

西沙群岛凹顶藻属两新种*

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在研究我国西沙群岛产的凹顶藻属的种类时,我们遇到了几号外形特殊的标本,经研究其形态构造后,认为是凹顶藻属中尚未报道过的两个新种,模式标本和副模式标本均存于中国科学院海洋研究所植物标本室。

1. 簇枝凹顶藻 (新种) *Laurencia fasciculata* sp. nov. (图 1—2, 图 5: 1)

Frondes epiphyticae, 4—5 cm altae, radiante multifarieque ramosis, axibus 1—paucis e disco basali, axi primaria percurrent, 1100—1300 μ diam., supra in ordine 3—4 frequenter ramosi; ramulis fasciculatis, numeris 3—9; ramulis ultimis breviter clavatis, apice leviter rotundatis, 250—650 (—900) μ long.; in sectione transversali cellulis epidermalibus ad partem superiorem mammiformiter projicientibus, 24—38 μ long.; parietibus cellularum medullarum incrassationem lenticulatam ostendentibus; cellulae epidermales longitudinaliter lacuna deiunctae; tetrasporangia parallele disposita, ovoidea vel subglobosa, 32—96 μ longa, tetraedrice divisa.

Hab. Ad *Laurencia verticillata* epiphyticum, in rupe corallino submarino ca 1 m infra superficiem crescens ad Jinqingdao, Ins. Xisha, Guangdong Province, China, III, 1976 (AST 76-1246, $\oplus$, Holotypus; AST 76-1019, $\oplus$, Paratypus).

藻体直立,附生,以基部一小固着器附生于轮枝凹顶藻藻体上,体高 4—5 厘米,多列互生分枝,色近紫色到浅粉红色,枝端黑,质地柔软,制成的干标本能较好的粘着于纸上。枝圆柱状, 3—4 回分歧,主干及顶,其径 1—1.3 毫米,次生枝略及顶,三生枝较短,略细;枝腋角常钝圆,特别是在体中部的三生枝较明显,上部的分枝略差;枝与枝间亦常互相粘连;末枝极短,长 290—456 微米,径 245—456 微米,常 3、4 个,多至 8、9 个或更多一些的小末枝簇生于三生或次生枝上,末枝多的枝簇,如在解剖镜下检查时,则可以看出它实际上是由 3、4 个小枝组成的小枝簇组成的;枝端钝圆形,枝顶端的皮层细胞明显地突出,表面观圆至卵圆形,径 16—25 微米,毛丝体短,生于枝顶端凹陷处。体横切面观,由不规则圆形的薄壁细胞组成髓部,胞径 86—160 微米,胞壁极薄,仅 1.6—2.0 微米厚,其上有明显的透镜状加厚,透镜状加厚常常形成一个完整的一圈围绕着胞壁,或近于一圈(图 1:13)。皮层细胞不排列成栅状,长径 24—38 微米,细胞间有明显的次生纹孔连结(图 1:8);纵切面观,髓部细胞壁上的透镜状加厚呈透镜状,有时隐约可以看到部分细胞底壁(图 1:8)。孢囊枝短,密集簇生成群,每个孢囊枝径 380—470 微米,长 300—650 (—900) 微米;四分孢子囊生长在未变态的最末小枝的皮层细胞中,孢囊枝的纵切面观,四分孢子囊与轴平行排列(图 2),囊卵形或近圆形,长径 32—96 微米;四面锥形分裂。囊果、精子囊未见到。

