New or Interesting Species of Gymnomitrion (Hepaticae) in Japan

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North: 邦産サキシロゴケ属における新知見

It seems that there has not been any critical work on the Japanese species of Gymnomitrion, one of the typical Holarctic genera of Hepaticae. Species of Gymnomitrion are, however, found throughout the alpine regions of Japan. Some of them appear in fragments of literature, but most of them remain unfortunately in obscurity. In the present paper, the writer wishes to introduce a new species and a new variety into the genus, and also a new conception of G. laceratum which has been ignored for a long time. It may be better to give here a brief history of investigation of the Japanese species of Gymnomitrion.

The earliest record of Gymnomitrion from Japan was made by Stephani, who described Acolea faurianum in 1901, and A. breviloobum and A. laceratum in 1917. Of these three species, the first two were transferred to Gymnomitrion by Herzog in 1926. No report appeared from that time up to 1942, when Dr. Hattori recorded Gymnomitrion concinnatum, G. corallioides and G. revolutum from Japan. In 1943, Prof. Horikawa transferred A. faurianum, A. breviloobum and A. laceratum to Gymnomitrion. In 1950, Hattori reduced A. faurianum to a variety of G. corallioides and in 1952 he described a new species, G. noguchianum. In his later paper (1957), he regarded A. breviloobum and A. faurianum as a variety of G. concinnatum and of G. corallioides respectively. Next year, he reported the occurrence of G. apiculatum and G. crenulatum on Mt. Ontake. Of these species G. revolutum may appropriately be transferred to Marsupella, as has been done by K. Müller. Thus the species of Gymnomitrion hitherto known from Japan are six in all.

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10) Rabenhorst's Krypt.-Fl. 3 Aufl. 6: 757 (1956).

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2) Do. 6: 77, 78 (1917).
3) Geographie der Moose 270 (1926).


Gymnomitrion elgonense var. squarrosum S. ARNELL, l. c. 533, fig. 7.

Since STEPHANI described the present species based upon FAURIE's collection, no. 1314, made on Mt. Jizogatake, no one has made account of this species. In the course of examination of the exotic species of Gymnomitrion the writer found a noticeable fact that G. steerei from the Appalachians of Eastern North America and G. elgonense from Mt. Elgon of East Africa appear to be conspecific with G. laceratum from Japan. SCHUStER (11) has already suggested that G. elgonense may be identical with G. steerei. The writer has been lucky enough to obtain a topotype specimen (12) of G. steerei and an isotype (13) of G. elgonense through the courtesy of Dr. SCHUStER and of Dr. ARNELL.

Japanese G. laceratum is of very rare occurrence, perhaps known only by the type collection, isotypes of which are fortunately kept in our Herbarium (KYO). Before entering into further discussion the writer would like to describe G. laceratum on the basis of its isotypes.

Plants yellowish brown to dark brown, densely caespitose in thick mats. Leafy shoots filiform or clavate, 0.2-0.5 mm wide including leaves, somewhat compressed; stem 5-7 mm long, 0.15 mm wide, procumbent or erect, much branched and entangled; cortical cells in 2-3 layers, hardly differentiated, walls somewhat thickened, yellowish, internal cells hyaline, with thin walls. Leaves nearly transversely inserted, densely imbricate, appressed, oblong or ovate, concave, 0.40-0.45 mm long, 0.32-0.35 mm wide, lobed 1/3-1/2 way down; lobes triangular ovate, acute or subacuminate, nearly equal in size and form, the margin distinct, composed of thick-walled hyaline cells. Underelaves vestigial, sporadically occurring, connate with the postical base of the leaf on one side of the stem. Rhizoids rather numerous, occasionally occurring on ventral side of the leaf base, colourless. Cells of leaf apex 10×10 μ, of the middle 12-15×20-25 μ, of the base 15-18×30-40 μ, walls remarkably thick, trigones large but indistinct, cuticle smooth or a little verrucose. Plant dioecious; inflorescences terminal, fertile shoots clavate or pyriform, female bracts broader than stem leaves and shallowly lobed, the innermost ones much smaller, often 3-lobed, the margin of lobe crenulate or spinose-dentate. Capsule reddish-brown, spherical, 0.4 mm in diameter, 4-valvate down to the base, with


12) N. AMERICA. Tennessee: Myrtle Point, Mt. LeConte, Sevier Co., R. M. SCHUStER 24137.

