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THE HEPATICAE (CHIEFLY RICCIA AND ANTHOCERO-  
TACEAE) OF THE GALAPAGOS ISLANDS AND THE  
COAST AND ISLANDS OF CENTRAL AMERICA  
AND MEXICO

BY

MARSHALL A. HOWE

Assistant Director, The New York Botanical Garden

In a list of eighteen Hepaticae from the Galapagos Islands (including two referred to genus only), determined by Professor A. W. Evans and published in Dr. B. L. Robinson's "Flora of the Galapagos Islands"<sup>1</sup>, one was a *Riccia*, "sterile and indeterminable" from Iguana Cove, Albemarle Island, and another from Tagus Cove, Albemarle Island, was referred to the North American *Notothylas orbicularis* (Schwein.) Sulliv. Of the 36 numbers of supposed *Ricciae* (including 3 collected on Guadalupe Island by Mr. John Thomas Howell in November, 1931) and Anthocerotaceae sent to the present writer for determination, one turned out to contain a sterile *Plagiochasma*. Following is the list of species collected:

RICCIACEAE

*Riccia sorocarpa* Bisch.

North end of Guadalupe Island, *Howell No. 160*; *No. 145* (sterile), from slopes above N. E. Anchorage, Guadalupe Island, may be a very reduced condition of this species.

<sup>1</sup> Proc. Am. Acad. Arts and Sci. 38: 100, 101. Oct. 1902.



***Riccia nigrella* DC.**

Guadalupe Island, *Howell Nos. 142, 146, 164, and 168*; Ensenada, Lower California, *Howell No. 181*.

***Riccia trichocarpa* M. A. Howe**

Slopes above N. E. Anchorage, Guadalupe Island, *Howell No. 138*; Ensenada, Lower California, *Howell No. 183*.

***Riccia Elliottii* Steph.**

Puerto Vallarta, State of Jalisco, Mexico, *Howell No. 236*. On moist shaded soil, Braxilito Bay, Costa Rica, *Howell No. 238*; same locality, *Howell No. 239*; on soil among rocks on steep bank, on largest island in Murcielago Bay, Costa Rica, *Howell No. 240*.

***Riccia* sp.**

Three collections (*Howell Nos. 174, 175, and 177*) were made on Socorro Island, March 26, 1932, two of them in stream-bed above Braithwaite Bay. No spores have been found. The occasional or rather numerous purple papillae or short cilia on the thallus margins suggest affinity with a species of the Galapagos Islands and Mexico described below as new under the name *Riccia iodocheila*, but the thalli are usually broader, both actually and in relation to height, and the superficial cells are larger.

***Riccia* sp.**

*Howell No. 259*, Camp 1, Indefatigable Island, Galapagos Islands, alt. 1700 ft., growing on decaying fragments of wood, presumably moist. The plants belong in the *Ricciella* section of the genus and bear some resemblance to the terrestrial condition of *Riccia fluitans* L., but are probably not referable to that species. They are apparently sterile and for that reason are not accurately determinable.

***Riccia iodocheila* M. A. Howe, sp. nov.**

Thallis parvis, 3-6 mm. longis, plerumque 1-3-plo dichotomis, irregulariter gregariis aut radiantibus, viridibus, firmis, levibus, nigro-violaceis in marginibus et plus minusve infra; segmentis primariis oblongis aut oblongo-ellipticis, 0.4-1.2 mm. (saepius 0.6-0.8 mm.) latis; segmentis apicalibus similibus aut obovatis, obtusis; marginibus acutis aut subobtusis, erectis vel paullum inflexis, papillas paucas violaceo-purpureas aut hyalinas vel ciliis breves obtusas 25-60  $\mu$  longas



ferentibus; papillis apicali-dorsalibus raris; sulco in apice manifesto; squamis parvis, violaceis, cellulis paucis formatis; sectionibus transversalibus semiorbicularibus, plano-convexis, aut concavo-convexis, tam altis quam latis ad bis latioribus, in partibus mediis 18-25 cellulis crassis; epidermide dorsali e cellularum seriebus duobus contexta, cellulis primariis mammiformi-hemisphericis, cito collapsis, nullis eminentiis conspicuis relictis, cellulis subjacentibus 15-25  $\mu$  in diam. max.; monoica; ostiolis antheridiorum laeviter aut haud elevatis; sporis nigro-brunneis, cito opacis, 70-105  $\mu$  in diam. max., rotundati-subangulatis vel interdum plane angulatis, non-alatis, facie exteriori lineis permultis irregularibus anastomosantibus notata, eis aliquando areolas parvas irregulares 3-5  $\mu$  latas formantibus, faciebus interioribus similibus aut paulum minus fortiter notatis, marginibus laevibus aut subtiliter submammillatis.

