ON *FOLIOCEROS*,* A NEW GENUS OF ANTHOCEROTALES

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ABSTRACT

A group of species which could be referable to *Anthoceros* (Mich.) L. emend. Proskauer, but for the occurrence of uniform thickening in their elaters, have been assigned to a new genus *Folioceros*. On the analogy of similar uniform thickening occurring in the elater of *Plagiochasma intermedium* while the elaters of other species of *Plagiochasma* have spiral thickening, it has been contended that the uniform thickening in the species of *Folioceros* has the same distinction and taxonomic significance as the spiral thickening in elaters of *Megaceros* and *Dendroceros*. *Folioceros* also distinguishes from *Anthoceros* in the ornamentation of spores. Besides the type species, *F. assamicus* sp. nov., the other species assigned to *Folioceros* are, *F. vesiculosus* (Aust.) comb. nov., *F. fuciformis* (Mont.) comb. nov., *F. mamillisporus* (Bhardw.) comb. nov. and *F. dixitianus* (Mahabale) comb. nov.

INTRODUCTION

Anthocerotales comprises five genera at present. These are *Anthoceros*, *Phaeoceros*, *Megaceros*, *Dendroceros* and *Notothylas*. The primary distinguishing features between these genera are—

(i) thallus with or without schizogenous cavities

(ii) elaters with or without spiral thickening.

In *Anthoceros* the thallus has schizogenous cavities and the elaters are non-spiralled. *Phaeoceros* has solid thallus and non-spiralled elaters. *Megaceros* agrees with *Phaeoceros* in respect of thallus but has spiral thickening in its elaters. In *Dendroceros* the thallus has either schizogenous cavities or none with a solid midrib, both kinds subtend one cell thick lamina and the elaters in both kinds are spiralled. *Notothylas* has solid thallus (schizogenous cavities never reported) and spiralled elaters.

There are also some distinguishing features between these genera considered to be of secondary importance (PROSKAUER, 1951) such as—

(*a*) tiered or untiered wall of the body of antheridium;

(*b*) Sporophyte epidermis with or without stomata;

(*c*) black (brown or smoky also) or translucent yellow spores.

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*In the concluding paragraph of my paper (BHARADWAJ, 1965) on the morphology of *Anthoceros mamillisporus* and *A. dixitianus*, I had expressed the intention of reinstating *Aspiromitus* St., after restricting it to contain only black-spored species possessing elaters in whose cells the walls are so thickened as to leave a narrow uneven lumen. As the rules in the International Code of Botanical Nomenclature (1966) stand, the type of *Aspiromitus*, *A. husnoti* St. (selected by PROSKAUER 1948) is not only the first species described by Stephani for the genus but also it exhibits long, septate elaters, the main diagnostic criterion of the genus as defined by him. Moreover, *A. husnoti* is very much similar to *A. punctatus* L., the lectotype of *Anthoceros* (Mich.) L. emend. PROSKAUER (1951), in all respects including the spore morphography. Hence, *Aspiromitus* St. stands merged with *Anthoceros* and such species of *Aspiromitus* as have elaters with thickened walls, cannot form a basis for its revival. These have to be grouped under a new genus.

Anthoceros has tiered antheridial wall, stomatiferous sporophyte epidermis and black spores. *Phaeoceros* and *Megaceros* have untiered antheridial wall and translucent yellow spores but while the sporophyte epidermis in the former is stomatiferous it is non-stomatiferous in the latter. *Dendroceros* has tiered as well as untiered antheridial wall in its species according to PROSKAUER (1951, p. 341) although I have observed only untiered antheridial wall in the genus so far, the spores are, according to PROSKAUER, of both kinds and the sporophyte epidermis is non-stomatiferous. In *Notothylas*, PROSKAUER (1951, p. 341) has observed untiered antheridia tending to be tiered although I have observed only the normal untiered condition so far, the spores are said to be of both kinds and the sporophyte epidermis is non-stomatiferous.

With regard to the characters in spores, from my researches (BHARADWAJ, 1960, 1965, 1965a) in the species of *Anthoceros* and *Phaeoceros*, I have found that the differences in the ornamentation and organization in spores are unambiguous and their nature being constant they are of considerable taxonomic importance. Hence, I propose to include these aspects among the characteristics of secondary importance. In *Anthoceros* the spores are reticulate reticuloid, spinose, or baculate, in *Dendroceros* muriculate, baculate or asperate and in *Phaeoceros*, *Megaceros* and *Notothylas* spinulose, asperate or baculate. Whereas in *Anthoceros*, *Megaceros* and *Dendroceros* the spores are without an equatorial girdle, it is present in *Phaeoceros* and *Notothylas*.

