A collection of the Anthocerotae from Seram and Ambon

Jiro HASEGAWA*

The island Seram and its adjacent small island Ambon situated between Celebes I. and New Guinea in the Banda Sea have been little explored from the view-point of anthocerote flora. Indeed, there have been no records of the Anthocerotae from Seram, although three species of the Anthocerotae, Anthoceros grandis ÅNGST. [=Megaceros flagellaris (Mitt.) Steph.], Anthoceros amboinensis Schiffn. and Dendroceros karstenii Schiffn. (=D. acutilobus Steph.) have been recorded from Ambon by Schiffner (1893, 1898).

Recently, Mr. H. AKIYAMA of Kyoto University made an extensive collection of bryophytes on these islands as a member of the botanical expedition to central Moluccas by the University of Tokyo and Herbarium Bogoriense from December 1984 to March 1985. Fortunately I could study 21 specimens of the Anthocerotae from his collection, and recognized nine species including one new to science.

These nine species are alphabetically enumerated below, and descriptions and drawings are given to two species. All the specimens cited below are kept in KYO. The collector's name, H. AKIYAMA is abbreviated to HA and the specimen member is cited without the prefix C.

I am much indebted to Mr. H. AKIYAMA (Kyoto University) who kindly afforded me an opportunity to investigate his collection, and Prof. N. KITAGAWA (Nara University of Education) who gave me valuable suggestions and read the manuscript. My cordial thanks are also due to Dr. H. INOUE (National Science Museum, Tokyo) and Dr. M. MIZUTANI (Hattori Botanical Laboratory) for their aid in locating the type specimen of Dendroceros subdifficilis, and to the directors and curators of the herbaria of Conservatoire et Jardin botaniques, Genève and the National Science Museum, Tokyo for their loan of type specimens of some Asian species of the Anthocerotae.


* Laboratory of Applied Botany, Faculty of Agriculture, Kyoto University, Kyoto 606, Japan; also the Hattori Botanical Laboratory, Nichinan-shi, Miyazaki-ken 889-25, Japan
Specim. exam.: SERAM. Kecamatan Seram Utara: Elemata-Mukualaina, ca. 100 m alt., HA 9311 (on trunk of tree). Kecamatan Tehoru: Wolu, along a trail between Wae Waya and Kokan, 900–1230 m alt., HA 10436 (on branches of tree).
Distr.: Samoa, New Guinea, Ambon, Java, new to Seram.


Specim. exam.: SERAM. Kecamatan Seram Utara: along a trail between Maraina and Hatuolo, 600–700 m alt., in a secondary lowland forest, HA 9191 (on branches of tree); Gunung Kakihi near Elemata-Mukualaina, 100–300 m alt., HA 9337 (on trunk of tree).
Distr.: Samoa, Fiji, New Caledonia, Bismark Archipelago, Java, Borneo, new to Seram.


Specim. exam.: SERAM. Kecamatan Seram Utara: Gunung Hausana near Elemata-Mukualaina, 400–650 m alt., in a secondary forest, HA 9411 (on leaf).
Distr.: Borneo, new to Seram.

4) **Dendroceros javanicus** (NEES) Nees in Gott. et al., Syn. Hep.: 582 (1846).

Specim. exam.: SERAM. Kecamatan Tehoru: Wolu, along a trail between Wae Waya and Kokan, 900–1230 m alt., HA 10422 (on branches of tree).
Distr.: Samoa, Fiji, New Guinea, Java, Formosa, new to Seram.

4) **Dendroceros seramensis** HASEGAWA, sp. nov. (Fig. 1)

*Dendroceros subdifficilis* Hatt. novae-guineae habitu similis huic speciei novae, sed differt (1) laminis thallorum subtilibus et saepe reticulatim perforatis, (2) parietibus cellularum epidermidum capsularum valde incrassatis et luminibus angusto-linearibus et (3) sporis parvis (40–50 × 32.5–45 μ). *Dendroceros difficilis* Steph. laminis thallorum valde crispatis et costis cavernosis etiam similis *D. seramensi*, sed distinctus plantis satis magnis, capsulis validis brevisbusque, et cellulis epidermidum capsularum aegre elongatis.