In solo argillaceo, in loco "Wreck Bay, Chatham Island" dicto, Insularum Galapagensium, Oceani Pacifici, specimen typicum (n. 201) John Thomas Howell, Apr. 18, 1932, legit. Species *Ricciae violaceae* M. A. Howe affinis est, sed in sporarum sculptura, probabiliter in characteri monoico, thalli ciliis marginalibus paucioribus, etc., differt.

Typus: Herb. Calif. Acad. Sci. No. 215005.

Thallus small, 3-6 mm. long, mostly 1-3 times dichotomous, irregularly gregarious or forming rosettes, green above, compact, firm, smooth, deep violet on margins and the higher ventral parts; main segments oblong or oblong-elliptic, 0.4-1.2 mm. (mostly 0.6-0.8 mm.) wide; terminal segments similar or obovate, obtuse; margins acute or subobtuse, erect or slightly inflexed, bearing occasional violet-purple or hyaline papillae or short obtuse cilia 25-60  $\mu$  long, rarely with papillae on dorsal surface in younger parts; median sulcus obscure except near apex; scales small, violet, few-celled; transverse sections as high as broad to one half as high, semi-orbicular, plano-convex, or concavo-convex, 18-25 cells thick in median parts; dorsal epidermis 2-stratose, the cells of the primary stratum mammiform-hemispheric, soon collabent, leaving no conspicuous cusps, the cells of the succeeding stratum 15-25  $\mu$  in maximum diameter, rather obscurely defined when seen from above; monoicous; antheridial ostioles slightly or not at all elevated; spores dark brown, soon opaque, obscurely or sometimes distinctly angled, destitute of margins, 70-105  $\mu$  in maximum diameter, the outer face marked with very numerous low irregularly anastomosing ridges, these sometimes forming small irregular areolae 3-5  $\mu$  wide, the inner faces similarly but a little less strongly marked, the spores appearing smooth or very minutely mammillate in profile.

On moist clay flat, Wreck Bay, Chatham Island, Galapagos Islands, *Howell No. 201* (holotype), April 18, 1932.

*Riccia iodocheila* is evidently allied to *Riccia violacea* M. A. Howe, of the West Indies, type from Mona Island, off Porto Rico, but it differs in being apparently monoicous rather than dioicous, in having fewer and smaller marginal papillae or cilia, and in the smoother more angular spores, which have smaller and much less perfect areolae. The areolae of the spores of *R. violacea*, as stated by the present writer in *The Bryologist* (20: 36. 1917) are 7-11  $\mu$  wide, while those of *R. iodocheila*, when formed, are 3-5  $\mu$  wide. In the writer's treatment of *R. violacea* in *North American Flora* (14: 20, 21. 1923), the measurements were reduced to include two Mexican collections (Lerdo, *Jared G. Smith*, Jan. 2, 1892, and Magdalena, Sonora, *David Griffiths*, Aug. 18, 1904). These two Mexican collections are now identified with *Riccia iodocheila*, described above, with type from the Galapagos Islands.