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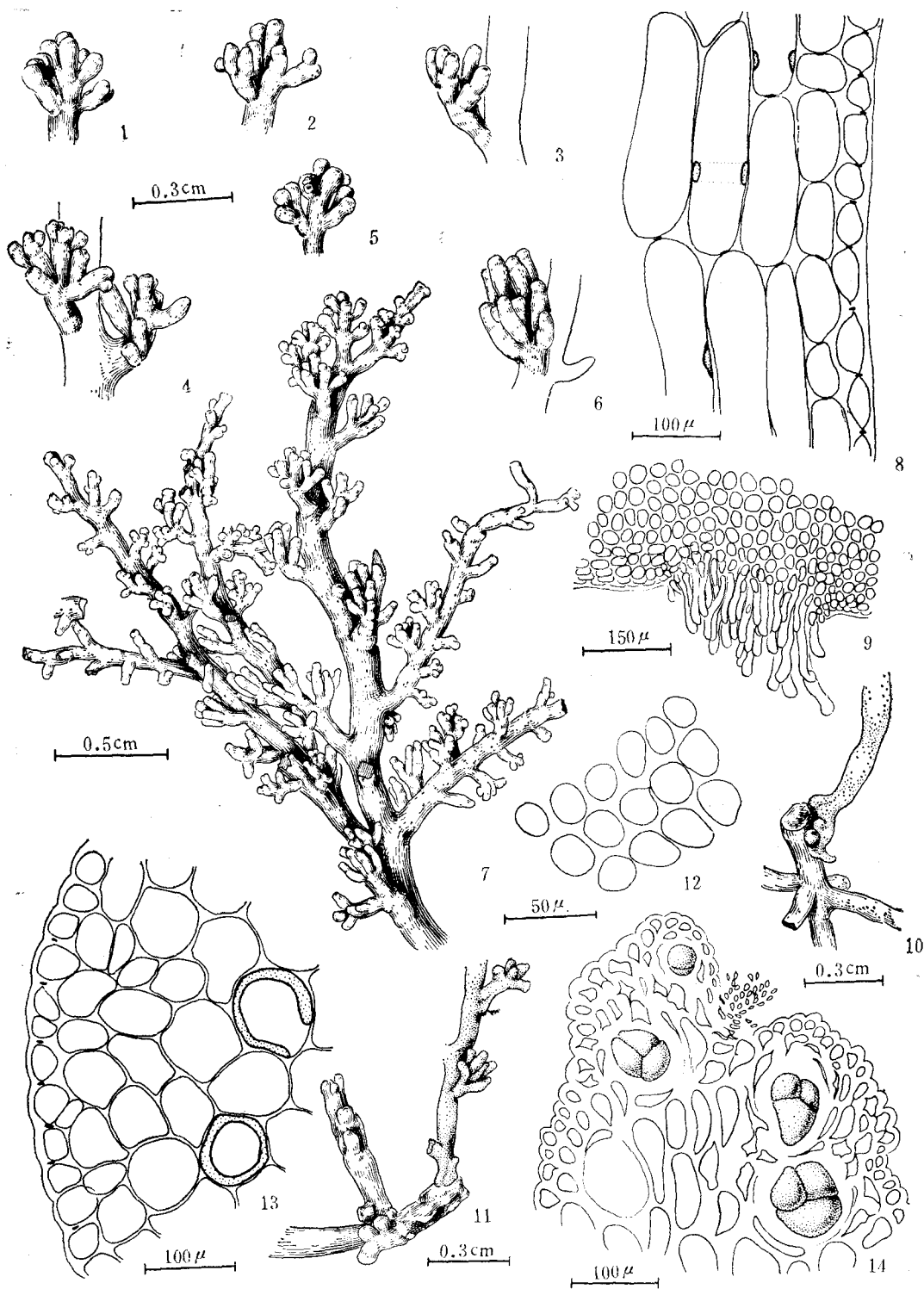
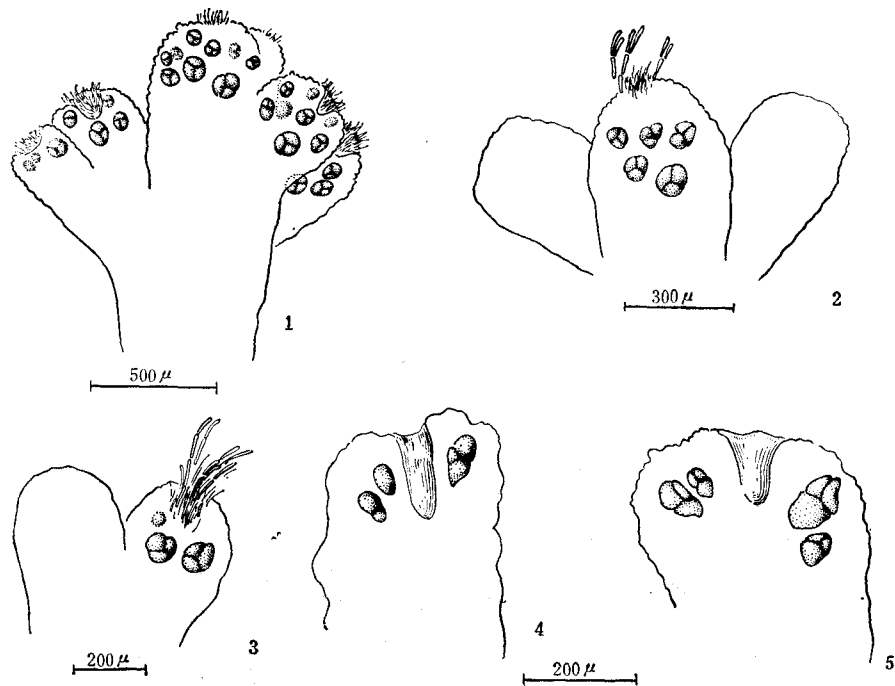


