウセキダニ属の一新種（ダニ亜綱：ミズダニ亜団：ホウセキダニ科）

森本 静子（兵庫県立人と自然の博物館）

日本で見つかったホウセキダニ属の一新種を *Feltria* (*Feltriella*) *takachiho* sp. nov. として記載した．本種は，宮崎県の道路沿いで，崖から浸み出た水で濡れたコケの中から発見された．本種は，*Feltria* (*Feltriella*) *multiscutata* Cook, 1961，*Feltria* (*Feltriella*) *crassipalpis* Lundblad, 1941，*Feltria yinjiangensis* Li & Guo, 2022 に類似しているが，新種はオス・メスともに左右の背毛 postocularia 間の距離が長いことで *F.* (*F.*) *multiscutata* と区別できる．加えてメスの背板 dorsal plate D が小さいことで *F.* (*F.*) *crassipalpis* のメスと，また，背板 dorsal plate D が小さく背前板 anteromedial plate が丸みをおびていることで *F. yinjiangensis* のメスと区別できる．