***Riccia Howellii* M. A. Howe, sp. nov.**

Thallis parvis vel mediocribus, 3-10 mm. longis, plerumque 2-4-plo dichotomis, irregulariter gregariis aut aliquando radiantibus, pallidi-viridibus, glaucescentibus, vel albescentibus, supra minute reticulatis, in siccitate saepe aliquanto papyraceis aut rugulosis, infra pallidi-viridibus, saepius (marginibus quoque) violacei-brunneis; segmentis primariis oblongis aut obovatis, 0.75-3 mm. (saepius 1-2 mm.) latis; segmentis primariis oblongis aut obovatis, 0.75-3 mm. (saepius 1-2 mm.) latis; segmentis apicalibus similibus, 0.6-1.5 mm. latis, obtusis aut subacutis; marginibus tenuibus et acutis aut latius membranaceis vel subpapyraceis, saepe albescentibus, ascendentibus aut aliquando deflexis, integris aut cellulis marginalibus saepe papilliformibus; sulco in partibus junioribus profundo et acuto; squamis parvis, hyalinis aut brunnei-violaceis marginem attingentibus; sectionibus transversalibus semiorbicularibus, planoconvexis, aut arcuati-subfusiformibus, aliquando tam altis quam latis, saepius duplo-triplo (-sextuplo) latioribus quam altis, in partibus mediis 12-20 cellulas crassis; epidermide dorsali e cellularum seriebus duobus contexta, cellulis primariis plerumque mammiformi-hemisphericis, cito collapsis, parietibus plerumque persistentibus et parietes exteriores cellularum subjacentium fortiores facientibus, rarius fugacibus et calyces humiles reliquentibus, cellulis subjacentibus 25-30  $\mu$  (-50  $\mu$ ) in diam. max., a superficie visis; monoica; ostiolis antheridiorum 40-70  $\mu$  altis aut aliquando aegre elevatis; capsulis plerumque multis; sporis brunneis, interdum violaceis tinctis, deinde saepe fuscis et opacis, 75-130  $\mu$  (plerumque 95-120  $\mu$ ) in diam. max., rotundati-subangulatis, ubique paene uniformiter foveolati-areolatis, faciei exterioris areolis plerumque 10-15  $\mu$  latis, saepe papillas obtusas humiles vel trabeculas truncatas 3-5  $\mu$  altas ostendentibus.

In loco "Iguana Cove, Albemarle Island" dicto, Insularum Galapagensium, Oceani Pacifici, specimen typicum (n. 209) John Thomas Howell, Jun. 4, 1932, legit. Quoque in insulis alteris Archipelagi Galapagensis Howell legit. Species *Ricciae Elliottii* Steph. affinis est, sed in characteribus epidermalibus, etc. differt.

Typus: Herb. Calif. Acad. Sci. No. 215008.

Thalli small to medium-sized, 3-10 mm. long, mostly 2-4 times dichotomous, irregularly gregarious or sometimes forming imperfect rosettes, light green, glaucescent, or albescent, minutely reticulate above, often somewhat wrinkled or papyraceous when dried, concolorous or more often violet-brown below and on margins; main segments oblong or obovate, 0.75-3 mm. (mostly 1-2 mm.) wide; terminal segments similar, 0.6-1.5 mm. wide, rounded-obtuse or subacute; margins thin and acute or rather broadly membranous, subpapyraceous, or scarious-albescent, ascending or the edge sometimes deflexed, entire or marginal cells often papilliform; median sulcus deep and acute in younger parts; scales small, obscure, hyaline or brownish violet, reaching the margin; transverse sections semi-orbicular, planoconvex, to arcuate-subfusiform, sometimes as high as broad, more often 2-3 (-6) times as broad as high, 12-20 cells thick in median parts; dorsal epidermis 2-stratose, the cells of the primary stratum mammiform-hemispheric to cylindric-domeshaped, soon collabent, their walls usually persistent and reinforcing the outer walls of the subjacent layer (secondary epidermis), rarely fugacious and leaving obscure cups, the cells of succeeding stratum 25-35  $\mu$  (-50  $\mu$ ) in maximum diameter in surface view; monoicous; antheridial ostioles 40-70  $\mu$  high or sometimes scarcely elevated; capsules moderately abundant; spores brown, sometimes tinged with violet, often becoming opaque, 75-130  $\mu$  (mostly 95-120  $\mu$ ) in maximum diameter, obscurely angled, margins commonly wanting, outer and inner faces almost equally foveolate-areolate, the areolae mostly 10-15  $\mu$  wide, commonly showing in profile obtuse or truncate processes or lamellae 3-5  $\mu$  high.

GALAPAGOS ISLANDS: Iguana Cove, Albemarle Island, *Howell Nos. 199 and 209* (holotype); shaded by rocks, west base of Tagus Cove Mountain, Albemarle Island, *Howell Nos. 219 and 220*; James



Bay, *Howell No. 187* (p. p. max.), June 4, 1932; on moist earth, James Bay, *Howell No. 188*; on moist surfaces of shaded rocks, Hood Island, *Howell No. 184*; Wreck Bay, Chatham Island, *Howell Nos. 203, 204 and 205*; on clay-gravel soil, about 500 ft. elevation, along trail, Charles Island, *Howell No. 247*. Type and cotypes divided between the California Academy of Sciences and The New York Botanical Garden.

