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New discovery and redescription of *Hondoniscus kitakamiensis* Vandel, 1968 (Crustacea: Isopoda: Trichoniscidae) from scree-covered slope, Iwate-ken, Northern Japan *

Takashi Komatsu [1], Noboru Nunomura [2]

[1] National Museum of Nature and Science, Tokyo, 4-1-1, Amakubo, Tsukuba-shi, Ibaraki 305-0005, Japan
[2] Noto Marine Laboratory Institute of Nature and Environmental Technology, Kanazawa University, Ogi, Noto-cho, Ishikawa 927-0553, Japan

ホンドワラジムシ*Hondoniscus kitakamiensis* Vandel の岩手県岩泉町の地下浅層からの発見と再記載

小松　貴 [1]，布村　昇 [2]

[1] 国立科学博物館　305-0005　茨城県つくば市天久保9-1-1
[2] 金沢大学環日本海域環境研究センター臨海実験施設　927-0553　石川県鳳珠郡能登町小木

Hondoniscus kitakamiensis（和名：ホンドワラジムシ）は岩手県岩泉町の鍾乳洞，龍泉洞において採集された標本をもとに，Vandel（1968）により新属新種として記載された．しかし，個体数が少ない上，記載された形質の記載や図示が少なかったため，新たな個体に基づいて他の形質を再記載することが期待されていた．一方，龍泉洞は観光客の増大にともない，自然水路にそって掘られた人工のトンネルにより水や空気の流通が起こり，次第に本種の生息環境は悪化して，近年では他の洞窟性動物と同様に龍泉洞や近隣の洞穴でも確認されておらず，その絶滅が危惧されていた．著者の一人である小松は，本種の分布域が他の地下性節足動物同様に地下浅層に広がっている可能性が高く，付近の地下浅層にも生息すると考え，その調査を行ってきた．その結果，2015年7月に龍泉洞口から西に2 km離れた宇麗羅山内の地下浅層から同属の未記載種を発見し，*H. ureirensis*（和名：ウレイラワラジムシ）として記載した．その後，2018年6月に龍泉洞付近の川岸の地下浅層から，白色無眼のナガワラジムシ類を3個体採集した（布村・小松，2018）．これらは，その外形ならびに第2触角，オスの第1腹肢，第2腹肢の形態などの重要形質を観察した結果，ホンドワラジムシと確認されたので，従来報告されていなかった形質を新たに記載した．本種が洞穴だけでなく地下浅層にも生息する事実，さらに同属近縁種ウレイラワラジムシと単一山塊内に共存する事実は，本種の保全生態学および地下性生物における生物地理学的な観点からも極めて重要である．本種の分布範囲が，実際この地域内のどの位まで及ぶかは未知であり，今後の調査が望まれる．この標本は国立科学博物館および富山市科学博物館に保管される．

Key words：*Hondoniscus kitakamiensis*, discovery from upper hypogean zone, redescription
キーワード：ホンドワラジムシ，地下浅層からの発見，再記載

Introduction

Vandel (1968) established a new genus *Hondoniscus* and described *Hondoniscus kitakamiensis* on a few specimens collected from Ryusendô cave, Iwate-ken. But in recent years, there has been no additional report of this species. After that, two species of the genus have been known as valid, *H. mogamiensis* and *H. ureirensis* from the northern Honshu, Japan, respectively from Tohoku District, Northern Japan.

Among them, *H. kitakamiensis* has been known only from the limestone cave Ryusendô, the type locality of the species, but the environment of the cave gradually dried to ensure the increasing tourists' one's safety secure a tunnel-shaped device through which air is blowing along the natural waterway. Caused by this tunnel, condition of air and water changed habitat became worse.

So in recent years, some biological surveys, which

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seems worth considering possible, were held by some scientists: Koumori-ana branch hole of Ryusendô (Fujii *et al.,* 2010) and Uchimagi-dô cave (Fujii *et al.,* 2011), near from Ryusendô. But the occurrence of this species has not been confirmed. This species has designated as an endangered species by Ministry of the Environment in 1991 (Uéno and Nunomura, 1993; *Hondoniscus kitakamiensis*).

Therefore, the first author (TK) made a series of research in the zone of scree-covered near Ryusendô cave and collected individuals, and they were sent to the second author (NN) and we made a redescription of *H. kitakamiensis* on the specimens.