图1 簇枝凹顶藻 *Laurencia fasciculata* sp. nov. 76-1246

1—6. 各种类型的簇状孢囊枝； 7. 藻体外形图； 8. 部分藻体纵切面观；
9. 藻体上的假根状附着器； 10—11. 簇枝凹顶藻附生在轮枝凹顶藻藻体上；
12. 部份皮层细胞表面观； 13. 部分藻体横切面观； 14. 孢囊枝纵切面观。

图2 簇枝凹顶藻 *Laurencia fasciculata* sp. nov. 76-1246

(图示四分孢子囊生长在孢囊枝上的位置)

习性和标本采集地 附生在礁平台内低潮线下1米左右生长的轮枝凹顶藻藻体上。**模式标本** AST 76-1246, ⊕, 系1976年3月23日夏邦美采自我国西沙群岛的晋卿岛。**副模式标本** AST 76-1019, ⊕, 3月, 标本采集地同上。

主要特征 (1) 最末小枝呈簇状, 簇生在三生或次生枝上; (2) 多列的互生分枝, 腋角常钝圆; (3) 皮层细胞间纵切面有次生纹孔连结(图1:8); (4) 髓部细胞壁上有明显的透镜状加厚; (5) 枝端的皮层细胞明显地突出; (6) 体切面观皮层细胞不排列栅状; (7) 四分孢子囊生长在皮层细胞中, 孢囊枝的纵切面观, 四分孢子囊与轴平行排列。

新种孢囊枝上四分孢子囊的排列, 除了散生在孢囊枝上部的侧表面与轴平行外, 有的成熟的四分孢子囊的纵向排列一般也只有两个, 上面的一个位于孢囊枝的顶端, 下面的一个紧挨在其下, 孢囊枝上部的纵切面观也显示了这种情况(图2:4), 最初, 我们曾考虑这是否是凹顶藻属内两个亚属之间的中间类型, 但从藻体的纵切面观皮层细胞之间有明显的次生纹孔连结来看, 本种属内的位置仍应在凹顶藻亚属(Subgenus *Laurencia*) 福氏凹顶藻组内(Section *Forsteranae*)。

在这一组中, 与簇枝凹顶藻相同均具有在髓部细胞壁上的透镜状加厚部分和末枝顶端皮层细胞突出的特征的种类有加氏凹顶藻(*L. galtsoffi* Howe), 毡毛凹顶藻(*L. pannosa* Zanard.) 和马岛凹顶藻(*L. mariannensis* Yamada), 但新种独特的簇状分枝方式和外形等特征则与这几种完全不同。在簇状分枝方式上, 产于加利福尼亚州西海岸的略钝凹顶藻(*L. obtusiuscula* S. et G.) 和产于加利福尼亚湾的埃岛凹顶藻(*L. estebaniana* S. et G.) 与新种有些类似, 但前一种藻体甚大, 高10—18厘米, 三、四生枝很长, 色暗紫, 髓部细胞

