Two new species of *Trematodon* (Musci) from Japan

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秋山弘之：日本産ナガダイゴケ属の2新種

*Trematodon*, a small genus of the family Dicranaceae, is best characterized by the extremely long necks of capsules, and by this character it is easily distinguished from other genera of the family.

Two well-known species, *T. longicollis* and *T. ambiguus*, are widely distributed in the world, but most of other species have rather restricted distribution ranges, and many are known only by the type specimen and a few additional ones.

After Takaki (1962) revised Japanese species of *Trematodon* and recognized five species, little attention has been paid to the taxonomy of Japanese *Trematodon*. Recently I made an intensive collection of bryophytes on Mt. Hakusan, central Japan, and among them I found two unfamiliar plants of *Trematodon*. To clarify the taxonomic status of these plants, I compared them with several allied species on the basis of the type and authentic specimens. My examination has led to the conclusion that our plants are sharply different from any described species and represent two new species, which are described below with a brief review of the genus.

I wish to express my cordial thanks to Prof. N. Kitagawa, Nara University of Education and to Dr. J. Hasegawa, Kyoto University for their valuable suggestions and criticisms. I am deeply obliged to the curators of the herbaria, HIRO, KYO, MAK, NICH and TNS, for their kind loan of specimens. Thanks are due to Mr. M. Umebayashi for his drawing of some pictures. I also wish to express my appreciation to Dr. H. Koyama and the members of our laboratory for their kind advice through the course of this study.

*Trematodon hakusanensis* H. Akiyama, sp. nov. Fig. 1

*Trematodontis semitortidentis* Sak. valde similis, sed differt collis capusullae longioribus, foliis falcatis, plantis viridibus.

Plants in small tufts, bright green, soft. Stems 2–4 mm long, mostly simple or more or less branched, densely foliate. Leaves 1–2 mm long, clasping at base, spreading-flexuose above when moist, strongly curled when dry, from oblong, sheathing bases rather gradually narrowed to sublinear limbs; margins recurved, unistratose, entire throughout;

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Fig. 1.
costae indistinct, 1/6–1/4 the leaf width at base, widened above shoulder, excurrent, in cross-section in the upper limb showing one layer of guide cells without stereids, in sheathing base similar to that in the upper limb but more obscure; all the laminal cells thin-walled, short rectangular (1 : 1–1 : 3) above, long rectangular (1 : 3–1 : 6) at shoulder, much more laxly oblong below, narrow at margin; stem cells thin-walled.

Autoicous. Male shoots at the base of female shoots. Perichaetial leaves up to 2.5 mm long, from oblong, clasping bases attenuated to linear limbs, margins recurved, curled when dry, lamina extending upward along costa. Perigonial leaves up to 2 mm long, from ovate, clasping bases attenuated to linear limbs, slightly falcate when dry.

Setae 4–7 mm long, yellow, smooth, usually nearly straight; capsules 2 mm long, slightly inclined; urns bright brown, 0.7–0.9 mm long, ovate, pale brown; capsule necks 1.5–2.0 the urn length, width, with ca. 40 stomata; peristome single, of 16 teeth, easily detached from the mouth; teeth linear-triangular, 250–290 μm high, pale red, smooth throughout, with narrow vertical bars becoming oblique above, perforate between the nodes in the middle and lower parts, not split into segments. Spores 20–25 μm in diameter, spherical, coarsely papillose.

Habitat. On roadside soil, from temperate to subalpine zones.

Specimens examined. Ishikawa Pref.: Kanko-shindo, Mt. Hakusan, Shirane Village, 2060 m alt. (H. Akiyama 3222, KYO); ditto, 1960 m alt. (H. Akiyama 3255, KYO—type). Fukui Pref.: Kamikoike, Mt. Hakusan, Ohno City, 900 m alt. (Sasaki 243, TNS).

The present new species resembles *Trematodon semitortidens* reported from Japan by Sakurai (1933) in general appearance, but the latter differs in the following characters; (i) plants are glossy yellow, (ii) capsule necks are of nearly the same length as of the urns, (iii) cells of leaf-costa and stem are not thin-walled (laminal cells are thin-walled), (iv) leaves are very slightly curled when dry, (v) costae are distinct even at the leaf base, (vi) peristome are persistent, and (vii) urns are dark red.