Considering the two primary distinguishing features, it is apparent that in Anthocerotales, the genera are distinguished from one another on the basis of differences in one or both. However, between the genera *Megaceros*, *Dendroceros* with solid midrib and *Notothylas*, where there is general agreement in the nature of both the primary distinguishing features, the differences in the character of the thallus i.e., strap-shaped in *Dendroceros* and broadly radiating shaped in *Megaceros* and *Notothylas* and in the nature of spiral and the size of elaters between the first two together and the last named genus, as well as other differences have been utilized to maintain their identity.

Although the elater in Anthocerotales is evidently an important feature for distinguishing the genera, PROSKAUER (1951), while building up a case for the creation of *Phaeoceros* out of the older genus *Anthoceros* L., substantially discredited pseudoelaters (elaters—BHARADWAJ, 1960) as providing no taxonomic characteristics in these genera. His contention stemmed out of an old interpretation (GOEBEL and SUESSENGUTH, 1927) that pseudoelaters were formed by a haphazard break down of a haphazardly constructed three-dimensional girder system of the sterile cells around the spores in the sporophytes, that it was quite impossible to find a typical elater representing the commonest type found in a species and that although there is variation in the amount of wall thickening normally shown in different species as well as in the absolute length reached by individual cells, a complete intergradation is achieved between the extremes so that it is clearly impossible to draw a line anywhere.

However, a series of studies by me (BHARADWAJ, 1958, 1960, 1965 and 1965a) have led to the establishment of the following facts regarding the morphology and taxonomic importance of elaters in *Anthoceros* and *Phaeoceros*:

(1) elaters are normally produced from the archesporium by elater mother cells which are of the same generation as the spore mother cells.
(2) like the spore mother cells dividing twice to produce a spore tetrad, the elater mother cell normally divides twice to produce an elater tetrad.
(3) while in the spore mother cells the spindles of the two successive nuclear divisions lie at right angles to each other, in the elater mother cells the spindles lie in the same direction resulting into a linear arrangement of the daughter cells.

(4) each elater (tetrad) is independent of the other elater tetrads. It does not fuse with them to form any three dimentional girder system.

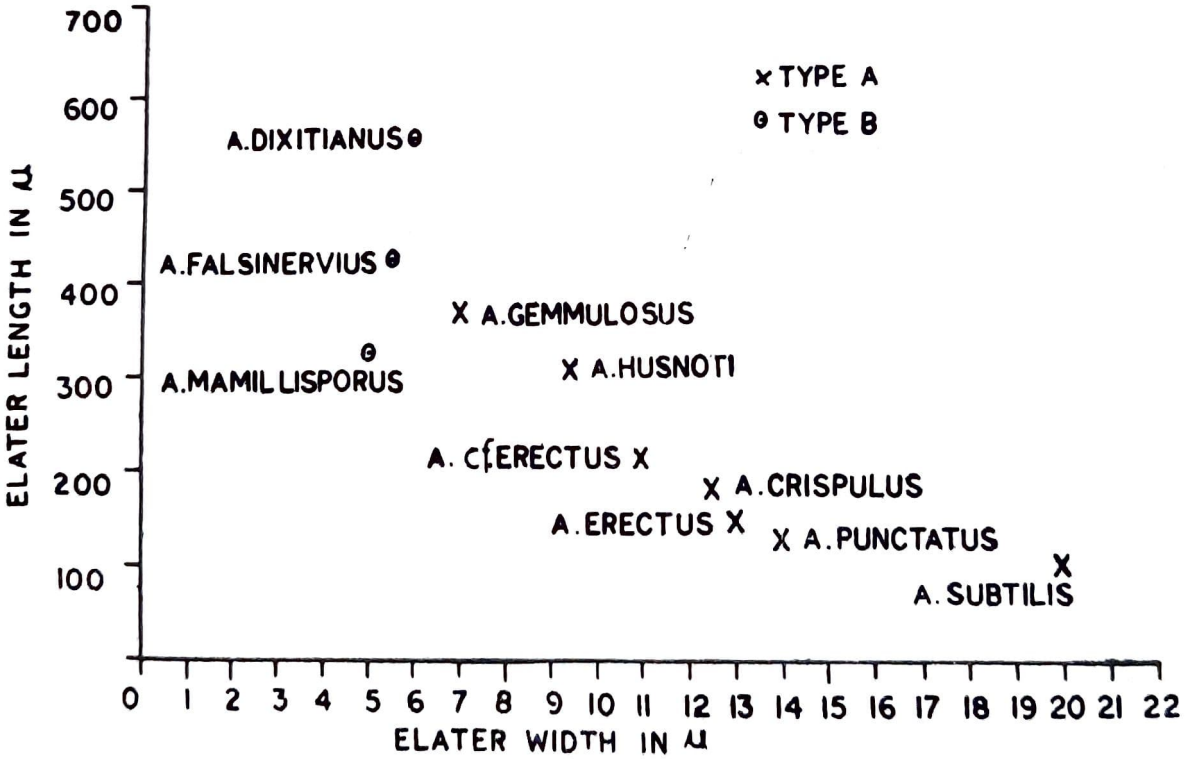
(5) elaters (tetrad) have a tendency to break up into 1, 2 or 3 celled pieces during dehiscence of the capsule. This tendency is analogus to that in the spore tetrads where spores separate from the sisters on maturity.