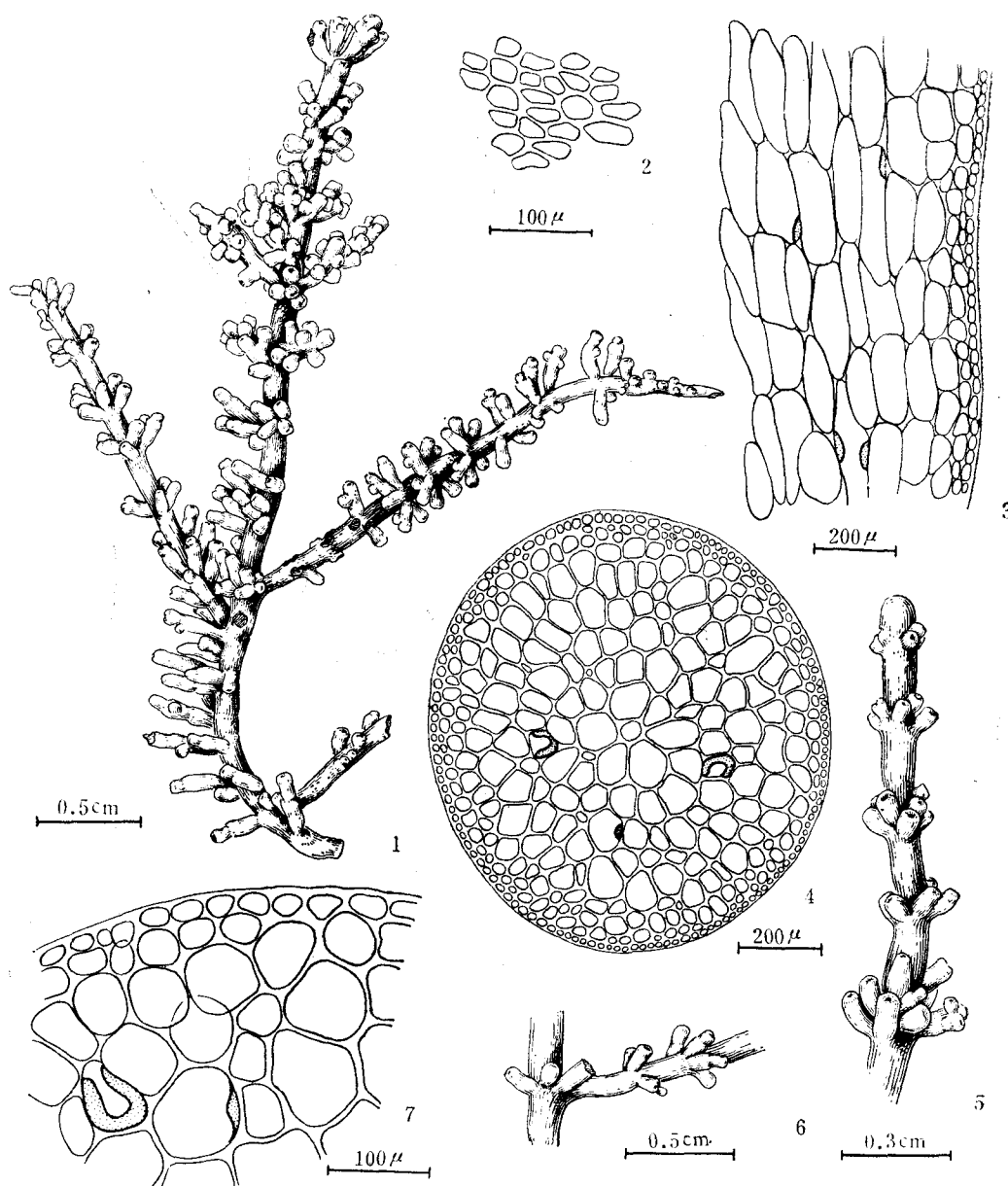


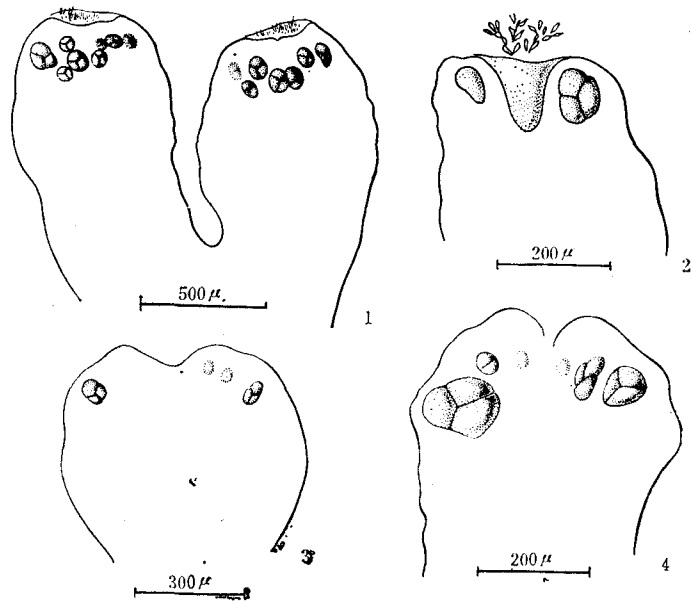
图3 轮枝凹顶藻 *Laurencia verticillata* sp. nov. 57-5207

1. 藻体外形图；2. 部分皮层细胞表面观；3. 部分藻体纵切面观；
4. 藻体横切面观；5. 轮生小枝；6. 次生枝上生出的三生枝；
7. 部分藻体横切面观。

为长椭圆形；而这一新种附生，成熟的藻体只有4—5厘米高，没有长的三生枝，色近紫色到浅粉红色，枝端黑色，髓部细胞近圆形，两种间有明显的区别；后一种的藻体扁压、分枝扭曲，内部构造也不同，与新种分隶于不同的组中。

2. 轮枝凹顶藻（新种） *Laurencia verticillata* sp. nov. (图3—4, 图5:2)

Frondes subcartilagineae, infra substoloniferosae, supra erectae, 5—7 cm altitudine, axibus

图4 轮枝凹顶藻 *Laurencia verticillata* sp. nov. 57-5027

(图示四分孢子囊生长在孢囊枝上的位置)

infra paululum denudatis, ramis ramulisque determinatis, intervallis 1—2 mm, magna ex parte verticillatis; ramulos verticillatos breves 1—2 mm long. quarum 1—2 ascendentes indeterminatos longiores; in sectione transversali cellulis epidermalibus subquadratis 13—32 μ diam., haud simili modo ut cellulis valliformibus dispositis; parietibus cellularum medullosarum incrassationem