Thin cell-walls of leaves and stems are also known in *T. montanus*, very recently described from Canada by Belland and Brassard (1983) and *T. laetevirens* reported from Scandinavia by Hakeljor and Frahm (1976). Among the Japanese species, *T. campylopodinus* also shares this character. This species resembles *T. hakusanensis* in general appearance but differs in the following characters; (i) the inner surface and the outer upper surface of peristome are densely papillose, (ii) peristome teeth are deeply forked to the base, (iii) setae are longer (5–8 mm long), (iv) spores are larger (27–30 μm in diameter), (v) cells of leaf shoulders are quadrate and thick-walled, and (vi) leaves are

ovate to lanceolate abruptly narrowed to subula.

Belland and Brassard (1983) reported the deciduous peristome in T. montanus. T. hakusanensis also has the deciduous peristome which is easily detached from mouth.

Peristome teeth of Trematodon are almost always papillose in the outer surface above and in the inner surface throughout, so the non-papillose peristome teeth are the most important feature for this new species. Takaki (1962) reported T. mayebarae from Kyushu, southern Japan, whose peristome teeth are throughout papillose and lack vertical bars on both surfaces. T. mayebarae shows one extreme form of papillation, and T. hakusanensis does another extreme one.

**Trematodon brevicarpus** H. Akiyama, sp. nov. Fig. 2 and 3

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Trematodon brevicarpus SCHOF. valde similis, sed differt peristomii dentibus perforatis, dense papillosis, annulis duplicibus.

Plants in small tufts, bright yellowish-green, somewhat glossy. Stems 3–4 mm long, mostly simple, densely foliate, radiculose below. Leaves 1.6–2.2 mm long, gradually narrowed from clasping, oblong-ovate bases to long, linear limbs, spreading at tip when moist, slightly falcate and flexuose when dry; laminae extending upward along costa; cells 15–25 μm long, rectangular (1 : 3–1 : 5) above, 30–55 μm long, laxly oblong below, narrow and short at margin; margins ± recurved, unistratose below, entire except at the upper part; costae excurrent, distinct and 1/3–1/4 the width of leaf bases, in cross-section at the sheathing base showing a median row of guide cells with stereid bands both upper and lower sides. In female and male shoots, lower leaves short, scale-like and appressed.

Monoicous? (perigonium and perichaetium are terminal on adjacent but different
systems). Perichaetal leaves up to 2 mm long, flexuose-spreading when moist, nearly straight when dry, from distinct, ovate-oblong, sheathing bases abruptly narrowed into long linear limbs filled with costae. Outer perigonal leaves longer than perichaetal leaves, up to 2.4 mm long, gradually narrowed from ovate-oblong, sheathing bases, pale red at base. Inner perigonal leaves up to 2.4 mm long, abruptly narrowed from orbicular, sheathing bases into long linear limbs occupied wholly with costae, red at base.

Setae 2(–3) mm long, pale yellow, smooth, usually straight, slightly flexuose when dry; urns 0.5–0.6 mm long, globose, dark red; capsule necks about as long as the urn, with 50 stomata, strongly plicate when dry, pale yellow; opercula 0.4–0.5 mm long; annuli double; calyptras with a short beak, detached separately from opercula; peristomes single, of 16 fragile teeth, not deciduous; teeth triangular, 150–180 μm high, pale red, not forked but irregularly perforate in the middle portion, with narrow vertical bars in the upper and middle portions, with obscure vertical bars and delicate papilae in the lower portion, sometimes delicately papillose above, densely papillose throughout the inner surface. Spores 25–30 μm in diameter, spherical, minutely papillose.

Habitat. On base ground, forming a small tuft with Ceratodon purpureus, in shiny place, in subalpine zone.

Specimen examined. Ishikawa Pref.: Minamiryugabanba, Mt. Hakusan, Shirane Village, 2090 m alt. (H. AkiYama 3302, KYO—type).

Trematodon brevicarpus shares with T. boasii described from Canada by Schofield (1966) the following characters; (i) very small plants, (ii) globose and red colored urns, (iii) short peristome teeth, and (iv) gradually narrowing leaves. T. boasii is, however, easily distinguished from T. brevicarpus by the characters; (i) peristome teeth are not so distinctly perforate, (ii) annuli are single, (iii) the outer surface of peristome teeth is not papillose below, (iv) perigonia occur at the bases of female shoots, (v) necks are not plicate when dry, and (vi) urns are bright red-brown (not dark red).

T. montanus is also similar to T. brevicarpus, but differs in the deciduous peristome, the thin cell-walls of leaves, and the abruptly narrowed leaves.