*Riccia Howellii* is closely allied to the West Indian, Mexican, and Central American *R. Elliottii* Stephani<sup>2</sup> but seems distinguishable by the closely reticulate rather than coarsely alveolate character of the dorsal epidermis, which shows itself in a cross section of the thallus by the essential absence of thickened cusps representing the walls of the collapsed cells of the primary epidermal layer. The cells of the final (secondary) epidermis average considerably smaller than those of *Riccia Elliottii*; and the plants themselves average smaller. The Galapagos Islands plants cited above vary in vegetative characters, but are remarkably uniform in size, form, color, and markings of their spores and it is believed that they represent only one species. A peculiar feature of some of the specimens with conspicuous albescent margins is that these margins become fuscous after being soaked out with New York tap-water.

#### MARCHANTIACEAE

##### *Plagiochasma* sp.

Socorro Island, *Howell No. 176*—apparently sterile and undeterminable.

#### ANTHOCEROTACEAE

##### *Notothylas galapagensis* M. A. Howe, sp. nov.

Planta olivacea, parva, radianti, 5-10 mm. in diam., aliquanto tenui et levi, lobis paucis rotundatis aut truncatis instructa; cellulis paginae dorsalis irregulariter 5- vel 6-gonis, oblongis, aut quadrati-suborbicularibus, 25-65  $\mu$  in diam. max.; involucris 0.8-1.5 mm. altis, in longitudinem plicatis vel alatis, alis plus minusve cristatis aut ciliati-denticulatis, ore lacinulati-fimbriatulo vel irregulariter ciliato; capsulis brevi-cylindricis, 1.5-2 mm. longis, parietibus cellularum exteriorum maxime incrassatis; sporis pallidi-flavis, deinde paulum fuscis, levibus, 40-50  $\mu$  diam. max.; elateribus ca. 40-50  $\mu$  diam., aliquando obscure spira notatis; columella bene evoluta et persistenti.

Cum *Riccia Howellii* in loco "James Bay" dicto, Insularum Galapagensium, Oceani Pacifici, John Thomas Howell (n. 187, p. p. min.) Jun. 4, 1932, legit. Species fortasse *N. dissectae* Steph. affinis, sed in sporis majoribus, elateribus paene sine spiris, etc., differt.

Typus: Herb. Calif. Acad. Sci. No. 215004.

<sup>2</sup> Type from Dominica, B. W. I. *Riccia Elliottii* appears to be the legal name for a group of somewhat variable plants, including *R. Breutelii* Hampe, type from St. Jan, *R. Brittonii* M. A. Howe, type from Mona Island, and *R. Gaumeri* Underwood Ms., type from Yucatan.



Thalli small, olivaceous, forming rosettes 5-10 mm. in diameter, rather thin and smooth, with a few truncate or rounded-obtuse marginal lobes; cells of dorsal surface irregularly 5- or 6-sided, oblong, or quadrate-suborbicular, 25-65  $\mu$  in maximum diameter; involucre 0.8-1.5 mm. high, longitudinally plicate or alate, the wings more or less cristate or ciliate-denticulate, the mouth lacinulate-fimbriate or irregularly ciliate; capsule short-cylindric, 1.5-2 mm. long, abruptly constricted below to a pedicel 75-150  $\mu$  long, bivalved, the exterior cells very thick-walled, their walls (at least of the more elongated cells) mostly 10-16  $\mu$  thick (i. e., the two collateral walls) commonly wider than the lumen of the cell, the valve-margins reddish brown; spores pale yellow, becoming more or less fuscous, 40-50  $\mu$  in maximum diameter, with cell wall finally 2-3  $\mu$  thick, smooth or very nearly so; elaters of about the same size, with traces of very irregular spiral thickening; columella well developed and persistent.

Growing with *Riccia Howellii* at James Bay, *Howell No. 187* (p. p. min.), type, June 4, 1932. Also, James Bay, *Howell Nos. 193* and *195*, and Charles Island, *Howell No. 197*.

*Notothylas galapagensis* is closely allied to *N. dissecta* Steph., from Guatemala, in the thick-walled cells of its capsule and its essentially smooth spores, but its spores are larger (40-50  $\mu$  vs. "27  $\mu$ "), its elaters are nearly devoid of any spiral thickening instead of being trispiral, and its smaller thallus is sparingly round-lobed instead of being profoundly dissected.

