HYPNUM HESELERI SP. NOV. (HYPNACEAE), A CURIOUS NEW MOSS FROM EUROPE

HISATSUGU ANDO and MASANOBU HIGUCHI

ABSTRACT. Hypnum heseleri sp. nov. (Hypnaceae) is described based on an epiphytic specimen collected in Saarland, Germany. The same species is recorded also from two localities in the Netherlands. This moss is remarkably unusual for the genus Hypnum, being characterized by the julaceous habit reminiscent of Myurella julacea, broadly ovate, wrinkled leaves with short twisted acumens, deeply plicate lamina consisting of rhomboidal to broadly linear cells, sinuose subentire margins of leaves, and comparatively large perichaetal leaves with once to thrice twisted acumens. It is most closely related to Hypnum cupressiforme in which an abnormal form with broadly ovate, crisped leaves that mimics this new species is rarely found.

INTRODUCTION

In August 1989, Dr. P. Geissler (Geneva) sent us for identification a curious pleurocarpous moss of julaceous habit bearing good sporophytes which was collected by U. Heseler (15 Feb. 1989) from a poplar tree in Saarland, Germany. According to her letter, the moss seemed to suggest a species of Homomallium, but she as well as some other bryologists who examined the specimen were unable to identify it. At a glance it reminded us of a large form of Myurella julacea. Our preliminary study of the specimen proved that it may be a member within the subfamily Hypnoideae of Hypnaceae and more probably referable to Hypnum among the known genera, but no described taxa of the genus fit with its characters although H. cupressiforme, the exceedingly variable complex, seemed to be most closely related to it. We at first even considered that it is so distictively characterized as to merit a new generic status.

In March 1990, Dr. J.-P. Frahm (Duisburg), the team leader of the German bryologists who were involved in this strange moss which was found in their country and caused a sensation, wrote us that the specimen had been sent to several specialists in the world for their opinion and they all had concluded it to be an undescribed species possibly of Homomallium or a new genus. Frahm, at that time, trusted us with taxonomic treatment and publication of this mysterious moss.

A little later in March 1990, Dr. B. O. van Zanten (Haren) sent us a sterile specimen of an epiphytic moss collected by himself (1 Feb. 1990) in the province of Drenthe, the Netherlands, which puzzled him and Dr. A. Touw (Leiden) and which they were unsuccessful.

1 Contribution from the Laboratory of Plant Taxonomy and Ecology, Hiroshima University, N. Ser. No. 449.
2 Department of Biological Science, Faculty of Science, Hiroshima University, Kagami-yama, Higashi-hiroshima-shi, Hiroshima-ken 724, Japan.
3 Department of Botany, National Science Museum, 3–23–1 Hyakunin-cho, Shinjuku-ku, Tokyo 169, Japan.
ful in naming. We were excited to note that the Dutch specimen was assignable to the same taxon as the Saarland moss in question. It was of great interest and note that such an unusual moss so far unknown was found in Europe where the moss flora has been explored and studied so thoroughly.

In the meantime, Frahm (1990) reported the discovery of this mysterious moss in Saarland in the second issue (June 1990) of “Bryologische Rundbriefe”, a new bryological newsletter in Germany, and soon after it van Zanten (1990) presented an article concerning the same moss found in Drenthe in “Buxbaumiella” 23 (Aug. 1990).

In the end of 1990, “The Bryological Times” No. 57/58 announced a “Mysterious moss in Germany and Holland” and thus called attention of world bryologists to this curious new phase of a hypnaceous moss. Its third finding was later reported by van Zanten (1993) from the province of Noord Brabant, the Netherlands where A. van der Pluijm collected it in 1984.

We have studied this “mysterious moss” with considerable care and finally concluded that it should be described as a new species of the genus Hypnum (sect. Hypnum). The origin of this striking new taxon only recently (1984, 1989, 1990) found in such bryologically well-investigated areas is an interesting topic to be elucidated. Problems concerning it are discussed in a separate paper by van Zanten and Hofman (1994).