13) AFRICA. Kenya Colony: Mt. Elgon, W. slope of Koitobos, 4200 m, on steep rock, OLOV HEDBERG 887a.
strong nodular thickenings in epidermal cells. Elater up to 80 µ long, 11 µ thick, bisprial, reddish brown. Spores nearly spherical, 16 µ in diameter, minutely verrucose, reddish-brown.


**G. steerei** bears a close similarity to *G. laceratum* in its external appearance, colour, texture, size, and mode of fasciculation. Its leaves are also similar in form and size and are cleft to half way down, vestigial underleaves occurring near the insertion of leaves. There is also no distinction in leaf cells, walls of which are evenly thickened, resulting in distinct trigones, but cortical cells are somewhat different, being a little differentiated. There is no significant distinction in female bracts, which are often crenulate or spinose-dentate on margin, and in capsule walls with characteristic nodular thickenings in epidermal cells. Spores and elaters are also identical.

Compared with *G. laceratum*, *G. elgonense* is stouter and larger and its cortical cells more distinctly differentiated, but it corresponds exactly to *G. laceratum* in
the following respects: underleaves occurring sporadically, leaves deeply incised into acute lobes, cells with thickened cell-walls, etc. Underleaves are not mentioned in the original description, but the writer confirmed their sporadic occurrence in the isotype specimen at hand. Unfortunately the type variety was described on the basis of sterile specimens and it is impossible to make a comparison of inflorescences and sporophyte, but female bract of var. *squarrosum* are said to be irregularly dentate as in the case of *G. laceratum*. It seems that var. *squarrosum* is no more than a modification of the type variety as suggested by Arnell.

As the result of the above observation the writer has come to a conclusion that both *G. steerei* and *G. elgonense* can not be regarded as a species distinct from *G. laceratum*. Thus *G. laceratum* becomes a remarkable species of extremely disjunctive distribution: Mt. Jizogatake in central Japan, Mt. LeConte of the Appalachian in Eastern North America, and Mt. Elgon in East Africa.

*Gymnomitrion integerrimum* N. Kitagawa sp. nov.

Dioica, minuta, olivaceo-virens vel brunneori-flavidula, in rubibus dense depresso-caespitosa. Caulis ad 7 mm longus, 0.15-0.2 mm in diametro, cum folis 0.17-0.35 mm latus, parum ramosus, ascendens, radicellis numerosis, pallidis, saepe et basi foliorum ortis. Folia caulina transverse inserta, valde appressa, dense imbricata, valde concava, in plano late ovata vel rotundato-quadrata, 0.32-0.37 longa. 0.28-0.33 m lata, margine integerrima, apice truncata vel retusa. Cellulae majores, apicales 15×15 μ, mediae 16-27×25-32 μ, basales 16-20×25-40 μ, parietibus tenuibus, trigonis magnis acutis, cuticula minutissime verrucosa. Androecia terminales, clavata; bracteae foliis caulinis majores, ceterum eis similis, diandrae. Antheridia axillaria, spherica, 60 μ in diametro, stipite 40 μ longo, 2 cellulas lato.

Hab. Honshu: Pref. Toyama: Murodo-daira in the Tateyama Mountains, ca. 2300 m alt., in crevices of rocks at an open place in the alpine region, N. Kitagawa 3630 (Type in KYO).

The present species resembles *G. concinnatum* in its external appearance, but, under the microscope, it is easily distinguished not only from *G. concinnatum* but also from all the other members of the genus except *G. noguchianum* by the non-lobed leaves. Compared with *G. noguchianum* characterized by having non-lobed leaves, the present species is distinguished by the following respects: (1) plants are olive-green or brownish, (2) leaves are broadly round or truncate or retuse at apex, the cells larger, thin-walled and so the trigones distinctly large. In addition, it is remarkable feature of the present species that the rhizoids occur frequently on the ventral side of leaf base as in the case of *Plectocolea*.