From the North American *Notothylas orbicularis*, it differs chiefly in the much thickened walls of the exterior cells of the capsule. There is considerable range in the thickness of the cell-walls in *N. orbicularis*, but no such thickness as is shown in our photograph of the valve surface of *Notothylas galapagensis* has ever been observed in the North American species. The specimen collected by the Hopkins-Stanford Expedition, at Tagus Cove, Albemarle Island, and referred by Evans to *N. orbicularis*, the writer has not been able to examine, but it is assumed that it would now be identified in *N. galapagensis*.

### ***Anthoceros simulans* M. A. Howe, sp. nov.**

Thallis parvis, caespitosis, cavernosis, profunde laciniati-lobulatis, crispatis, superficie lamellati-cristata vel irregulariter proliferante, cellulis superficialibus plerumque 35-85  $\mu$  in diam. max., marginalibus saepe mammiformi-hemisphericis; monoica (?); involucris cylindricis truncatis, 1-1.5 mm. altis, 0.3-0.45 mm. latis, levibus, aut sublevibus; capsulis numerosis, 1-3 cm. altis, fusco-nigris, valvis siccitate laeviter tortis aut rectis, stomatiferis; sporis fuscis, demum opacis, 44-51  $\mu$  in diam. max., facie exteriori dense muricati-papillata, papillis conico-acutis aut subtruncatis, 1.5-3  $\mu$  longis, faciebus interioribus sublaevibus aut papillis valde humilioribus praeditis; pseudo-elateribus fuscis, 40-150  $\mu$  longis, 5-16  $\mu$  latis, plerumque 1-3 cellulis constitutis, raro furcatis; columella levi.

Terricola in loco umbroso humido, alt. 1,000 m., in monte "Tagus Cove" dicto insulae "Albemarle" Insularum Galapagensium, Oceani Pacifici, specimen typicum (n. 213) John Thomas Howell Maio 26, 1932, legit.

A *A. fusiformi* Aust. involucris brevibus cylindricis (1-1.5 mm. longis et 0.3-0.45 mm. latis vs. 2-9 mm. longis et 0.35-1.2 mm. latis), capsulis brevioribus tenuioribus (1-3 cm. longis et 0.12-0.175 mm. latis vs. 2-9 cm. longis et 0.25-0.5 mm. latis),



et papillis sporarum plus opacarum longioribus crassioribus minus acicularibus differt.

A *A. punctato* L. et *A. crispulo* (Mont.) Douin, *A. simulans* capsulis tenuioribus et papillis sporarum plus opacarum valde congestis, minus acutis, plerumque brevioribus differt.

Typus: Herb. Calif. Acad. Sci. No. 215006.

Thalli small, cespitose, terricolous, cavernous, deeply laciniate-lobulate, crispate, the surface lamellate-cristate or very irregularly proliferate, the surface cells mostly 35-80  $\mu$  in maximum diameter, the marginal often dome-shaped or hemispheric-protuberant; monoicous<sup>3</sup>; involucre cylindric, truncate, 1-1.5 mm. high, 0.3-0.45 mm. broad, smooth or nearly so, truncate; capsules numerous, 1-3 cm. long, 0.12-0.175 mm. broad, dark brown or black, the valves very slightly, if at all, twisted on drying, freely provided with stomata; spores fuscous, becoming opaque, 44-51  $\mu$  in maximum diameter, outer face densely muricate-papillate, the papillae conic-acute or subtruncate, 1.5-3  $\mu$  long, the inner faces with much lower irregular papillae; pseudo-elaters fuscous, 40-150  $\mu$  long, 5-15  $\mu$  wide, mostly of 1-3 cells, rarely branched; columella smooth.

On ground in a moist shady spot, Tagus Cove Mountain, at elevation of 3,300 feet, Albemarle Island, Galapagos Islands, *Howell No. 213* (holotype), May 26, 1932.

*Anthoceros simulans* is perhaps most nearly allied to *A. fusiformis* Aust., of the Pacific Coast of North America, from which it differs in its short-cylindric involucre (1-1.5 mm. long and 0.3-0.45 mm. wide vs. 2-9 mm. long and 0.35-1.2 mm. wide), in the shorter and slenderer capsules (1-3 cm. long and 0.12-0.175 mm. wide vs. 2-9 cm. long and 0.25-0.5 mm. wide), and in the longer stouter less acicular papillae of the more opaque spores.