lenticulatam ostendentibus; cellulae epidermales nullo modo longitudinaliter lacuna seiunctae; tetrasporangia ad angulum 90° inter se patentia, ovoidea vel subglobosa, 47—160 μ longa, tetradrice divisa.

Hab. In rupe corallino submarino ca 2 m infra superficiem crescens ad Yongxingdao, Ins. Xisha, Guangdong Province, China, IV, 1957 (AST 57-5027, ⊕, Holotypus), Jinqingdao, Ins. Xisha, Guangdong Province, China, III, 1976 (AST 76-2078, ⊕).

藻体直立，高 5—7 厘米，基部具匍匐茎，其上生直立枝，匍匐茎上有一些不规则盘形固着器，色紫红或紫褐，体质较硬，制成的干标本不易附着于纸上；主干不及顶或及顶不明显，下部多少有些裸露，分枝 4—5 回，圆柱状，轮生，偶有偏生现象，常常在主干和各级分枝上每间隔 1—2 毫米的距离轮生一圈密集的小枝，在这些小枝中特别是在枝中部的、有时可以长出 1—2 个较长的次级枝，因此，各级分枝上都以同样的方式按一定的距离轮生一圈小枝，形成明显的环节状（图 3:1, 5），所有各级枝的枝径为 0.4—1.5 毫米；最末小枝棍棒状，长 0.5—1 毫米，可达 1.5 毫米，枝端钝头，其皮层细胞不突出。藻体横切面观，中央有较明显的中轴细胞，径约 49—65 微米，围轴细胞 5—7 个（小枝较明显），胞径 110—130 微米；髓部细胞径 82—180 微米，髓部细胞壁上有明显的透镜状加厚，皮层细胞宽而扁，19—26 微米 × 13—32 微米，不排列成栅状（图 3:3）。皮层细胞表面观带角，长径 26—35 微米，纵切面观皮层细胞间无次生纹孔联结（图 3:3）。