Plants corticolous, densely aggregated in small patches or scattered in large patches, often intermingled with *Plagiochila* sp. and *Radula* sp., brownish green to dark brown when dry. Thalli narrow and dichotomous, repeatedly branched, up to 2 cm long, mostly 1.2–1.6 mm wide, costae 230–600 μ wide, 100–150 μ thick, dorsally flat and ventrally convex, cavernous, lacunae medium-sized, arranged in a single layer, or small to large, scattered throughout, laminae unistoratose throughout, rather narrow, strongly and irregularly crispate, laminal cells in surface view rounded quadrate to rounded rectangular, mostly 25–35 × 20–30 μ, thin-walled, trigones triangular or quadrate, often perforated, confluent large perforations scattered near thallus margins, cuticle nearly smooth; involucres cylindrical, mostly 2.5–4.5 mm high, more or less roughened with scattered small outgrowths. Plants monoicous; androecia scattered on costa of main branches, antheridia solitary, short-stalked, antheridial bodies globose, 150–180 μ in diam. Capsules slender, long, more than 1.5 cm long, projecting far beyond involucres, ruptured along one suture, epidermal cells elongate-rectangular, mostly 30–70 × 15–20 μ, trabeculately thick-walled, lumens elongated elliptical. Spores rounded rectangular to rounded ovoid, mostly 50–85 × 45–70 μ, composed of more than 15 cells, densely
Fig. 1. *Dendroceros seramensis* HASEG. a. Thallus with two involucres, ×4.8. b. Sterile thallus, ×7.5. c–d. Cross-section of costae, ×7.5. e. A portion of costa in cross-section, ×300. f–g. Epidermal cells of capsule, ×320. h–k. Spores, ×320. a–e, g–j drawn from type; f, k from Akiyama 9302.

The present new species is closely related to New Guinean *Dendroceros subdulcifilis*. They have the following characteristics in common; (1) plants are small and closely adhere to the substrate, (2) thalli are narrow and dichotomously branched, (3) thallus-laminae are strongly crispate, (4) costae are dorsally flat and have various-sized lacunae.
Fig. 2. *Dendroceros subdifficilis* Hatt. a. Thallus with involucres, ×7. b. Marginal parts of thallus-lamina in surface view, ×83. c. Laminal cells and perforations, ×330. d. Cross-section of costa, ×120. e. Epidermal cells of capsule, ×320. f-g. Spores, ×475. All drawn from type.

within, and (5) capsules are slender and project far beyond involucres.

The above characteristics suggest that *D. seramensis* closely resembles *D. subdifficilis* in general appearance. In fact, I first regarded *D. seramensis* as a variant of *D. subdifficilis* which exclusively grows on leaves of trees (*D. seramensis* grows on trunks and branches of tree).

However, a detailed comparison between two species* revealed that they were distinct enough in several important characters for the specific separation; *D. subdifficilis* differs from *D. seramensis* in (1) thallus-laminae are very delicate and lacy, (2) large confluent perforations on thallus-laminae are closely arranged and form reticulation, (3) walls of epidermal cells of capsules are extremely thickened leaving narrow-linear lumens, and (4) spores are distinctly smaller (40–50 × 32.5–45 μ**).

* I examined type material of *D. subdifficilis* (*Tsugana 1178* in TNS). As no figures of this little known species have been published, I give drawings of this species in Fig. 2.
** In original description of *D. subdifficilis*, HATTORI (1951) described “Sporae...diametro 50–80 μ”, but in my measurement they are 40–50 × 32.5–45 μ (I could find no spores more than 50 μ in length). Now I suspect that HATTORI’s measurement was based on spore tetrads (60–70 × 50–60 μ in my measurement) which might be confused with mature spores because of the multicellular condition of the latter.
September, 1986


D. difficilis recorded from Java and the Philippines also resembles D. seramensis in the strongly crispate thallus-laminae and the cavernous costae, but is distinct in the fairly large plant (thalli 2.3–2.8 mm wide, costae 0.5–1.8 mm wide), the stout and short capsules (up to 1.3 cm long), and the less elongated epidermal cells of capsules [30–35(–50) \times (10–)20–25 \mu].


Specim. exam.: SERAM. Kecamatan Seram Utara: Elemta-Makualaina, ca. 100 m alt., in a secondary lowland forest beside a wide river, HA 9200 (on soil).
Distr.: Samoa, New Caledonia, New Guinea, Java, Sumatra, new to Seram.


Specim. exam.: SERAM. Kecamatan Tehouru, Piliana, Makariki spring, ca. 360 m alt., around a spring in a forest, HA 10224 (on rotten log); Wolu, along a trail between Wae Waya and Kukan, 900–1230 m alt., in forest, HA 10431 (on rotten wood); along a trail between Wolu and Wae Waya, 0–360 m alt., in a secondary lowland forest, HA 10291 (on gravel). Kecamatan Seram Utara: at the summit of low mountain near Kanikeh, ca. 600 m alt., in mountain forest, HA 9607 (on rotten wood); along a trail between Maraina and Hatuolo, 600–700 m alt., in a secondary lowland forest, beside stream, HA 9183 (on rock); Sawai, Wae Ili, 800 m alt., in mountain forest, beside stream, HA 9760 (on boulder); along a trail between Wae Ninioa and Wae Poo, 200–880 m alt., in a secondary forest, HA 9587 (on rotten log).
Distr.: Widely distributed in tropical and subtropical Asia and the South Pacific islands, and also in New Zealand, new to Seram.