On the basis of my current studies, I can add now that:—

(6) in *Anthoceros*, the wall of the elater cells is either thin ($< 1\ \mu$), its width being 1/5 to 1/20 or even more of the lumen width and having smooth inner surface (type 'A') or, thick ($> 2\ \mu$), its width being equal to the lumen width and having uneven inner surface (type 'B'). On drying, while the thin walled elater cells flatten and the walls show small folds, the thick walled elater cells are unaffected.

(7) the elater length in *Anthoceros* is variable within definable limits in each species. The length of elater is inversely proportional to the width of the elater cells in type 'A' but not so in type 'B'. In type 'A' the narrowest elater cell (*A. gemmulosus*, 7.0 μ) has longest elater tetrad (mean 365 μ), and the widest elater cell (*A. subtilis**, 20μ) has shortest elater tetrad (mean 105 μ). In type 'B', the narrowest width in *A. dixitianus* and *A. mamillisporus* is 6.0 μ and 5.0 μ respectively, but the length of the elater tetrad is 550 μ and 320 μ respectively (Graph 1).

(8) the elaters of type 'A' and 'B' together do not form an intergrading series (Graph I). They are not only structurally separable but also biometrically separable as they tend to lie on separate axes.



Graph 1—Comparative relationship of elater tetrad length and elater cell width in *Anthoceros* spp., referable to types A and B.

Thus, on the basis of differences in the elater structure, *Anthoceros* is divisible into two groups of species, one with thin walled elaters (Group A corresponding to type A) and the

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*An examination of the type material of *A. subtilis* St. from Geneve has confirmed that *A.* cf. *subtilis* described by me (BHARADWAJ, 1960) is the same as *A. subtilis*.

other with uniform thickening on the wall in the elaters (Group B corresponding to type B). The morphology of the kind of thickening present in the elater walls of the latter group would not have been clear had similar thickening in the elaters of *Plagiochasma intermedium* L. & L. (Pl. 1, Fig. 1) not been noticed by me (BHARADWAJ, 1952). This uniform thickening in elaters of *P. intermedium* is rather an exception for the genus *Plagiochasma* L. et L., where, in other species, e.g., *P. articulatum* Kashyap (Pl. 1, Fig. 2), the elaters have spiral thickening. Obviously the continuous thickening on the elater walls in P. *intermedium* is a morphographical variation of the spiral thickening in the elater of *P. articulatum*. Parallelly so, the uniform thickening in the elater walls of *Anthoceros* spp. of Group B, is a morphographical variant of the spiral thickening, presumably the like of which is found in the elaters of *Megaceros* and *Dendroceros*. Evidently the uniform thickening in the elaters of Group B, has the same taxonomic significance *vis-a-vis* Group A of *Anthoceros*, as *Megaceros* has *vis-a-vis Phaeoceros* where the only difference of primary importance between the two, is in the spirally thickened and unthickened nature of elaters.

With respect to the distinguishing characters of secondary importance the most significant difference between Groups A and B occurs in the spore ornamentation. In Group A, the spores are reticulate or reticuloid and in Group B they are spinose or baculate.

Group A of *Anthoceros*, contains its lectotype, *A. punctatus* L., and hence, represents *Anthoceros* proper where as the Group B is proposed herewith to be referred to a new genus *Folioceros*.

DESCRIPTION

Folioceros gen. nov.

Incl. *Aspiromitus* STEPHANI (1916) *pro parte*

Diagnosis—Proprietates primariae: Thalli cum cavis magnis a cellularium separatione procreatis. Sporogonium cum perpetua regione intercalari cellularium divisione. Columella quae adest. Elaters acquabiliter non spirae induratione.

Proprietates secundariae: Antheridia quorum corporum membrana quatuor cellularum ordinibus formata est. Sporogonii epidermis stomatifera vel non stomatifera. Sporarum color fulvus vel fuscus vel fumosus, ornamentum baculose vel spineus, compositio equatoria noncingulata est.

Species typica: Folioceros assamicus sp. nov.

Characteristics of primary importance: Gametophyte with large schizogenous cavities. Sporophyte with persistent intercalary meristem. Columella present. Elaters with regular, non-spiral thickening.