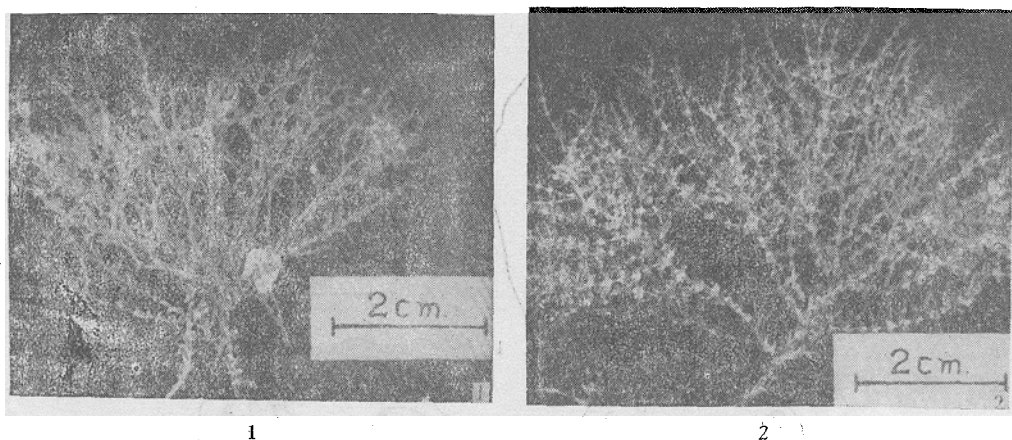


图 5

1. 簇枝凹顶藻 *Laurencia fasciculata* sp. nov. 模式标本 (Typus);
2. 轮枝凹顶藻 *Laurencia verticillata* sp. nov. 模式标本 (Typus)。

四分孢子囊生长在最末小枝顶端的皮层细胞中,孢囊枝的纵切面观囊与轴垂直排列,孢囊枝单条,偶有分枝的,囊卵形或长卵形或近圆形,47—160 微米 $\times$ 32—110 微米;四面锥形分裂。囊果、精子囊未见到。

习性和标本采集地 生长在礁平台内低潮线下 2 米左右的珊瑚或死珊瑚枝上。

模式标本 AST 57-5027, $\oplus$, 1957 年 4 月 8 日夏恩湛、郑树栋采自我国西沙群岛的永兴岛。这一新种还见于西沙群岛晋卿岛, 3 月 (AST 76-2078, $\oplus$)。

主要特征 (1) 较多的小枝间隔一定的距离轮生在各级枝上, 形成一个紧密的圈, 使藻体呈环节状; (2) 纵切面观皮层细胞间无纹孔连结; (3) 髓部细胞壁上有明显的透镜状加厚; (4) 枝端皮层细胞不突出; (5) 横切面观皮层细胞不排列成栅状; (6) 孢囊枝的纵切面观, 四分孢子囊与轴垂直排列。

我们在检查本种藻体的横切面观时, 见到其中轴细胞明显, 并有 5—7 个围轴细胞, 生长点细胞位于凹陷的枝顶端, 因而曾一度怀疑其是否为软骨藻属的种类, 但经纵切藻体则发现枝端的轴细胞列较清楚, 下部则逐渐变得隐约不清, 这一特点表明本新种的自然地位为凹顶藻属。

根据 Saito (1967) 对凹顶藻属的属下分类, 本新种应属于软骨凹顶藻亚属, 软骨藻组, 但该组中的种类其髓部细胞壁大都缺乏透镜状加厚部分, 这一新种则明显的存在, 因此, 软骨凹顶藻亚属中组的分类还有待进一步的研究。

