

Kohsaku YAMADA*: **Three new species of *Radula***
(Hepaticae) from Papua New Guinea

山田耕作*: パプア ニューギニア産ケビラゴケ属 (苔類) の3新種

Recently I studied 74 specimens of *Radula* collected in Papua New Guinea by the courtesy of Dr. H. Streimann (Canberra Botanic Gardens, Australia), and found three new species, *Radula dolabrata*, *R. hattorii*, and *R. sharpii*, among them. The descriptions and illustrations of these three species are given below.

Radula dolabrata Yamada, sp. nov. (Fig. 1)

Planta mediocris, flavovirens; caulis irregulariter et dense ramosus; lobi foliorum caulinarum moderate vel laxe imbricati, oblongi, apice obtuso, basi subtruncati (vel raro leviter arcuati), cellularum parietibus tenuibus, trigonis mediocris, cuticula laevi; lobuli oblique patuli, dolabriformes vel rectangulares, apice subacuto vel acuto, basi caulem haud tegente, carina valde inflata, subrecta vel leviter arcuata.

Plants medium-sized, creeping on large mosses, yellow-green in herb. Stem (8-)10-15 mm long, ca. 0.18 mm in diam., with leaves 2.6-3.1 mm wide, irregularly and densely pinnately branched, branches 2-5 mm long, ca. 0.1 mm in diam., with leaves 1.6-1.9 mm wide; stem 9-11 cells thick, cortical cells somewhat smaller than medullary cells, pale brown, thin-walled with large trigones, medullary cells thin-walled with large trigones. Leaf-lobes widely spreading, moderately to loosely imbricate, slightly concave, when flat oblong, 1.3-1.5 mm long, 0.9-1.0 mm wide, apices obtuse, usually not incurved, basal margins subtruncate (or rarely slightly arched), not auriculate at bases, covering the stem 4/5-2/3 the stem-width or rarely extending slightly beyond the farther edge of stem, insertion inverted J-shaped; marginal cells 15-18×10-13 μm , median cells 21-24×11-21 μm , thin-walled with medium-sized trigones, basal cells 26-31×13-15 μm , thin-walled with large trigones, intermediate thickenings seen; cuticle smooth; leaf-lobules obliquely spreading, ax-shaped (very variable in forms) to rectangular, ca. 1/2 the lobe-length, 0.6-0.75 mm long, 0.3-0.45 mm

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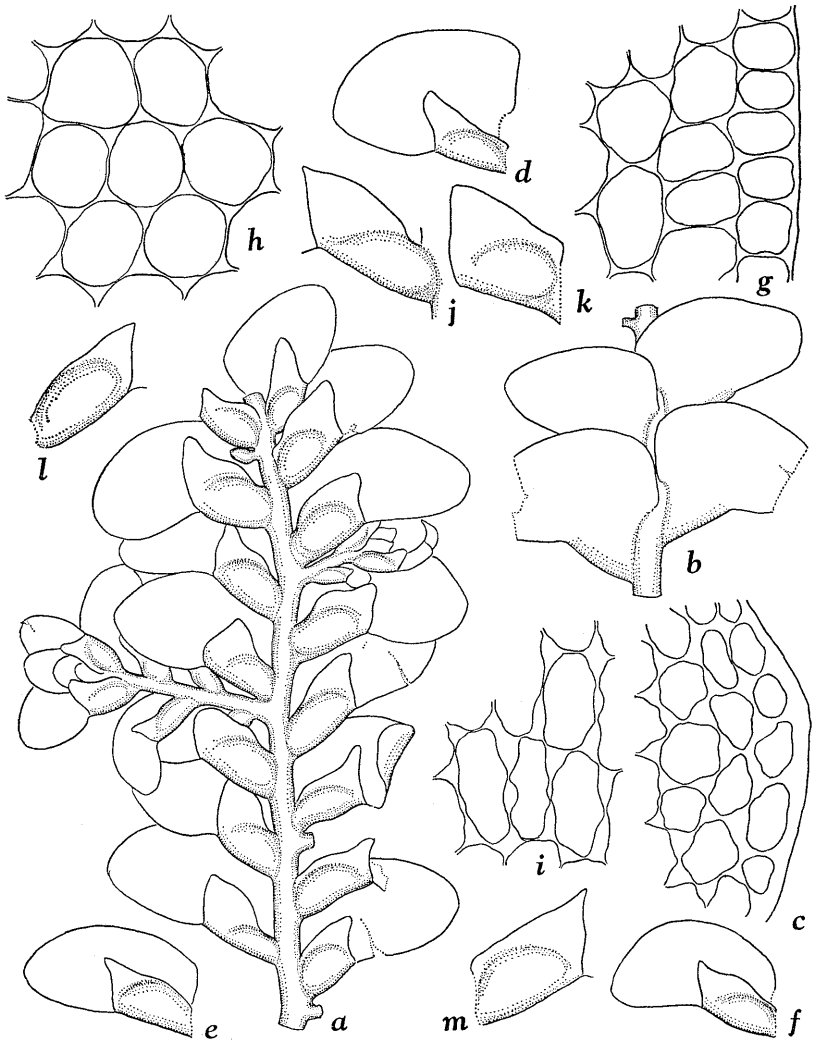