Characteristics of secondary importance: Jacket of body of antheridium composed of four tiers of cells. Epidermis of sporophyte with or without stomata. Spore colour yellowish brown, smoky or black, ornamentation baculate or spinose, organization equatorially non-girdling.

Type species: *Folioceros assamicus* sp. nov.

Comparison—Folioceros is similar to *Anthoceros* is respect of the presence of schizogenous cavities in the thallus but differs in the structure of the elaters. It agrees with *Anthoceros* in respect of the tiered wall of the antheridial body, and to some extent also in the stomatiferous nature of the sporophyte epidermis and the spore colour as well as organisation but differs in the spore ornamentation which is reticulate or reticuloid in *Anthoceros* (BHARADWAJ 1960) but baculate or spinose in *Folioceros*.

Folioceros differs from *Phaeoceros* in both the characteristics of primary importance relating to the thallus and the elater. It also differs in the nature of the antheridial body wall, in spore colour, ornamentation and organisation. However it agrees partly in the stomatiferous epidermis of the sporophyte.

Folioceros differs from *Megaceros* in the nature of the thallus but in a way agrees in the thickened nature of the elater which is uniform in the former and spiral in the latter. It also differs in the characteristics of secondary importance relating to the antheridial body wall, normal sporophyte epidermis and the spore colour and ornamentation.

Folioceros agrees with the section of *Dendroceros* having schizogenously cavernose thallus, in the thickened elaters (though differing in details) and in the non-girdling organization of the spore. The two differ in the nature of the antheridial body wall and the normal capsule epidermis. The section of *Dendroceros* having a solid, well-defined midrib in the thallus, differs from *Folioceros* in that respect in addition.

Folioceros disagrees with *Notothylas* in the nature of thallus which is solid in the latter. In the thickened nature of elaters both agree but for details, and that the elater cells are narrow and elongated in the former while squarish or trapezoid in the latter. They differ in the nature of the antheridial body wall, the normal epidermis of sporophyte and in the spore ornament as well as the organisation where *Notothylas* has spores with equatorial girdle similar to those in *Phaeoceros*. The colour of mature spores in *Notothylas*, as far as known, is brown to black.

Evidently, *Folioceros* is distinctly different from the other known genera of Anthocerotales. However it exhibits comparative nearness to *Anthoceros* and to the section of *Dendroceros* having schizogenously cavernose midrib in the thallus rather than with *Phaeoceros*, *Megaceros*, *Notothylas* and the section of *Dendroceros* having solid thallus.

Folioceros assamicus sp. nov.

Holotypica—Text-Figs. 1-5, Pl. 1, Figs. 3-8.