***Hondoniscus kitakamiensis* Vandel, 1968 (Figs.1-2)**

Material examined: 2♂♂ (2.5-2.6 mm in body length) and 1♀ (approximately 3.0 mm in body length, posterior part broken) from the zone of scree-covered slope

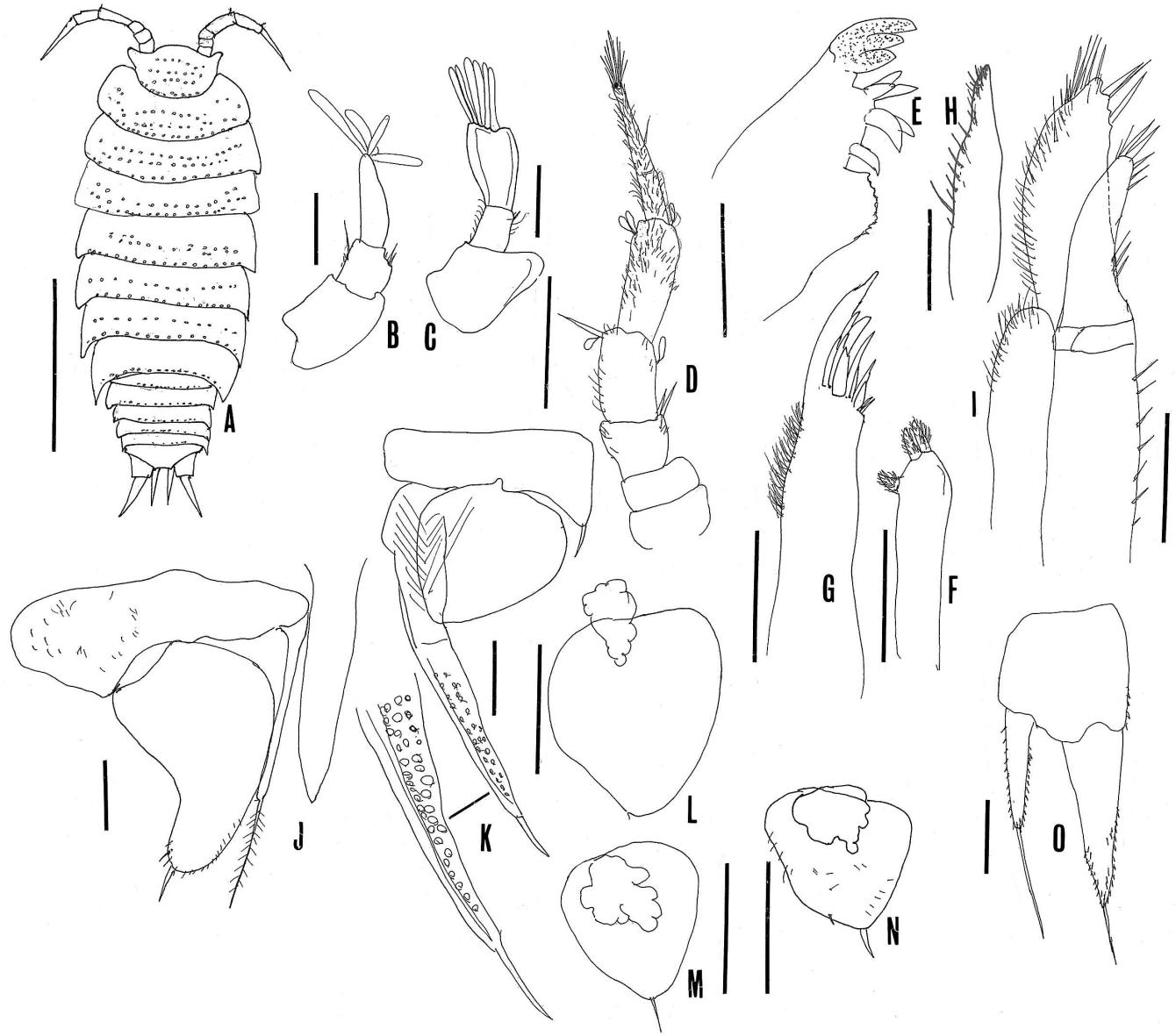

Fig. 1 *Hondoniscus kitakamiensis* Vandel, 1968.
A: Dorsal view, small tubercles accentuated; B: Antennule of a female; C: Antennule of a male; D: Antenna; E: Left mandible; F: Mesial endite of maxillula; G: Lateral endite of maxillula; H: Maxilla, I: Maxilliped; J: Penes and male first pleopod; K: Male pleopod 2; L: Pleopod 3; M: Pleopod 4; N: Pleopod, 5; O: Uropod. Scale bars show A: 1.0 mm, B-C: 0.05 mm, D: 0.2 mm, E-N 0.1 mm (A, C-N: male, B: female).