Fig. 1. *Radula dolabrata* Yamada. *a, b*. Portions of stems, *a* ventral view, *b* dorsal view, $\times 16$. *c*. Portion of cross-section of stem, $\times 480$. *d-f*. Stem-leaves, $\times 16$. *g-i*. Cells of lobe of stem-leaf, *g* from margin, *h* from middle, *i* from base, all $\times 480$. *j-m*. Leaf-lobules, $\times 23$. Drawn from the type.

wide, apices often prolonged, subacute to acute, abaxial margins substraight, not decurrent, adaxial margins substraight or slightly arched, the bases not covering the stem, carinal regions widely inflated; rhizoid-initial area convex, rhizoids rarely seen; keel spreading at angles of 50-60° with the stem, 0.5-0.65 mm long, substraight or slightly arched, not decurrent, sinus wide. Sexual organs not seen.

Type: Morobe Prov.: Koke village, 3 km SE of Aseki, 1500 m, advanced regrowth forest besides stream, on *Ficus* trunk, Jan. 20, 1981. H. Streimann & E. Tamba 11711 (holotype in CBG; isotypes in LAE, NICH).

The diagnostic characters of this new species are 1) the oblong leaf-lobes with obtuse apices and subtruncate basal margins, 2) the ax-shaped to rectangular leaf-lobules (very variable in forms) with often prolonged, subacute to acute apices, and substraight or slightly arched, not decurrent keels, 3) the bases of leaf-lobules not covering the stem, and 4) the very wide sinuses.

The present new species seems to be a polymorphous species, especially in forms of leaf-lobules, but is very unique in the above characters, and no close relative is known in New Guinea, tropical Asia, and Pacific Islands.

Radula hattorii Yamada, sp. nov. (Fig. 2)

Planta sterilis, mediocris, olivacea, corticola; caulis dense et irregulariter pinnatim ramosus; lobi foliorum caulinorum moderate imbricati, recte patuli, in plano ovati, basi parum auriculati; lobuli contigui, recte patuli, in plano subquadrati, basi \pm auriculati, area carinali valde inflata, carina cum caule angulis 50-60° formante, subrecta vel parum sinuata.

Plants medium-sized, on bark, olive-green in herb. Stem 5-15 mm long, ca. 0.26 mm in diam., with leaves 2.7-3.2 mm wide, densely and irregularly pinnately branched, branches 2-6 mm long, ca. 0.15 mm in diam., with leaves 1.9-2.2 mm wide. Stem 10-13 cells thick, cortical cells as large as medullary cells, both cells thin-walled with large trigones, subhyaline. Leaf-lobes moderately imbricate, widely spreading, slightly concave, ovate, 1.3-1.6 mm long, 1.0-1.3 mm wide, apices obtuse, basal margins arched, slightly auriculate at bases, usually slightly extending beyond the farther edge of stem, insertion inverted J-shaped, short; marginal cells 10-11 \times 9-10 μ m, thin-walled with small trigones, median cells 23-26 \times 16-19 μ m, thin-walled with medium-sized trigones, intermediate thickenings often seen, basal cells 36-46 \times 13-16 (-23) μ m, thin-walled with large

trigones, intermediate thickenings usually seen; cuticle smooth; leaf-lobules contiguous or rarely slightly remote, widely spreading, subquadrate, ca. 1/2 the lobe-length, 0.8–0.9 mm long, 0.7–0.8 mm wide, apices bluntly angular or rarely obtuse, abaxial margins substraight, not decurrent, adaxial margins slightly arched toward the arched bases, \pm incurved at middle, the bases covering the stem 4/5–2/3 the stem-width (rarely slightly extending beyond the farther edge of stem), bases \pm auriculate, carinal regions inflated throughout; rhizoid-initial area widely convex, rhizoids rarely seen, brown or subhyaline; keel spreading at angles of 50–60° with the stem, 0.6–0.8 mm long, substraight or slightly sinuate, not decurrent, sinus very wide. Sexual organs not seen.