DESCRIPTION AND DISCUSSION

Hypnum heseleri Ando et Higuchi, sp. nov. (Figs. 1, 2)


Dioicus? Plants small, green to yellowish-green, whitish in old plants, resembling a large form of Myurella julacea. Stems prostrate, to 3 cm (rarely 5 cm) long, radiculous in scattered tufts, in cross-section round to elliptic, with a slightly developed central strand;

Fig. 2. SEM micrographs of peristome of *Hypnum heseleri* (Holotype). 1, 2. Outside view of peristome. 3–5. Outer surface of exostome tooth (3. upper portion, 4. middle portion, 5. lower portion). 6, 7. Inside view of peristome. 8. Inner surface of basal membrane of endostome. Scale bars: 1, 2, 6–8: 100 μm; 3–5: 10 μm.
epidermal cells thick-walled, not differentiated from the cortical cells; subpinnately or irregularly branched; branches short, sometimes radiculose at base, to 5 mm long, 0.6–0.8 mm wide with leaves, julaceous, blunt, erect-ascending, straight or slightly curved. Pseudoparaphyllia subfilamentous to lanceolate. Stem leaves loosely imbricate to spreading, broadly ovate, more or less cordate, not decurrent, rather abruptly short-acuminate, usually once, rarely twice, twisted to left in acumen, straight or slightly falcate, 0.70–1.1(–1.2) mm long, 0.45–0.70 mm wide, concave, deeply plicate; margins unevenly sinuose, sometimes recurved below, rarely partly laciniate; costa short and double; median cells rhomboidal to broadly linear, smooth, 30–45(–60) µm long, 5–7 µm wide in lumen, rather incrassate; basal cells with thicker, pitted walls; alar cells well differentiated, subquadrate to rectangular, 7–10(–13) along the margins, in 5–7 rows, homogeneous. Branch leaves smaller with fewer subquadrate alar cells, 0.60–0.80 mm long, 0.30–0.50 mm wide, less markedly plicate. Inner perichaetial leaves erect, comparatively large for the normal leaves, up to 2.5 mm long, sheathing at base, oblong-lanceolate, not plicate, gradually acuminate, once or twice, rarely thrice, twisted to left in acumen; margins entire or minutely serrulate above, rarely partly laciniate; median cells rather thick-walled. Sporophytes yellowish- to reddish-brown when mature. Calyptra cucullate, naked. Seta 8–10 mm long, smooth, very weakly twisted when dry, mostly to right, rarely to left near the capsule. Capsule suberect to slightly inclined, oblong-cylindric, 1.5–2.0 mm long exclusive of operculum, 0.7–0.9 mm thick, slightly or hardly contracted below the mouth when dry; exothecial cells subquadrate or quadrate-hexagonal to rectangular, rather thick-walled, more or less collenchymatous; operculum short-rostrate; annulus 1–2-seriate. Peristome perfect; exostome teeth lance-subulate, yellow or yellowish-brown, narrowly bordered below, finely cross-striolate below, papillose above, trabeculate at back; basal membrane ±1/3 as high as the teeth; segments as high as the teeth, keeled, narrowly perforate below, papillose; cilia 1–2, nodulose, papillose. Spores 14–18(–21) µm in diameter, slightly punctate, maturing in spring, occasionally germinating within the capsule.

Types. Germany, Saarland, ca. 10 km east of Saarbrücken, in a small side-valley of Grumbachtal, 240 m alt., TK 6708/315, on trunk of *Populus canadensis*, leg. U. Heseler, 15 Feb. 1989 (holotype in B; isotypes in DUIS, GRO, HIRO, L, SAAR); 6 March and 23 June 1989 (topotypes in HIRO, SAAR).

Other specimens observed. NETHERLANDS. Prov. of Drenthe, Burgvallen, Anlooër-diepeje, between Gasteren and Schipborg, ca. 5 km south of Zuidlaren, 5 m alt., on trunk of *Euonymus europaeus* in a small willow marsh, leg. B. O. van Zanten c.s., 1 Feb. 1990, No. 90.02.01 (GRO, HIRO, L, S-PA); Prov. of Noord Brabant, Biesbosch, southeast of Rotterdam, on *Salix*, with *Dicranoweisia cirrata*, leg. A. van der Pluijm, March 1984, No. 84.041 (GRO, HIRO). In the Biesbosch specimen, leaf acumen is comparatively long and more weakly twisted.