Colored urns of capsules are seen in another Japanese species T. semitortidens, and according to Schofield (1966) they sometimes occur also in T. ambigus. Colored capsules are often seen in many species of the family Splachnaceae, in which spores are reported to be carried by flies or other insects. At the first glance, the dark red urn of T. brevicarpus looks like that of Splachnaceae, but spores of this species are not mucous unlike in most species of that family.

These two new species and the others mentioned in this paper are distinguished from one another as follows;

1. Setae are shorter than 8 mm. ...........................................................2
2. Setae are longer than 10 mm. .........................................................7
3. Stem and leaf cells are thin-walled. ..............................................3
2. Stem and leaf cells are thick-walled (in T. semitortidens, laminal cells are thin-walled).

3. Cells of leaf shoulder are rectangular (1:3–1:6). Peristomes are deciduous. Upper surfaces of peristome teeth are smooth and with conical striations. Operculi fall off together with calyptra.

3. Cells of leaf shoulder are quadrate. Peristomes are persistent. Upper surfaces of peristome teeth are densely papillose. Operculi fall off separately from calyptra. Japan. .............................................. T. campylopodinus Besch.

4. Surfaces of peristome teeth are thoroughly smooth. Spores are 20–25 µm in diameter. Leaves are gradually narrowed to subulae. Calyptra beaks are long. Costae are indistinct at leaf bases. Japan. .............................................. T. hakusanensis H. Akiyama

4. Peristome teeth are more or less papillose. Spores are 25–32 µm in diameter. Leaves are abruptly narrowed to subulae. Calyptra beaks are short. Costae are distinct even at leaf bases. Canada. .......... T. montanus Belland et Brassard

5. Urns are straight. Setae are less than 4 mm long. Laminal cells are thick-walled. .......................................... T. semitortidens Sakurai

6. Setae are ca. 2 mm long. Necks are strongly plicate when dry. Urns are dark red. Annuli are double. Peristome teeth are strongly perforate. Spores are minutely papillose. Japan. .............................................. T. brevicarpus H. Akiyama

6. Setae are 1–4 mm long. Necks are not plicate when dry. Urns are bright red. Annuli are single. Peristome teeth are rarely perforate. Spores are coarsely papillose. Canada. .......................................... T. bossii Schofield

7. Stem and leaf cells are thick-walled (in T. longicollis, laminal cells are thin-walled).

7. Stem and leaf cells are thin-walled. Scandinavia.... T. laetevirens Hakelijer et Frahm

8. Capsule necks are as twice as urns in length. World-wide. ... T. longicollis Michx.

8. Capsule necks are as long as urns. .......................................... T. mayebaraee Takaaki

9. Capsules are straight. Peristome teeth are papillose, without vertical bars. Japan. .......................................... T. ambiguus (Hedw.) Hornsch.

References


摘 要 著者は1981-82年の2年間にわたり、加賀白山の蘇岳類相の調査・研究をおこなった。その結果、苔類61属134種、ツノゴケ類2属2種、藓類130属265種を確認することができた。この調査・研究によって得た若干の知見の詳細については、今後報告を続けて行きたい。本文ではナガダイゴケ属の2新種について述べた。

ハクサンナガダイゴケ Trematodon hakusanensis の2点標本はとともに殿ヶ池小屋から観光新道をやや下った地点で採集された。ススキゴケと似た環境に生育していた。登山道沿いのややえぐれて腐植土が垂れている場所で標本は小さな群落を点々とつくっていた。国立科学博物館の標本庫の中にもこの種にあたる標本を確認した。これも産地は白山であった。