Type: Central Prov.: Angabanga River 39 km ENE of Bereina, 400 m, lowland forest on ridge with some remnant *Cycas*, on a vine, Feb. 14, 1981. H. Streimann & E. K. Naoni 16198 (holotype in CBG; isotypes in NICH, UPNG, LAE, JE).

The important characters of the present new species are 1) the moderately imbricate, widely spreading, ovate leaf-lobes with obtuse apices, 2) the widely spreading, contiguous, subquadrate leaf-lobules with bluntly angular or rarely obtuse apices and arched bases, and substraight or slightly sinuate keels, and 3) the keels spreading at angles of 50–60° with the stem.

The present species is closely related to *Radula sumatrana* known in Thailand, Sumatra, Java and Borneo, but the latter is different in 1) the loosely imbricate to slightly remote leaf-lobes, 2) the undulate adaxial margins of leaf-lobules, 3) the arched bases of leaf-lobules usually fully covering the stem, and 4) the densely verrucose cuticle of leaf-cells.

The present species is similar also to *R. grandis* Steph. endemic to New Zealand, but the latter is different from the present species in 1) the plants often more than 30 mm long, 2) the densely imbricate, somewhat falcate-ovate leaf-lobes with incurved, obtuse apices, 3) the presence of gemmae on margins of leaf-lobes, and 4) the subquadrate leaf-lobules with slightly arched and slightly decurrent keels.

This new species is named in honor of Dr. Sinske Hattori.

Radula sharpii Yamada, sp. nov. (Fig. 3)

Planta mediocris, flavovirens; caulis 30–40(–50) mm longus, irregulariter pinnatim ramosus; lobi foliorum caulinarum laxe imbricate vel \pm remoti, saepe

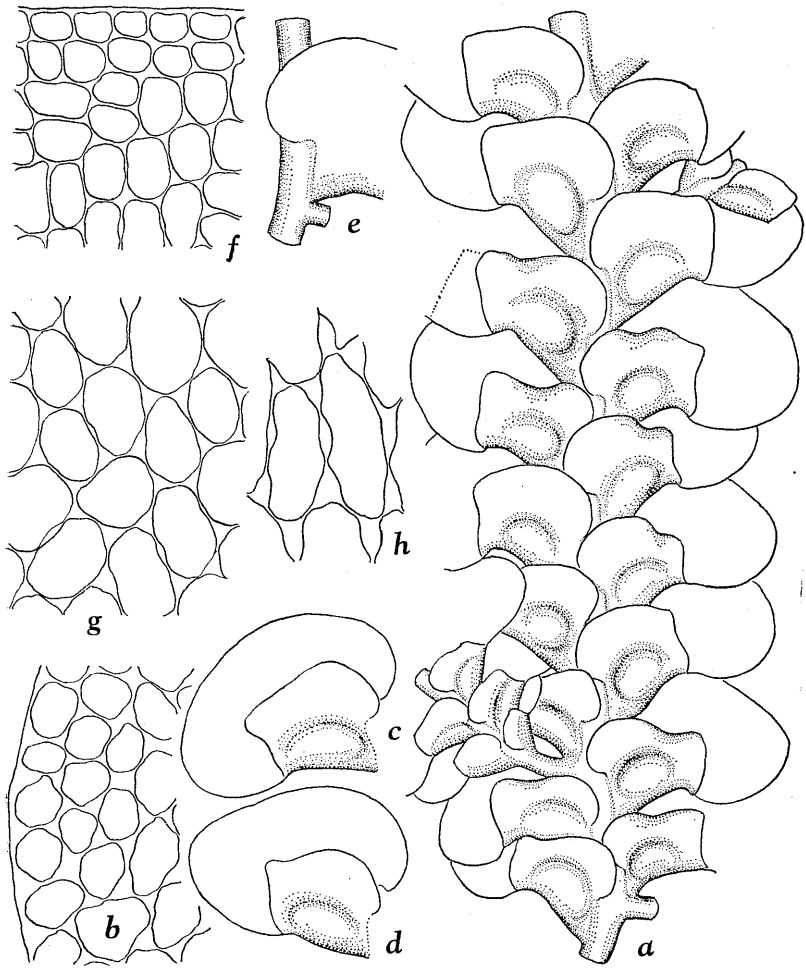


Fig. 2. *Radula hattorii* Yamada. *a*. Portion of stem, ventral view, $\times 16$. *b*. Portion of cross-section of stem, $\times 480$. *c*, *d*. Stem-leaves, $\times 16$. *e*. Basal portion of stem-leaf on stem, $\times 16$. *f*-*h*. Cells of lobe of stem-leaf, *f* from margin, *g* from middle, *h* from base, all $\times 480$. Drawn from the type.