From *Anthoceros punctatus* L. and *A. crispulus* (Mont.) Douin, *A. simulans* differs in the more slender capsules and especially in the much more crowded, less acute, and usually shorter papillae of the more opaque spores.

Of the numerous species from tropical America described by F. Stephani, *Anthoceros turbinatus* of Mexico, if we may judge by description alone, may appear to be the most closely allied to the Galapagos plant, but there is nothing turbinate or carnosose about the thallus of *A. simulans*.

### ***Anthoceros vegetans* M. A. Howe, sp. nov.**

Thallo mediocri, olivaceo, cavernoso, terricola, aliquanto carnososo, dissecto vel laciniati-lobulato, lobis plerumque flabelliformibus aut sublinearibus, saepe lobulis pyriformibus vel subglobosis marginalibus, deinde ut propagulis disjunctis, praeditis; superficie vulgo rugosa vel canaliculata, cellulis paginae dorsalis plerumque 30-50  $\mu$  in diam. max.; monoica; androeciis saepe involucris approximatis; involucris brevi-cylindricis, interdum geminatis, carnososis, 1.4-2.1 mm. altis, 0.75-1.1 mm. latis, rotundati-truncatis, ore subintegro vel subcrenato, superficie fere cristas vel lamellas humiles ferente; capsulis paucis, 5.5-8 mm. longis, 0.2-0.35 mm. latis,

<sup>3</sup> Antheridia have not been identified with certainty, but cavities, looking as if they had been occupied by antheridia occur on the same plant as the capsules.



olivaceis, deinde brunneis, stomatibus passim paucis, oblongo-ellipticis, plerumque 52-65  $\mu$  longis, 31-47  $\mu$  latis; sporis pallidi-flavis, translucentibus, 26-40  $\mu$  in diam. max., facie exteriori dense et minute papillati-muriculata, papillis interdum lineas irregulares aut areolas imperfectas formantibus, faciebus interioribus similariter sed minus fortiter notatis aut paene levibus; pseudo-elateribus paucis et inconspicuis, plerumque cellula una constitutis; columella conspicue filis pluri-cellularibus ramentaceis fibrillata, eis fortasse officiis pseudo-elaterum fungentibus.

In ripis humidis in loco "Wafer Bay, Cocos Island" dicto specimen unicum (n. 234) John Thomas Howell, Jun. 28, 1932, legit.

*Anthoceros vegetans* *A. laevi* affinis est, sed habitu propagulifero, capsulis brevibus (5.5-8 mm. vs. 10-35 mm.), columella fibrillata, sculptura sporarum, defectu pseudo-elaterum veri simili, etc., facile distinguitur.

Species fortasse *A. propagulifero* Steph. chilensi sterili affinis est, sed thallo non lamellifero. *A. Anthoceroti bulbifero* Steph. peruviano in sculptura sporarum *A. vegetans* longe distat.

Typus: Herb. Calif. Acad. Sci. No. 215007.

Thallus medium-sized, olivaceous, cavernous, terricolous, rather carnose, dissected or lacinate-lobulate, the lobes commonly flabelliform or sublinear, often with pyriform or subglobose marginal lobules detachable as propagula; surface commonly rugose or canaliculate, the surface cells mostly 30-50  $\mu$  in maximum diameter; monoicous; androecia often at base of involucre; involucre short-cylindric, sometimes geminate, carnose, 1.4-2.1 mm. high, 0.75-1.1 mm. broad, rounded-truncate, the mouth subentire or somewhat crenate, the surface commonly bearing low crests or lamellae; capsules few, 5.5-8 mm. long, 0.2-0.35 mm. broad, olivaceous, becoming brown, rather few, oblong-elliptic, mostly 52-65  $\mu$  long, 31-47  $\mu$  wide; spores pale yellow, translucent, 26-40  $\mu$  in max. diam., the outer face densely and minutely papillate-muriculate, the papillae sometimes forming irregular ridges or imperfect areolae, the inner faces similarly and less strongly marked or nearly smooth; pseudo-elaters few and inconspicuous, mostly 1-celled; columella conspicuously fringed with pluricellular branching filaments, these perhaps taking the place of pseudo-elaters.