The sexual condition of this species is uncertain and was described as “dioicous” with a question mark. The German specimen bears many sporophytes, sometimes producing doubled sporophytes from one female inflorescence (polysety), and hence we at first considered it may be autoicous. However, we were unsuccessful in finding androecia in spite of careful examination. Inflorescences resembling perigonial buds were sometimes found, in which, however, we observed archegonia contrary to expectation, or juvenile organs whose
sex is undeterminable. The specimens from the Netherlands are both sterile and only female inflorescences were found in Burgvallen plants and no inflorescences on Biesbosch ones. From these facts it is probable that this species is dioicous although male plants were found neither in German nor in Dutch populations.

For the production of sporophytes in the German specimen, van Zanten and Hofman (1994) propose the possibility that archegonia of *Hypnum heseleri* were fertilized by spermatzoids from male plants of *H. cupressiforme* growing intermixed with *H. heseleri*. We consider this to be quite possible because the specimens of *H. cupressiforme* observed intermixed in the packets of *H. heseleri* were certainly male, and frequently bore androecia. Another more substantial evidence for the hybrid nature of the sporophytes of *H. heseleri* is given by van Zanten and Hofman (1994). Irrespective of the possibility that the sporophytes of our new species are of hybrid nature, we, for the present, give their characteristics in the description as belonging to this species.

The generic status as a *Hypnum* of this species is supported by the following characters: (1) stem- and branch leaves differentiated, both with well-delimited alar parts consisting of many homogeneous subquadrate to rectangular cells; (2) costa short and double; and (3) capsule suberect to inclined, with completely hypnoid double peristome.


Several bryologists who examined this moss placed it tentatively within *Homomallium*, but the genus *Homomallium* differs from it in: (1) stem- and branch leaves scarcely differentiated, showing almost same form and size; (2) sexual condition always autoicous; (3) seta twisted to right below and to left above when dry; and (4) capsule inclined to horizontal, more strongly curved and contracted below the mouth when dry.

*Hypnum heseleri* is distinctive in several peculiar features and will hardly be confused with any other known species of *Hypnum*. The more important diagnostic characters of this species are: (1) constantly julaceous leafy stems and branches with loosely imbricate or spreading leaves; (2) broadly ovate, concave, wrinkled leaves with short twisted acumens; (3) deeply plicate lamina with loose areolation consisting of rhomboidal to broadly linear cells; (4) unevenly sinuose, subentire margins of leaves; (5) comparatively large perichaetial leaves with once to thrice twisted acumens.

*Hypnum cupressiforme*, which is characterized primarily by the leaves with well-delimited alar parts consisting of many rather homogeneous, subquadrate to rectangular cells, is considered to be most closely related to *H. heseleri*. We rarely encounter specimens of
H. ANDO & M. HIGUCHI: *Hypnum heseleri* sp. nov. (Hypnaceae)


*H. cupressiforme* in which some branches or some parts of stems and branches exhibit an aberrant form that strikingly resembles *H. heseleri*, bearing strongly crisped, broadly ovate leaves with short cells. An example of such a specimen is shown in Fig. 3, which was drawn based on a Dutch specimen (Prov. of Gelderland, “De Bruuk”, Groesbeek nr. Nijmegen, on living broad-leaved tree, leg. Ph. Sollman, Apr. 1984) presented by van Zanten. This abnormal crisped form of *H. cupressiforme* is, however, distinguished from *H. heseleri* by the fact that the leaf acumen is never twisted and the leaves are irregularly or rather transversely wrinkled while those of *H. heseleri* are longitudinally plicate. *H. cupressiforme* also differs in the longer-cylindric capsule with longer-rostrate operculum and
the earlier season of spore maturing, namely, late autumn to winter in *H. cupressiforme* as against spring in *H. heseleri*. At any rate, it is very likely that *H. heseleri* may have evolved from *H. cupressiforme* by recent mutation although its origin is not confirmed decisively (van Zanten and Hofman 1994).

**ECOLOGY**

**German population**

The new moss was found growing on one of the poplar trees (*Populus canadensis*) planted on the bottom (sandstone) of a small moist valley which extends from north to south, at an altitude of ca. 240 m, with a small brook running through it. The place is surrounded by an old shady beech forest in the lower part and by a younger beech forest and a glade in the upper part. Trunks of the poplar trees planted in the valley are rich in epiphytic bryophytes.