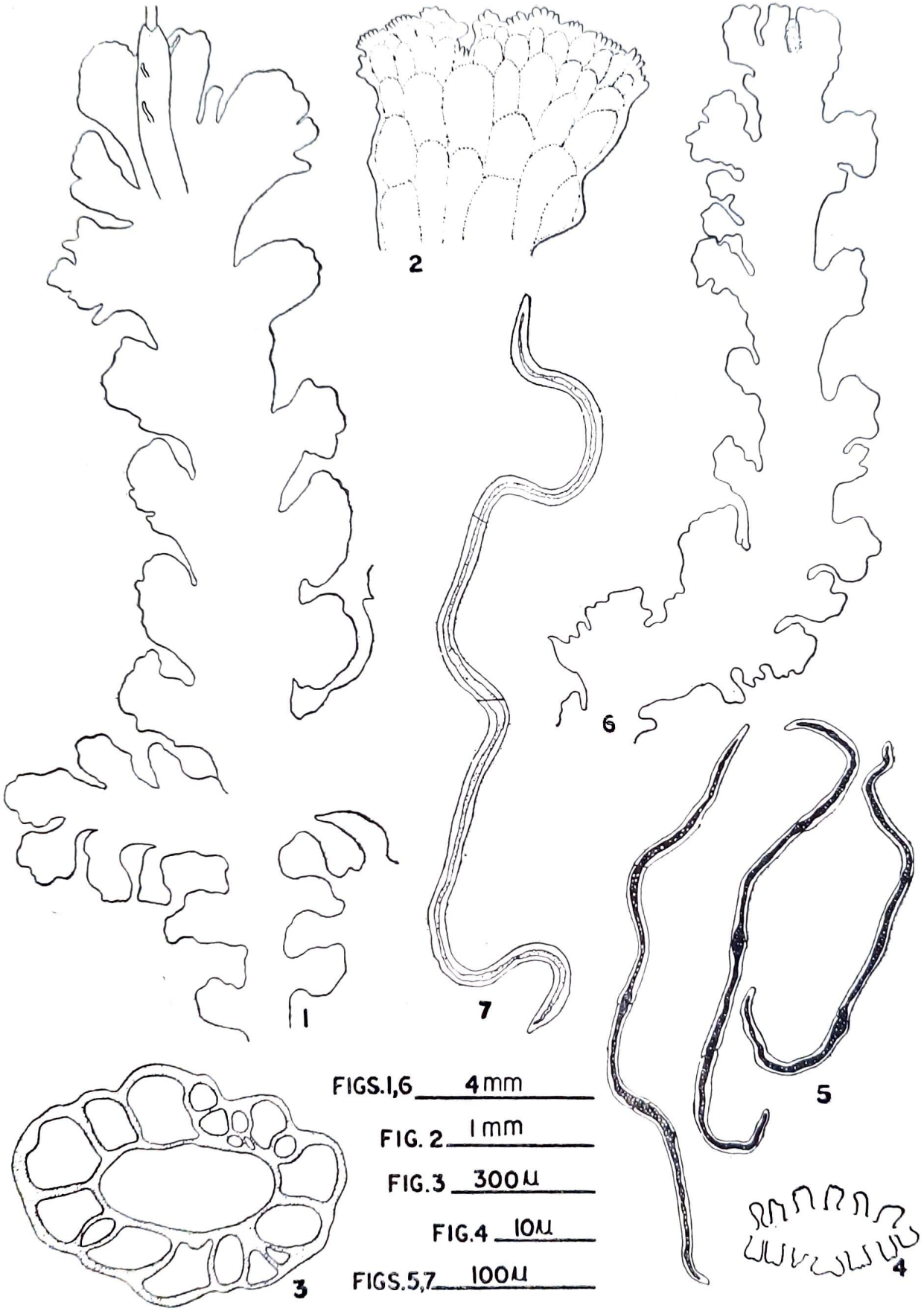
Diagnosis—Planta dioica, rupicola. *Frons* ad 4 cm longa et ad 6 mm lata, cavernosa, linearibus alterne lobata, dense pinnatis, margine crenulati—cellarum longarum. *Involucra* cavernosa, lamellata. *Capusla* exigue stomatifera. *Sporae* 35 μ, fulvae, minute baculosae, cicatrix tetradi non perspicua. *Elateres* tetradi 350 μ (300-410 μ) longi, septati, cavibus fluctuosibus. *Androecia* sparsa, alveolis parvis. *Antheridia* ad 8 in utroque alveolo, corporum 160μ (150-175 μ) longorum.

Type Locality—Right bank of a stream at the bend between Mile-posts 57/2 and 57/3 on Gauhati-Shillong Road, Assam, India (BHARADWAJ legit 1964).

Repository—Author's personal herbarium Nos. 143-150.

Thallus—The plants are dioecious. The thallus consists of fronds not forming regular rosettes. Each frond may be once or twice forked into strap-shaped branches of varying length (Text-Fig. 1). Each branch has a slightly broader anterior part. The margin of the branch is deeply cleft by broad lobes arranged pinnately. Each lobe has an irregularly dentate margin (Text-Fig. 2) caused by longish marginal cells and it is copiously cavernous. The mucilage cavities are smaller nearer the margin and progressively bigger inwards. The surface of the thallus is smooth.

The surface cells contain mostly only one chloroplast each. The chloroplast is variously shaped, sometimes dense with few lighter areas in its green body or it is simply a spongy moss of net work. No centralized pyrenoid body could be made out in any of the two forms.



Figs. 1-5. *Folioceros assamicus* gen. et sp. nov.: 1. A sporogonium bearing strap-shaped frond showing the nature of lobing. 2. One lobe in surface view (magnified). 3. A t. s. of involucre. 4. Bacula on the equator of spore. 5. Complete elaters.

Figs. 6, 7. *Folioceros vesiculosus* (Aust.) comb. nov.: 6. A sporogonium bearing frond (redrawn from BARTLETT 1928, Fig. 2B). 7. A complete elater tetrad with 3 cells only (redrawn from BARTLETT 1928, Fig. 9A)

Androecia—Androecia have been observed only sparsely distributed on the branches of a frond. These are only slightly raised above the surface when undehisced but the dehisced ones develop a well defined, small, circular pore at the apex of a raised cone. The dehiscence pore has been seen even in such androecia where none of the antheridia had dehisced but all were fully mature and presumably ready for dehiscence. The androecia are small and contain only 6-8 antheridia. Antheridia are club shaped; body is 150-175 μ (160 μ mean); high, wall consists of four tiers of cells with the apical tier composed of conical cells. The stalk is four cells thick but only two cells high, the lower cells being much longer than the upper cells.