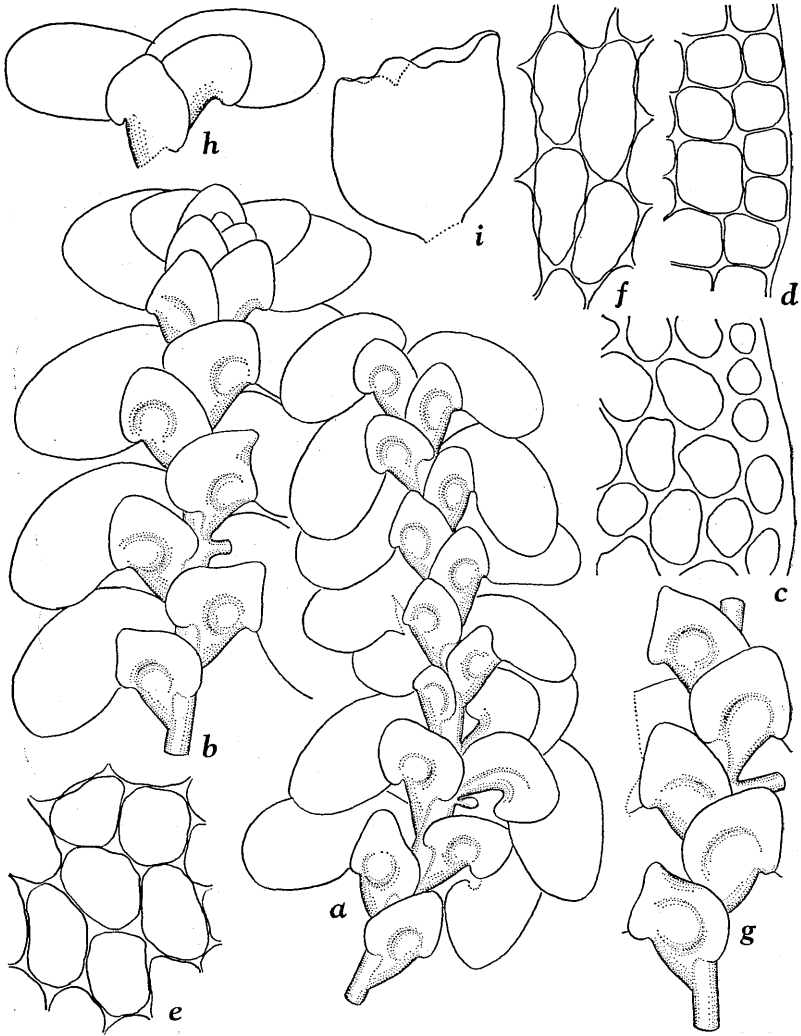


Fig. 3. *Radula sharpii* Yamada. *a, b*. Portions of stem and branch, *a* portion of branch with female bracts, ventral view, *b* apical portion of stem, ventral view, $\times 16$. *c*. Portion of cross-section of stem, $\times 480$. *d-f*. Cells of lobe of stem-leaf, *d* from margin, *e* from middle, *f* from base, all $\times 480$. *g*. Leaf-lobules on stem, $\times 16$. *h*. Female bracts, $\times 16$. *i*. Perianth, $\times 40$. Drawn from the type.

caudi, in plano oblongi falcati, apice obtuso; lobuli contigui, in plano subquadrati, basi abaxiali \pm appendiculata. Dioica (androecia non visa). Gynoecia in caule et ramis terminalia; perianthia plano-campanulata ore undulato.