The moss *Hypnum heseleri* grows 2 m high on the trunk, forming one small colony, ca. 10 × 10 cm, on the better-lighted NE side of the trunk which is about 20 cm in diameter and apparently dead in the upper part. This trunk is covered with the following bryophytes: *Amblystegium serpens, Brachythecium rutabulum* (base), *Dicranoweisia cirrata, Grimmia pulvinata* (a small tuft), *Hypnum cupressiforme* (dominant), *Mnium hornum* (base), *Orthotrichum diaphanum, O. lyelli, O. obtusifolium, Frullania dilatata, Lophocolea heterophylla* (base), and *Radula complanata*.

On the other neighboring poplar trees, besides the above-mentioned bryophytes were observed *Ceratodon purpureus, Cryphaea heteromalla, Homalothecium sericeum, Leskea polycarpa, Orthotrichum affine, Pylaisiella polyantha, Tortula laevipila, Ulota bruchii, and Metzgeria furcata*.

Some of the old beech trees in the immediate proximity support small carpets of *Pterigynandrum filiforme* and *Neckera pumila*, and on the soil of a slope nearby, *Diphysci um foliosum* with numerous sporophytes was found. The presence of so many bryophytes, including some rare interesting species, in the valley indicates that this place is scarcely exposed to air pollution coming from the industrial area around Saarbrücken.

**Dutch population** (Prov. of Drenthe, Burgvallen)

The specimen of *Hypnum heseleri* was collected on the upper side of a thick, horizontally growing trunk of *Euonymus europaeus*, ca. 1 m above the water of a small creek called “Anlooer-diepje”, a tributary of the Drentsche Aa. The site is situated in a very wet willow marsh with some oak and birch trees and is named “Burgvallen” which is part of the nature reserve Drentsche Aa-valley. The willow marsh is of semi-natural origin. In the beginning of this century the area was in use by farmers as meadows, but, probably resulting from a bad water drainage, it was abandoned and gradually invaded by willow marsh vegetation.

This marsh area is rich in bryophytes. On the trunk where *Hypnum heseleri* grew, forming a patch ca. 10 cm in diameter, were observed also *Amblystegium serpens, Cer-
atodon purpureus, Dicranoweisia cirrata, Hypnum cupressiforme (dominant), and Leskea polycarpa. In the direct vicinity the following species were found on willow and birch trunks: Amblystegium riparium, Aulacomnium androgynum, Brachythecium rutabulum, B. velutinum, Bryum capillare, Drepanocladus uncinatus, Eurhynchium praelongum, Orthotrichum affine, Uloa bruchii, Lophocolea heterophylla, and Pilidium pulcherrimum. The ground mosses include some interesting species such as Brachythecium salebrosum, Cirripodium piliferum, and Rhizomnium punctatum. On the vertical banks of the brooklet occur Fissidens bryoides, Eurhynchium hians, E. speciosum, Pohlia wahlenbergii, Conocephalum conicum, etc. The surrounding area was investigated carefully by van Zanten c.s., but without success in finding the moss of Hypnum heseleri.

ACKNOWLEDGEMENTS

We wish to express our hearty gratitude to Mr. U. Heseler (St. Ingbert) who first found this new moss and gave us its specimens collected in three different times together with information concerning ecological conditions of its habitat, and to Dr. J.-P. Frahm (Duisburg) and Dr. P. Geissler (Geneva) for kindly giving us the privilege of studying and publishing this interesting moss and also to the former for reading the manuscript. Special thanks are also due to Dr. B. O. van Zanten (Haren) who offered us Dutch specimens of Hypnum heseleri as well as abnormal samples of H. cupressiforme collected in the Netherlands, and gave us a detailed information about the ecology of H. heseleri in Burgvallen. He kindly let us know results of the experiments and observations on this species which were very useful and stimulative to our taxonomic treatment and discussion, and he further helped us by carefully reading our manuscript and giving several valuable comments. Last but not the least we are grateful to Dr. W. B. Schofield (Vancouver) who critically reviewed the manuscript.

LITERATURE CITED