Involucre—Involucre is copiously cavernous (Text-Fig. 3), the schizogenous cavities being in one layer and it is sparsely roughened by small or big, strap-shaped lamellae.

Capsule—The capsule epidermis is very sparsely stomatiferous there being only 10 stomata per sq. mm of the surface. The stomata are 70 μ (mean) long. The epidermal cells are 105-315 μ (196 μ mean) long.

Spore—The spores are light brown and circular in polar view (Pl. 1, Figs. 3, 4). Proximally, an area enclosed by thin, tortuous ridges is seen which may be the vestiges of a tetrad mark (Pl. 1, Fig. 3). Spore exine is ornamented with variously shaped bacula (Text-Fig. 4). Each equatorial baculum is about 2 μ high and 1.2 to 1.5 μ wide. Along the equator, on an average, 31 bacula have been counted in one focus. The bacula on proximal face are much smaller and sparser as compared to those on distal face (Pl. 1, Figs. 3, 4). The mature spores are brown and range in their equatorial diameter from 33 to 39 μ and the average is 35 μ.

Elater—The elaters are narrow and long (Pl. 1, Figs. 5, 6, 7), brown in colour, the walls being unequally thick surrounding a darker lumen of variable width. The lumen is characteristically beaded at places. The elaters are either four celled or three celled both being equally numerous and are normally not fragile (Text-Fig. 5). Four celled elaters are 300-410 μ long, 350 μ being the average length. The three celled elaters are normally smaller. Elater width varies from 5-10 μ and mostly it is 6.5 μ in the middle region of the elater cells.

Folioceros vesiculosus (Aust.) comb. nov.

Text-Figs. 6, 7

Ms. *Anthoceros vesiculosus* Aust.
1916 *Aspiromitus vesiculosus* (Aust.) Stephani.
1928 *Anthoceros vesiculosus* Aust. (Maui, Hawai) Bartlett.

Stephani (loc. cit., p. 970) has provided the diagnosis of the species as follows:—

Planta monoica mediocris, brunnea, gracilis, rigida, crassa, corticola. *Frons* ad 3 cm. longa, 4 mm. lata, grosse cavernosa, spongiosa, anguste ligulata, plurifurcata, furcis late divergentibus, dense pinnatis, pinnis angustis patulis, antice inplato papulosis. *Involucra* 6 mm. longa, solitaria, anguste fusiformia, cavernosa, papulosa. *Sporae* 36 μ fuscae, minute papillatae. *Elateres* fusci, longi, haud septati. *Capsula* 4 cm. longa, tenuis,stomata numerosa. *Androecia* in ramulis numerosa, alveolis magnis. *Antheridia* numerosa (ad 20 in utroque alveolo).

The description of this species as compiled from Bartlett's work and as deduced by me from her illustrations, is as follows:

Thallus—The gametophyte is long, narrow and unbranched. Owing to the presence of many small lateral lobes, when sterile, it might be mistaken for one of the pinnate species of *Aneura* (Text-Fig. 6). Each frond normally produces a single large sporogonium. Usually

the involucre is one third or more the length of the capsule. The surface of the thallus is smooth. Internally the thallus is mostly made up of mucilage containing lacunae, simulating a network of veins on the surface.

Sporophyte—In the sporophyte, the epidermis of the capsule has *few* stomata. In the cortical cells of the capsule only one chloroplast per cell is present. The sporogenous layer is one-layered, no periclinal division occurring in the cells. The elaters are unbranched and eight to ten times the length of elaters in *A. hallii* and *Notothylas* (i.e. 350 μ to 500 μ, but the three celled complete elater figured by Bartlett measures about 600 μ, see Text-Fig. 7).

According to Bartlett, in the capsule there are no lateral grooves or other external indications suggesting the region effecting dehiscence but the capsule does split into two equal parts probably along the narrow strips of thin-walled cells seen in a cross-section on opposite sides, extending from the sporogenous chamber to the epidermis (However, in a t.s. of the capsule illustrated by Bartlett, I find one shallow groove, the part containing the opposite groove having been cut off from the photograph). The cortex is 5 cells thick the innermost layer being of small cells. In addition to the above information, STEPHANI (1916) has given some more details of this species while diagnosing it as *Aspiromitus vesiculosus* (Aust.) St. According to him the plant is monoecious, the involucre is cavernous, the spore is dark, 36 μ and minutely papillate, the androecia occur in the small branches, are large and contain numerous (upto 20 in one cavity) antheridia.