The vegetative features of the present species serve to bridge over the gaps between the family *Marsupellaceae* and *Jungermanniaceae*, in which Solenostoma may be most closely allied with it.
Fig. 2. Gymnomitrion integerrimum N. KITAG. (1-12)
1, cells of leaf middle, $\times 370$. 2, leaf apex, $\times 370$. 3, cells of leaf base, $\times 430$.
4, male bract with two antheridia, $\times 80$. 5, antheridium, $\times 180$. 6-10, leaves,
$\times 80$. 11, a part of sterile shoot, $\times 30$. 12, male shoot, $\times 30$.

Gymnomitrion concinnatum var. mucronulatum N. KITAG. (13-18)
13-15, leaves, $\times 80$. 16, leaf apex, $\times 560$. 17, cells of leaf middle, $\times 560$.
18, a part of sterile shoot, $\times 50$. 
Gymnomitrion concinnatum (Lightf.) Corda var. mucronulatum N. Kitagawa

var. nov.

Dioica, minutia, filiformis, fusco-brunnea vel flavo-rufescens vel nigrescens, saepe nitidula, in rupibus dense pulvinata vel intricatim caespitosa. Caulis ad 10 mm longus, 0.1 mm in diametro, cum foliis 0.2-0.3 mm latus, parum ramosus, procumbens vel ascendens. Folia caulina transversely inserta, concava, in plano rotundato-rectangulata, 0.4-0.5 mm longa, 0.3-0.45 mm lata, 1/5-1/4 viae deorsum inciso-biloba; sino acuminato vel acuto; lobis late divergentibus, ovato-triangulatis, mucronulatis vel acutis, saepe fragilis. Cellulae apicales 8×8 μ, mediae 7-10×7-15 μ, basales 8-13×15-24 μ, parietibus crassis, trigonis itaque minus distinctis. Folia flarialia multo majora, rotundato-quadrata, 0.9 mm longa, 0.8 mm lata, tenuiter biloba.

Hab. Honshu. Pref. Nagano: Mt. Kisokoma, ca. 2900 m alt., on granite, D. Shimizu H-56660 (Type in NICH); ibid., ca. 2840 m alt., D. Shimizu H-56569 (NICH); ibid., ca. 2900 m alt., D. Shimizu H-56630 (NICH); Mt. Norikura, 3030 m alt., on volcanic rock, S. Hattori H-17897 (NICH); ibid. 2700 m alt., S. Hattori H-18159 (NICH); Mt. Yatsugatake, 2400-2700 m alt., T. Seki 14491 (KYO).

This variety may be distinguished from the type variety by the following respects: (1) plants are slenderer and often lustrous like fine copper wires, (2) leaves are narrower with the lobes divergent, (3) cells are smaller and their walls are almost evenly thickened, hence the trigones not so distinct.

Occurrence of Treubia nana on Mt. Hayachine

In this summer, the writer found, on Mt. Hayachine, a noticeable species Treubia nana, which had been recorded only from the type locality, the Chichibu Mts. in middle Japan. So far as the writer knows Treubia is a genus of only three species. Its occurrence in Japan is very interesting from the geographical point of view, for the other two, T. insignis and T. bracteata, are known only from Malaysia and Formosa. The range of the genus is now extended as far north as nearly 39°30' N. Lat.

It occurs in a forest of Abies mariesii mingled with Acer caudatum ssp. ukurunduense, in association with the other bryophytes, such as Sphagnum sp., Dicranum sp., Rhytidiadelphus squarrosus, Scapania bolanderi, Calypogeia neesiana var. japonica and Lepidozia filamentos. It is noteworthy that the station where it was found belongs to a serpentine region.


Hab. Honshu. Pref. Iwate: Mt. Hayachine, northern Japan, ca. 1800 m alt., on mossy rock in a dense coniferous forest, N. Kitagawa 4268 (KYO).

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