Plants medium-sized, yellow-green in herb. Stem 30-40(-50) mm long, ca. 0.19 mm in diam., with leaves 2.5-2.9 mm wide, irregularly pinnately branched, branches 5-10(-20) mm long, ca. 0.14 mm in diam., with leaves 2.0-2.4 mm wide; stem 10-12 cells thick, cortical cells smaller than medullary cells, pale brown, trigones large, medullary cells thin-walled with large trigones, subhyaline. Leaf-lobes loosely imbricate or \pm remote, frequently caducous, slightly concave, when flat falcate-oblong to -ovate, branch-leaves more strongly falcate than stem-leaves, 1.3-1.4 mm long, 0.9-1.1 mm wide, apices obtuse, basal margin arched, slightly auriculate at bases, slightly extending beyond the farther edge of stem; cells thin-walled with medium-sized trigones, intermediate thickenings often seen in median and basal cells, marginal cells $12-15 \times 10-12 \mu\text{m}$, median cells $23-26(-29) \times 15-18(-20) \mu\text{m}$, basal cells $28-31(-39) \times 13-15 \mu\text{m}$; cuticle smooth; leaf-lobules contiguous, obliquely spreading, subquadrate, ca. $1/2$ the lobe-length, 0.5-0.6 mm long, 0.55-0.6 mm wide, apices obtuse or rounded, abaxial margins substraight (rarely sinuate at middle) with \pm small rounded appendages at bases, not decurrent, adaxial margins substraight or rarely slightly arched toward the arched bases, bases slightly auriculate, usually slightly extending beyond the farther edge of stem, insertion inverted J-shaped, short, carinal regions slightly inflated; rhizoid-initial area convex, rhizoids rarely seen, pale brown; keel spreading at angles of $40-50^\circ$ with the stem, 0.48-0.6 mm long, substraight (or rarely slightly arched), not decurrent, sinus subacute.

Dioecious (androecium not seen). Gynoecium terminal on branch, with one or two subfloral innovations, bract-lobe oblong-ovate with obtuse apex, bract-lobule subquadrate with arched abaxial margin with a small rounded appendage at base, and substraight or slightly sinuate keel; perianth flat-campanulate, ca. 0.6 mm long, mouth ca. 0.5 mm wide, slightly undulate.

Type: Morobe Prov.: Aseki-Mdamna Track, 1 km SW of Aseki, 1350 m, advanced secondary vegetation besides large stream in deep gorge, on *Ficus* trunk besides stream, Jan. 23, 1981. H. Streimann 12449 (holotype in CBG; isotypes in NICH, LAE, JE).

The diagnostic characters of this new species are 1) the falcate-oblong to -ovate, frequently caducous leaf-lobes with obtuse apices and subacute sinuses,

2) the contiguous, obliquely spreading, subquadrate leaf-lobules with \pm small, rounded appendages at bases of abaxial margins, 3) the leaf-lobules usually slightly beyond the farther edge of the stem, and 4) the flat-campanulate perianth with a slightly undulate mouth.

This new species is closely related to a form of *Radula javanica* Gott. (particularly the form identical with *R. variabilis* Hatt.) widely distributed in tropical Asia, but the latter is different from *R. sharpii* in 1) the widely ovate leaf-lobes with rounded apices, 2) the subquadrate or quadrate leaf-lobules covering the stem 1/2-1/3 of the stem-width, 3) the absence of small rounded appendages of abaxial margins of leaf-lobules, and 4) the flat-cylindric perianths with subtruncate mouth. The present species is also closely related to *R. novivrieseana* Yamada known in New Guinea, but is distinguished from the latter by 1) the slightly remote, narrowly oblong-ovate leaf-lobes with obtuse to narrowly rounded apices, 2) the obliquely spreading, usually slightly remote, subquadrate to ovate leaf-lobules with obtuse to narrowly rounded apices and substraight keels, 3) the absence of small rounded appendages of abaxial margins of leaf-lobules, and 4) the flat-cylindric perianths with subtruncate mouths.

The specific epithet of this taxon is proposed in honor of Dr. A. J. Sharp.

I wish to express my sincere thanks to Dr. H. Streimann for giving me an opportunity to study interesting *Radula* specimens, and to Dr. S. Hattori of the Hattori Botanical Laboratory for his critical advices, and to Dr. A. J. Sharp of the University of Tennessee for criticism and for his help with English of this article.

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オーストラリアのキャンベラ植物園から パプア ニューギニア産のケビラゴケ属苔類の標本を借覧して研究した結果、3種の新種を見いだしたので記載を行なった。

Radula dolabrata は葉下片が斧状になる性質をもつが、この種に類似のものはこれまで記載されたことがない。

R. hattorii の種小名は服部新佐博士に因む。この種は熱帯アジア産の *R. sumatrana* に似るが、後者とは横に開出した卵形の葉上片、接在する方形の葉下片、平滑な細胞表皮、いくらか弓状にくぼんだキールなどの性質で区別できる。

R. sharpii の種小名は A. J. シャープ博士に因む。この種は葉の上片が強く鎌状に下方へ曲り、しばしばキール付近から裂けて落葉すること、斜方形の葉下片は茎全体を被うこと、扁平な鐘状の花被をもつ点で他種から識別できる。