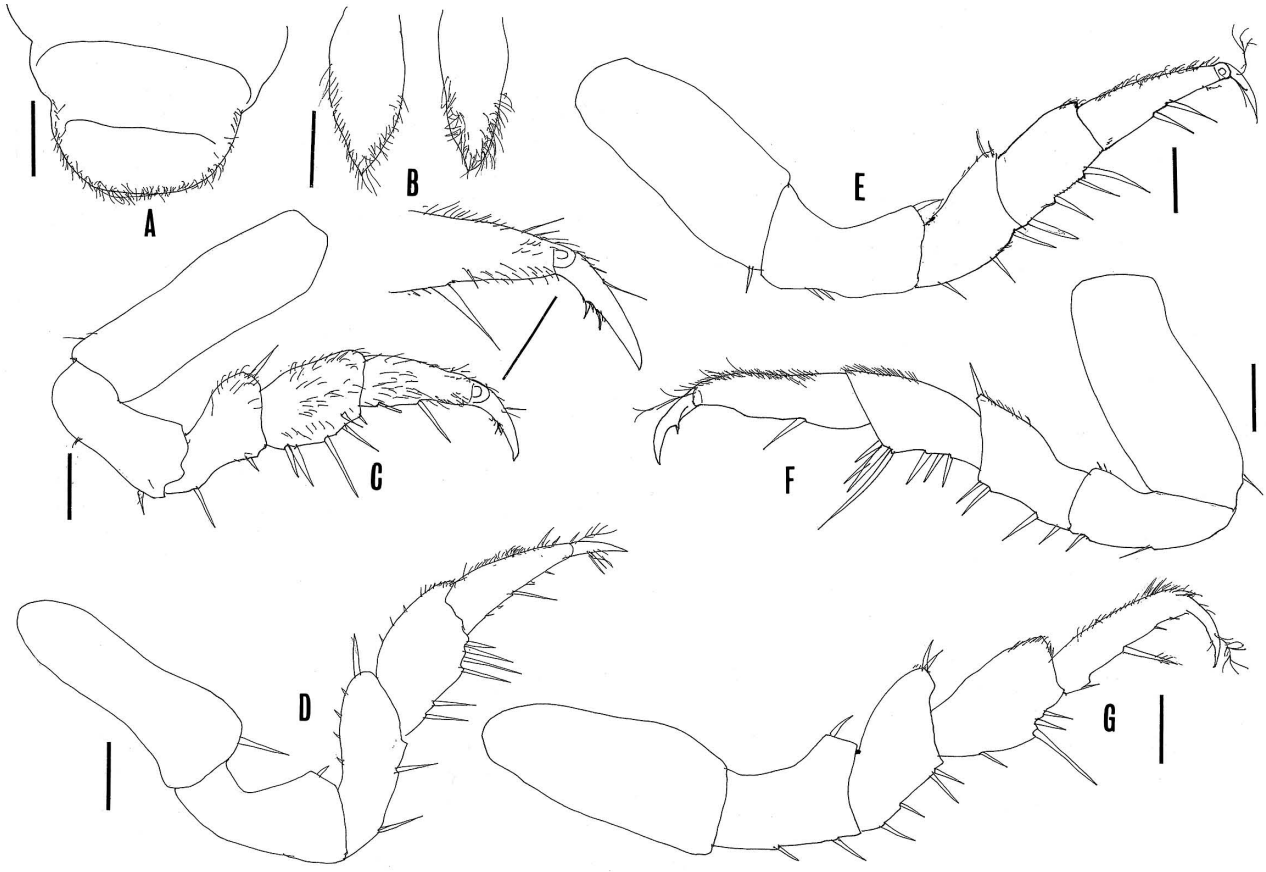

Fig. 2 *Hondoniscus kitakamiensis* Vandel, 1968.
A: Clypeus and labrum; B: Labium; C: Pereopod 1; D: Pereopod 3; E: Pereopod 5; F: Pereopod 6; G: Pereopod 7. Scale bars show A-B: 0.1mm, C-G: 0.1 mm. (All: male)