On moist steep banks of a stream, Wafer Bay, Cocos Island, Howell No. 234 (holotype), June 28, 1932.

*Anthoceros vegetans* belongs to the *A. laevis* group, but is easily distinguished from those species by its propaguliferous habit, its short capsules (5.5-8 mm. vs. 10-35 mm.), its fibrillate columella, its apparently almost deficient pseudo-elaters, and by the spore-markings, the papillae often showing a pronounced tendency to be confluent into ridges and imperfect areolae. The capsules as found are not dehiscing and it is probable that they are not fully mature.

Of the numerous American species of this group proposed by Stephani, *Anthoceros vegetans* is possibly allied to the sterile *A. propaguliferus* from Chile but the thallus in that species is said to be "antice lamellifera, lamellis confertis", while in the Cocos Island plant, lamellae are very weakly developed or wanting. *Anthoceros bulbiferus* Steph., from Peru, has spores that are "grosse remoteque spinosae", words that could never be applied to the spores of *A. vegetans*.



**Dendroceros crispus** (Sw.) Nees

On decaying wood, with foliose Hepaticae, lichens, etc., Indefatigable Island, *Howell No.* 255.

The specimens have not the long smooth involucre attributed to this species by Stephani (Sp. Hep. 5: 1015), but in this respect they are very similar to West Indian specimens referred to *D. crispus* (type from Jamaica) by Evans and others. The involucre is 4-4.5 mm. long and bears a moderate number of small irregular appendages. In West Indian specimens seen, the involucre is 3-5 mm. long, although Stephani describes them as 8 mm. long. The capsules of the Indefatigable Island plant are about 1 cm. long, the spores are 40-50  $\mu$  in maximum diameter and minutely granulate, and the elaters are about 300  $\mu$  long. Possibly the capsules average shorter than in typical *D. crispus*, but the writer does not find any reliable characters for specific distinction. Many species have been described in this genus without satisfactory diagnostic characters.

In the Mitten Herbarium, now in the possession of The New York Botanical Garden, is a fragment of the type of *Monoclea crispata* Hook. [*Dendroceros crispatus* (Hook.) Nees], from the island of St. Vincent, and also what is apparently a part of the original of *Anthoceros brasiliensis* Raddi [*Dendroceros brasiliensis* (Raddi) Nees]. The Raddi plant has immature capsules included in the involucre (which are about 6 mm. long), though Raddi's figures show mature dehiscent capsules. Stephani makes *Dendroceros crispatus* a synonym of *D. brasiliensis* and describes the involucre of the composite as 10 mm. long, the spores 72  $\mu$ , and the elaters 360  $\mu$  long. In the authentic specimen of *Monoclea crispata* Hook., the involucre is 4-5 mm. long ("vix duas lineas longus", according to Hooker), the spores are 45-65  $\mu$  in maximum diameter and minutely muriculate, and the elaters are 160-300  $\mu$  long. The species of *Dendroceros* are in need of critical revision, with a reexamination of the type specimens, beginning with *Anthoceros crispus* Swartz.



## PLATE 7

FIGURES 1-4, *Riccia Howellii* M. A. Howe, sp. nov.

1. Plants (James Bay, no. 187, p. p.), natural size.
2. Cross section of holotype (Albemarle Island, no. 209), showing spores, etc.,  $\times 38$ .
3. Cross section of holotype (Albemarle Island, no. 209), showing epidermis, etc.,  $\times 70$ .
4. Outer face of spore of holotype (Albemarle Island, no. 209),  $\times 246$ .

FIGURE 5, *Riccia iodocheila* M. A. Howe, sp. nov.

5. Outer face of spore of holotype (Wreck Bay, Chatham Island, no. 201),  $\times 246$ .

FIGURES 6 and 7, *Anthoceros vegetans* M. A. Howe, sp. nov.

6. A lobe of the thallus of holotype (Cocos Island, no. 234), somewhat more bulbiferous than is normal,  $\times 25$ .
7. Spores of holotype,  $\times 319$ . Pseudo-elaters are scarcely recognizable.