Specim. exam.: SERAM. Kecamatan Bula: Bula, Gunung (Mt.) Ili tubi, 100 m alt., in a secondary lowland forest, HA 10752 (on soil). Kecamatan Taniwel: near Taniwel, Gunung Nakaela (limestone mountain), 10–450 m alt., HA 10131 (on soil). Kecamatan Seram Utara: Elemta-Makualaina, ca. 100 m alt., roadside, HA 9282 (on soil).
Distr.: Widely distributed all over the world, new to Seram.

9) Phaeoceros polyandrus (Steph.) Hasegawa, comb. nov. (Fig. 3).


Plants dioecious, medium-sized to large, densely aggregated in large patches, brownish to greyish green when dry. Thalli oblong to linear, up to 2.5 cm long, mostly 3–5 mm wide, subdichotomously to somewhat pinnately branched, solid, in cross-section 280–500 \mu (8–13 cells) thick at the middle, dorsal surfaces densely covered with small lamella-like projections mostly one to four cells high (owing to this the thallus surfaces velvety in appearance), margins thin (a few cells thick), entire, often incurved, rhizoids rather numerous in the middle, pale brown, long; involucres solitary and scattered, small, up to
Fig. 3. Planticeros polyandrus (STREPH.) HASEG. a. Cross-section of involucre, ×30. b. A portion of involucre in cross-section, ×75. c. Thallus with a mature capsule, ×4.2. d–e. Cross-section of thallus, d ×115; e ×75. f–i. Spores, ×475. j–l. Elaters, ×300. All drawn from Akiyama 2366.

5 mm high, about 1.3 mm thick, extremely roughened with numerous laciniate outgrowths. Capsules up to 2 cm long, bivalved, usually with separated tips, epidermal cells rectangular, mostly 70–110 × 12.5–15 μm, strongly thick-walled (lumens usually narrow), stomata 60–72.5 × 30–37.5 μm. Spores pale yellow, rounded tetrahedral, mostly 22.5–27.5 μm in diam., both proximal and distal surfaces smooth or faintly granulate. Elaters brownish yellow, long, up to 380 μm long, about 7.5 μm thick, mostly 4-celled or
more, somewhat thick-walled (but lumens fairly large), sometimes weakly papillate.

Specim. exam.: **Ambon.** Air Besar, ca. 10 m alt., along a rather wide river, **HA 2366** (on clifffy bank). Distr. Java, new to Ambon.

Among Asian species of *Phaeoceros, P. polyandrus* is unique in the dorsal thallus surfaces which are velvety in appearance owing to the numerous small lamella-like projections. By this character it can be easily distinguished from other Asian species of *Phaeoceros.*

Other important diagnostic characters of this species include small spores (22.5–27.5 μ) which are nearly completely smooth throughout and long elaters (up to 380 μ) which are considerably thick-walled.

In the specimen collected in Ambon I could find no male plants, but through the examination of type material of *Anthoceros polyandrus* (Schiffner 69 in G) I confirmed that they were remarkable for their conspicuous androecia densely crowded throughout the dorsal surfaces of thalli except for marginal parts. This character is also diagnostic to this species.

On the basis of Javanese material of this species, **MEIJER** (1954) described the thalli as follows; “..., cross-sections show young parts of thalli solid, older parts with scattered rather narrow elongated (mucilage?) cavities, ...”, However, I could not recognize such cavities in material from Ambon.

**Literature Cited**


**要旨** セラム島とニューギニアの間に位置するセラム島とアンボン島のツノゴケ類について、これまでほとんどわかっていなかった。今回、京都大学の秋山弘之氏によってセラム、アンボン両島で採取されたツノゴケ類標本21点を調べ、一新種（Dendroceros seramensis）を含む9種を確認した。D. seramensisはニューギニアから記載されたD. subdifficilisに非常によく似ているが、葉状体翼部の構造、蒴壁の細胞の形状、胞子の大きさの違いによって区別することが出来る。Phaeoceros polyandrusはジャワ島からのみ知られていた稀な種であるが、アンボン島に生長しているのを確認した。本種はAnthocerosとして記載されたが、葉状体内部に空隙がなく、胞子が黄色なのでPhaeocerosに移した。葉状体背面前に密に覆っている毛状の突起、やや肥厚した細長い弾体、平滑で小さな胞子は本種を他種から区別する顕著な特徴である。残りの7種のうち、ボルネオからしか知られていなかったDendroceros foliicolaと世界中に広く分布するPhaeoceros laevis subsp. carolinianusを除いたあとの種は、すべて熱帯アジアと南太平洋地域に広く分布する種である。