200 m in altitude, Iwaizumi, Funai, Iwaya-chô, south from the mouth of limestone cave Ryusendô, type locality of *Hondoniscus kitakamiensis* Vandel, 1968, Iwaizumi-chô, Iwate 13 June, 2018, coll. Takashi Komatsu. These specimens will deposite as follows: 1♂ (NSMT Cr-26316) at National Museum of Nature and Science, Tokyo 1♂ (TOYA Cr-23766) and 1♀ (TOYA Cr-23767) at Toyama Science Museum.

Description: Body (Fig. 1A) 2.4-2.5 times as long as wide. Color white. Cephalon with a low and round medial process of antero-lateral angle. Eyes absent, dorsal surface of pereonal somite with 3 rows of small tubercles horizontally. Each lateral margin of many setae on lateral margin. Pleon abruptly narrower than pereonal somites. Each pleonal segment subequal in length. Posterior part of pleotelson truncated.

Antennule (Fig. 1B and C) with 3 segments: terminal segment with 4-6 aesthetascs at the tip. Antenna (Fig. 1D) with 5 peduncular segments: segments 1-3 rather short, segment 4 longer than the segment 3, segment 5 a little longer than peduncular segment 4 and setose. Flagellum, a little longer than peduncular segment 5, setose and almost inarticulate: only a faint suture line at one-third from the basal margin.

Clypeus (Fig. 2A) rectangular. Labrum (Fig. 2A) semicircular. Labium (Fig. 2B) fusiform, with many short setae. Left mandible (Fig. 1E): pars incisiva with 3 teeth; lacinia mobilis with 3 teeth; 2 setae behind lacinia mobilis and a single seta in front of processus molaris; processus molaris wide, with a long seta. Maxillula: mesial lobe: (Fig. 1F) with 3 plumose setae, lateral endite (Fig. 1G) with 10 simple teeth. Maxilla (Fig. 1H): slender, with weaker setae. Maxilliped (Fig. 1I): endite slender, tapering towards the tip, with a seta the tip and many setae; palp with long robust, epipodite elliptical.

A part of appendages were already fallen out the body when observing and unfortunately pereopods 2 and 4 were not confirmed.

Pereopod 1 (Fig. 2C): basis 2.8 times as long as

wide; ischium with 2 setae on inner margin; merus with 2 setae on inner margin and a seta at outer distal angle; carpus with 5-6 setae on inner margin and many setae on lateral margin; propodus with 2 setae on inner margin, many setae on outer margin and many setae on lateral margin.

Pereopod 3 (Fig. 2D): basis 2.8 times as long as wide, with a seta at outer distal angle; ischium with a seta on outer margin; merus with 2 setae on inner margin and a seta on distal outer angle: carpus with 6 setae on inner margin and many short setae on distal part of outer margin; propodus with a longer seta on middle part of inner margin and many setae on outer margin; dactylus with a dactylar seta.

Pereopod 5 (Fig. 2E): basis 2.1 times as long as wide, with a seta near inner distal angle; ischium with 2 setae on inner margin and a seta at outer distal angle; merus with 3 setae on inner margin; carpus with 4 setae on inner margin and many setae on outer margin; propodus with 2 setae on middle area of inner margin and many setae on outer margin and many setae on outer margin many setae; dactylus with a well-developed dactylar seta.

Pereopod 6 (Fig. 2F): basis 2.5 times as long as wide, with a seta near inner distal angle; ischium with 2 setae on inner margin; merus with 4 setae of inner margin and a seta at outer distal area; carpus with 7 setae on inner margin and many setae on outer margin and many setae on outer margin and many setae on distal part of outer margin; propodus with a seta on middle area of inner margin and many setae on outer margin; dactylus with a well-developed dactylar seta.