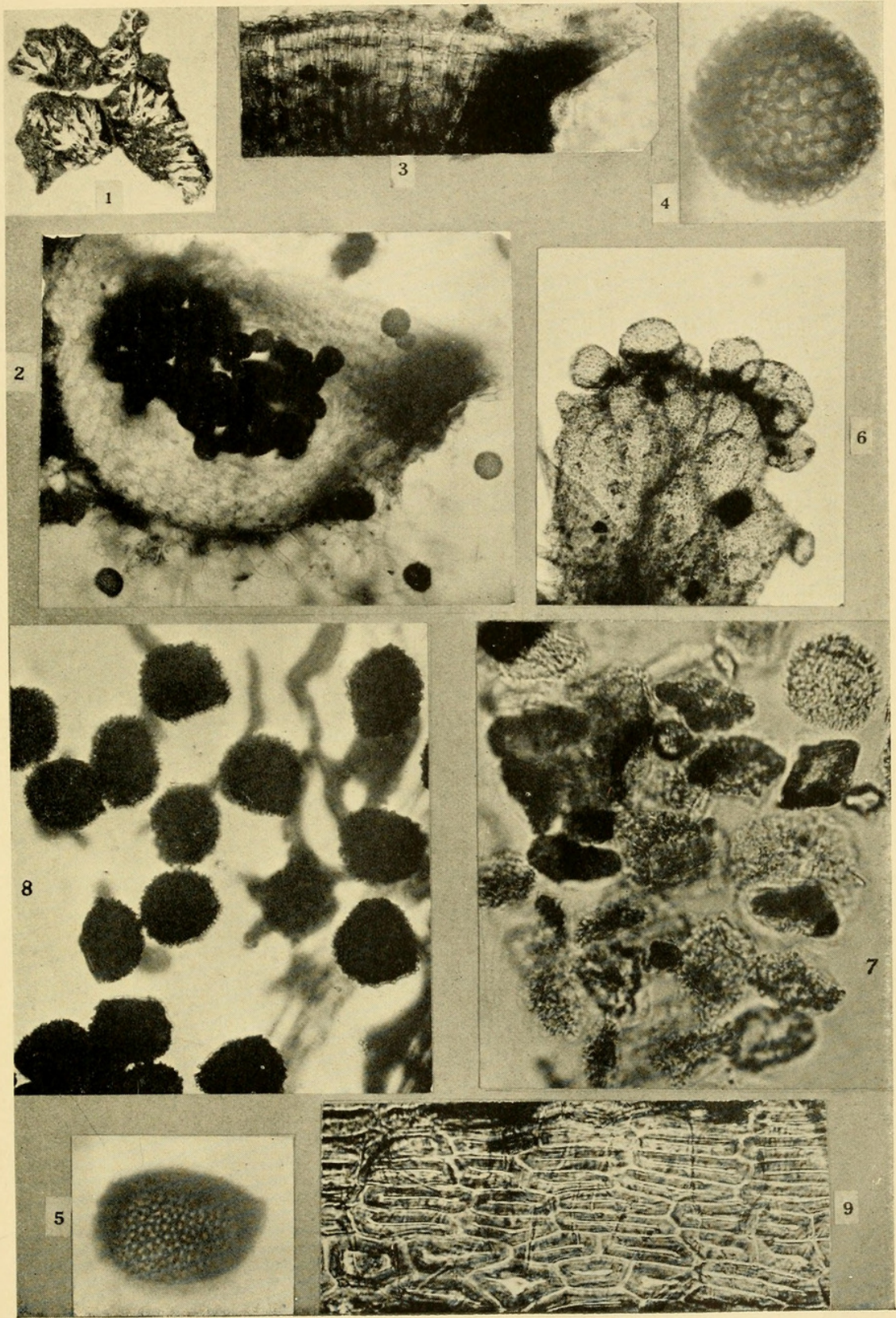
FIGURE 8, *Anthoceros simulans* M. A. Howe, sp. nov.

8. Spores and pseudo-elaters of holotype (Albemarle Island, no. 213),  $\times 246$ .

FIGURE 9, *Notothylas galapagensis* M. A. Howe, sp. nov.

9. A part of the capsule wall of holotype (James Bay, no. 187, p. p.), showing thickenings,  $\times 246$ .













Howe, Marshall A. 1934. "The Templeton Crocker Expedition to Western Polynesian and Melanesian islands, 1933. No. 17. The Hepaticae (chiefly Riccia and Anthocerotaceae) of the Galapagos Islands and the Coast and Islands of Central America and Mexico." *Proceedings of the California Academy of Sciences*, 4th series 21, 199–210.

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