On the basis of the information gathered above it is possible to diagnose this species as follows:

Diagnosis emend.: Planta monoica, corticola. *Frons* ad 3 cm longa, 4 mm lata, grosse cavernosa, spongiosa, dense pinnatis, pinnis anguste patulis. *Involucre* cavernosa, papulosa. *Capsula* exigue stomatifera. *Sporae* 36μ, fuscae, minute baculosae. *Elateres* tetradi ca. 500 μ longi, septati, cavibus aequabiliter angustus. *Androecia* in ramulis, polyandris. *Antheridia* ad 20 in utroque alveolo.

Folioceros fuciformis (Mont.) comb. nov.

1843 *Anthoceros fuciformis* Mont.
1916 *Aspiromitus fuciformis* (Mont.) Stephani.
1953 *Anthoceros fuciformis* Mont. in Proskauer.

The diagnosis of the species as given by STEPHANI (1961, p. 961) runs as follows:—Planta monoica major, valida et tenax, fusco-brunnea, corticola. *Frons* ad 5 cm. longa, simplex vel furcata, anguste ligulata, grosse cavernosa, remote et alterne lobata, lobis aequilatis integris vel palmatim divisis. *Involucre* 6 mm. longa, cavernosa cylindrica, levia, solitaria. Capsula ad 6 cm. longa, valida, stomata sparsa. *Sporae* fuscae, 36 μ, minute et creberrime papillatae. *Elateres* longi, fusci haud septati. *Androecia* sparsa involucro approximata. *Antheridia* desunt.

PROSKAUER (1953) has given an exellent description of *A. fuciformis* Mont., instituted by MONTAGNE as early as 1843. The description is fairly detailed and well illustrated but lacks information regarding the number of stomata per sq. mm of the capsule epidermis and the length of the elaters. He has figured only one stoma in which the longest cell measures 79μ and only one complete elater which measures 316 μ in length.

On the basis of the description given by PROSKAUER (1953) it is possible to diagnose *F. fuciformis* as follows:

Diagnosis emend.: Planta monoica, corticola. *Frons* cavernosa ad 5 cm longa et ad 0.7 mm lata, ramis linearbus, pinnata, remote et alternelobata, lobis aequilatis integris vel palmatim divisis. *Involucra* cavernosa, levia. *Capsula* exigue stomatifera. *Sporae* 34 μ, fulvae,

minute baculosae, cicatrix tetradi non perspicua. *Elateres* tetradi 316 μ (range?) longi, septati cavibus aequabiliter angustus. *Androecia* in ramis separatis, alveolis polyandris. *Antheridia* ad 21 in utroque alveolo, corporum 180 μ (range ?) longorum.

Besides *A. fuciformis*, PROSKAUER (1953 and 1951) has also furnished some significant information regarding a species of *Anthoceros* from Cameroons which according to him, is very much reminiscent of *A. fuciformis*. It is monoecious and the antheridial bodies measure 170-180 μ in length. The spores have an ornamentation similar to *A. fuciformis* but are smaller, being mostly 30 μ (27-34 μ). The cells of capsule epidermis are shorter in length than those in *A. fuciformis*. The epidermis lacks stoma. Regarding the elaters nothing has been said but from their figure (PROSKAUER 1951, Fig. 33) it is easily surmisable that their walls are thickened and the only complete elater figured there measures 680 μ. Evidently this is a species of *Folioceros*.

Folioceros mamillisporus (Bhardw.) comb. nov.

1948 *Aspiromitus mamillispora* Bhardwaj.
1966 *Anthoceros mamillisporus* (Bhardw.) Bharadwaj.

Diagnosis emend.: Planta monoica, terricola. *Frons* ad 10 mm longa, cavernosa, late dilata, marginibus irregulariter lobatis, lobis interdum rotundatis. *Involucra* cavernosa, levia. *Capsula* copiosa stomatifera. Sporae 40—50μ (43.5 μ) fuscae, spinosae-mamillatae, cicatrix tetradi perspicua. *Elateres* tetradi 320 μ longi, septati, cavibus irregulariter angustus. *Androecia* sparsa in ramis propriis, alveolis polyandris (ad 25 in utroque alveolo). *Antheridia* corporum 130 μ (125-145 μ) longorum.

Folioceros dixitianus (Mahabale) comb. nov.

1941 *Aspiromitus dixitianus* Mahabale.
1942 *Aspiromitus fergussoni* Apte & Sane.
1951 *Anthoceros dixitianus* (Mahaba.) Proskauer.
1951 *Anthoceros fergussoni* (Apte & Sane) Proskauer.
1965 *Anthoceros dixitianus* (Mahaba.) Prosk. in Bharadwaj.

Diagnosis emend.: Planta dioica, terricola. *Frons* ad 15 mm. longa, cavernosa, late dilata, superne remote lobata, lobis truncatis. *Involucra* cavernosa, levia. *Capsula* copiosa stomatifera. *Sporae* 37 μ, fuscae, spinosae-echinatae, cicatrix tetradi perspicua. *Elateres* tetradi 550 μ longi, septati, cavibus aequabiliter angustus. *Androecia* greggaria in ramis propriis, alveolis polyandris. *Antheridia* ad 60 in utroque alveolo, corporum 170 μ (160-180 μ) longorum.