Pereopod 7 (Fig. 2G): basis 2.3 times as long as wide; ischium with 2 setae on inner margin and 2 setae on distal margin; merus with 4 setae on inner margin and 2 setae at outer distal angle: carpus with 4 setae on inner margin and a group of short setae on outer distal area many setae on distal part of outer margin; propodus with a seta on middle area of inner margin and 3 shorter setae on inner margin and many setae on outer margin; dactylus with a well-developed dactylar seta.

Penes (Fig. 1J) fusiform and rather long, 4.6 times as long as wide.

Pleopod 1 in male (Fig. 1J): sympod rectangular, 2.3 times as wide as long, distal area with a seta: endopod 2-segmented, distal segment slender, with many fine setae on distal half; exopod round, with a seta on distal area.

Pleopod 2 (Fig. 1K) in male: sympod 6 times as wide as long, with a seta at outer distal angle; endopod 2-segmented; distal segment tapering towards the tip; exopod small and reniform, 1.3 times as long as wide.

Pleopod 3 (Fig. 1L): endopod smallr, with sinuate outer margin; exopod orbiculate.

Pleopod 4 (Fig. 1M): similar to pleopod 3, but exopod a little smaller, with a seta at the tip.

Pleopod 5 (Fig. 1N): endopod triangular, with sinuate outer margin; exopod orbiculate, with a seta at the tip, with relatively smaller number of microtrichs sparsely.

Uropod (Fig. 1O): sympod stout, almost as long as wide; endopod conical and slender, 4 times as long as the basal width; exopod conical, 1.4 times longer than endopod and 3 times as long as the basal width.

Environments and ecological notes: The sampling site is the right bank of Shizugawa-river, 700 m southeast of the entrance of Ryusendô cave. Most areas of the right bank of the river are covered by hard and high limestone cliff while there is a little of overed by soft soil and scree. The environment around sampling area was forest consisted of planted cedar and natural broad leaved deciduous trees. The ground surface around river bank was dusky and moist. TK dug the collapse area of the river bank by iron bar (40 cm long). As a result, three individuals of *H. kitakamiensis* were found from rock crack (about 50 cm underground), together with another terrestrial trichoniscid species, *Haplophthalmus danicus*. The geological features where the specimens collected were composed of quite fragile rock so many cracks (within a few millimeters wide). The surface of the rocks was quite wet (to the extent that waterdrop can no longer drip) and covered by a little of red clay. When the individuals were found, they walked positively on the rock surface and tried to escape downwards though the movement was very sluggish. TK successfully collected three individuals of *H. kitakamiensis*, and let more five specimens escape.

In addition to the above-mentioned sampling site, TK tried to find by digging ground along a few

streams on the mountain massif: the opposite side of the entrance the Ryusendô cave. But, none specimens of *H. kitakamiensis* were found there.

Remarks: *Hondoniscus kitakamiensis* was described on a few of specimens collected from the limestone cave Ryusendô (Vandel, 1968) and then Nunomura (1983) redescribed this species. But many features including maxillula, all the pereopods, pleopods 3-5 and some other important appendages have not been described nor figured. Fortunately, some additional specimens were placed at our disposal by TK; we redescribed many hitherto undescribed features: some pereopods 1, 3, 5-7, pleopods 3-5, clypeus, labrum, labium maxillula and maxilla.

The present specimens examined show the following slightly differences from the original description: (1) more numerous aesthetascs of antennule, 4-6 in the present specimens, (2) shorter fourth and fifth peduncular segments of antenna, (3) presence of a faint suture line on antenna, (4) more setose palp of maxilliped, (5) presence of setae n distal half of exopod of pleopod 2 and (6) less numerous setae at the tip of uropod. But these are considered to be slight and they are individual variations.

Ecologically, the discovery from the subterranean environment means the habitat of this species is not limited to cave but also more extensive environments. In addition, the fact that two related species, *H. kitakamiensis* and *H. ureirensis*, coexist within Ureira mountain massif is quite important in a viewpoint of biogeography and evolution of troglobites.

Acknowledgments

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Corrections: In the previous paper (Nunomura and Komatsu, 2018), the registration number of *Hondoniscus ureirensis* was wrong and they should corrected as follows:

Holotype "TOYA Cr-23587" read "TOYA Cr-23763"
Allotype "TOYA Cr-23588" read "TOYA Cr-23764"