ハクサンナガダイゴケは、植物体のほとんどの部分が非常に薄弱である細胞からなり立っていること（そのため植物体は脆弱である）、萌芽が脱落しやすいこと、および萌芽の歯の部分にパピラが全く見られないことが大きな特徴である。萌芽が脱落しやすいことは、カナダから報告された Trematodon montanus で知られていた形質である。しかし本新種は萌芽の形や葉形といった形質において T. montanus とはまったく異なる。エゾナガダイゴケ T. campylopodinus、シマオバナゴケ T. semimertidens (ともに日本産) の2種は、萌芽が短いこと、葉身部の細胞が薄弱であることなどの点で本新種と近縁と思われる。しかしごナガダイゴケは萌芽の歯の部分の形とパピラの程度、葉の肩部の細胞の形などで本新種とは異なる。一方シマオバナゴケは植物体が生えている時でも黄金色であるとのこと、葉身部以外の細胞が厚葉であることなどで区別される。シマオバナゴケの歯は強く弓形に曲るとある（TAKAKI, 1962）が、神戸大学の土永浩史氏が岳久島で採集された標本では歯は弱く傾く程度であった。ユミダイゴケ T. longicollis について多くの標本を調べたところ、同様に歯の曲り具合には様々な程度のものが見られた。これらから判断して、歯の曲り具合は安定した形質と思われる。またハクサンナガダイゴケの萌芽にはパピラが見られないが、これなどどの程度安定した形質であるのかについては今のところ不明である。ユミダイゴケでは萌芽の歯の部分のパピラの程度は実に様々であり、極端な場合には1つの歯の16本の歯のうち数本だけが筋引きをもたずパピラのみからなることさえある。このことを考慮すると、ハクサンナガダイゴケにおいても今後標本が集積された時点でこの点について再検討されなければならない。

アカマルゴケ Trematodon brevicalamus は、南竜ヶ馬場の南西部、テント場として新しく整地された場所のすれの土上に小さな群落をつくっていた。微小な種で目につくにくい。偶然その横に腰をおろしたので見つけることができた。周辺をくまなく探しましたが、他には見なかった。本種はユリミゴケ Tetraplodon angustatus を小さくして歯を赤黒くしたような印象を与える。植物体が微小であること、萌芽が短いことなどの点でカナダから報告された Trematodon boasii に似ているが、口環の色、歯の色、萌芽の歯の形などの点で異なっている。萌芽が赤黒くおびるという特徴は、日本産の種では他にシマオバナゴケとキシナガダイゴケ T. ambiguus に見られる。

日本に産するナガダイゴケ属は、これまで5種が報告されていた（TAKAKI, 1962）が、今回
報告した2種をあわせて7種となる。この7種は以下の通り検索される。

1. 萩柄の長さは10 mm以上。 ........................................ 2
2. 萩柄の長さは8 mm以下。 ........................................ 4
3. 萩柄の向きは内面、外面ともパピラからなり、縫厳しい。また2裂せず、穴のあくこともない。 .................................. マエバラナガダイゴケ T. mayebaraec TAKAKI
4. 萩柄の向きは顶部にパピラをもつが、外面下部には明瞭な縫をもつ、また多くの穴があく（まれに2裂する）。 ........................................ 3
5. 萩柄は中肋に沿って顶部に屈く。葉身細胞は薄腺。柄は薄色。全は本体の2倍以上
6. 萩柄長さと樹皮は樹皮が2.0倍の長さ。
7. 綠はふたほどはむられる。柄の柄の穴があくが2裂することなく、パピラは全くある。 \( \text{胞子は直径 20−25 \( \mu \text{m} \).} \)
8. ハクサンナガダイゴケ T. hakanensis H. AKIYAMA
9. 植物体は長さ。葉は乾くとやや長さ。藤身細胞は厚膜。
10. 植物体は長さ。葉柄は長さ。
11. 植物体は長さ。藤身細胞は厚膜。

秋山弘三：Leucodon esquirolii Thér. シワナナチビイタチゴケ（新称）日本に産す
本種の植物体は黒褐色、二次茎 (leafy stem) は1−2 cmで中心束が分化している。乾くと
葉は二次茎に密着する。葉長は1.5−2.0 mm、葉頂は突形で乳頭状突起のきょ歯をもつ。藤
頂および葉茎部中央以外では細胞は小さく四角形であり、また葉は縦じわを全く欠き短い横じ
わをもつという二点で本種は特徴である。

福部植物研究所に所蔵されている標本は造形器しかつていないが、本種と同定される。
この標本は大内信氏が1955年10月21日に、福岡県香春町香春岳で採集されたものである。標本ラ
ベルには標高 400 m の石灰岩上に生育していたとある。

本種は今までに中国南部（江蘇、浙江、福建、貴州、云南の各省）から知られていた。イタ
チゴケ属は一般に樹幹に着生する。香春岳が本種の分布の東限にあたることから、石灰岩上に
見つかかったことは興味深い。

Leucodon esquirolii Thér. in Monde Pl. ser. 2, 9(45): 22 (1907), NOGUCHI in
Japan, Kyushu, Fukuoka Pref.: Mt. Kawaradake, Kawara-cho (H. OCHI 202 NICH).
(H. AKIYAMA)