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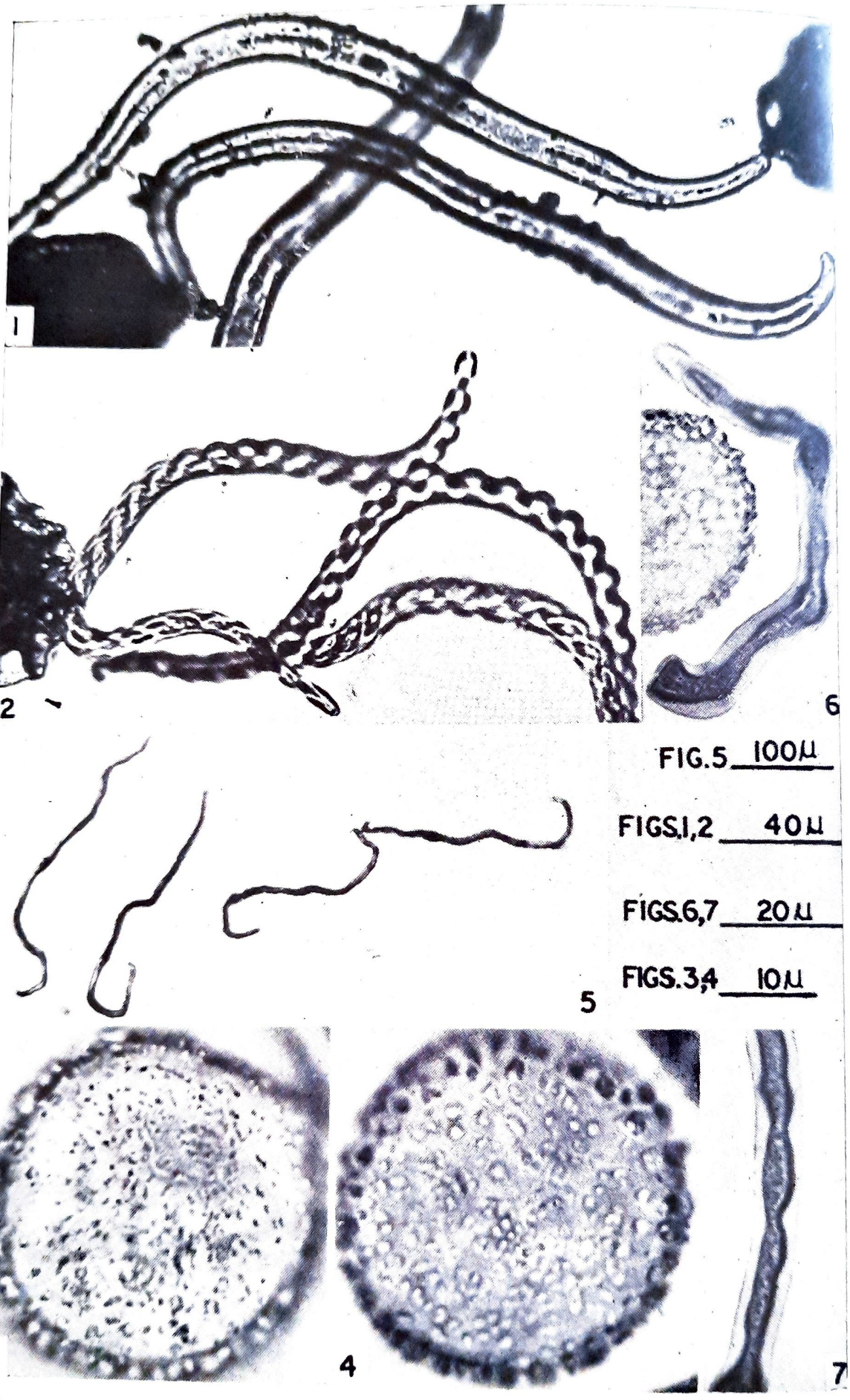
EXPLANATION OF PLATE 1

Fig. 1. Elaters in *Plagiochasma intermedium*. Fig. 2. Elaters in *P. articulatum*. Figs. 3, 4. Spore of *Folioceros assamicus* gen. et sp. nov. in proximal and distal foci respectively. Fig. 5. Four complete elaters of *Folioceros assamicus*. Figs. 6, 7. Parts of elaters of *F. assamicus* to show an end cell and the nature of lumen in a middle cell respectively.



Bharadwaj—Plate 1