新种藻体中, 上部的主干和各级分枝每隔 1—2 毫米轮生一圈密集而短小的有限枝, 这些小枝中有时又可长出 1—2 个较长的无限枝, 由于轮生枝圈的圆距相同, 使藻体显现出有规律的、呈环节状的分枝, 这一特征在凹顶藻属的种类中是罕见的, 连同其他特征, 本种无疑是凹顶藻属中尚未描述的种类。

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TWO NEW SPECIES OF *LAURENCIA* FROM XISHA ISLANDS, GUANGDONG PROVINCE, CHINA*

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Abstract

In the studies of the species of marine red algae from Xisha Islands, Guangdong Province, China, two interesting red algae are included. After morphological observations, we came to the conclusion that these algae are two new species of *Laurencia*. A description of the new species is given below:

The type specimens of the new species are deposited in the Herbarium of the Institute of Oceanology, Academia Sinica.

DIAGNOSIS OF THE NEW SPECIES

1. *Laurencia fasciculata* sp. nov.¹⁾ (text-figs. 1—2)

Thalli epiphytic, 4—5 cm tall, consisting of one or several erect, branched axes from a small discoid attachment, colour red-purple to black-purple, substance soft and adherent to paper on drying; branching multifariously alternate of 3—4 orders; primary axes percurrent, 1100—1300 μ in diameter, the secondary branches more or less percurrent and clothed with numerous crowded branchlets of higher order, and ultimately with dense clusters of ramuli in abbreviated alternate arrangement; ultimate branchlets short, about 245—456 μ thick and 290—456 μ long, cylindrical; branches sometimes in part attached to each other by outgrowths; epidermal cells near branch apices with projecting outer walls, in surface view subspherical to ovoid, 16—25 μ across; transverse section showing an outer cortex of small cells 24—38 μ long, no palisade arrangement of surface cells; medullary cells 86—160 μ in diameter, cell wall thin, only 1.6—2.0 μ thick, with distinct lenticular thickenings. Longitudinal secondary pit-connections among the cortical cells are present (text-fig. 1:8).

Stichidial ramuli (text-fig. 1: 1—6) in short, densely branched, and often clustered groups; individual stichidia 380—470 μ broad and 300—650 (—900) μ long; tetrasporangia in parallel arrangement, 32—96 μ in diameter, ovoid or subspherical, tetrahedrally divided, borne in the ends of simple, unmodified ultimate branchlets.

* Contribution No. 566 from the Institute of Oceanology, Academia Sinica.

1) For the Latin diagnosis of the new species, refer to page 267.

Habitat Epiphytic on *Laurencia verticillata*, on corallite in the sublittoral (to 1 m) region of reef flat, Jinqingdao, Xisha Islands, in March, 1976 (AST 76-1246, ⊕, Holotype; AST 76-1019, ⊕, Paratype).

The present species is certainly a very characteristic one, easily recognized and distinguished from other members of the section *Forsterianae* in its clustered ultimate branchlets. It is probably closely related to *Laurencia galtsoffi* Howe, *L. pannosa* Zanard, and *L. mariannensis* Yamada, the other three species in the section having surface cells which project at the ends of the branchlet and medullary cell walls with lenticular thickenings. The branchings of these species, however, are entirely different from the present new species. Though ramuli in dense glomerules on short ramuli have been reported in *L. obtusiuscula* S. et G. and *L. estebaniana* S. et G., the first of these, however, is ellipsoidal medullary cell and a much larger species, 10–18 cm high with rather longer tertiary branches than the present rounded medullary cell and smaller species, and the second is decidedly flattened while the present new species is cylindrical.

2. *Laurencia verticillata* sp. nov.¹⁾ (text-figs. 3–4)

Thalli erect cylindrical, with short basal stoloniferous branches attached by several irregular discs, and with several erect axes to about 5–7 cm tall, without conspicuous percurrent axes, purplish red or purplish brown in colour, subcartilaginous and imperfectly adhering to paper on drying; erect axes somewhat denuded below and with usually verticillate branches of 3–4 orders; secondary branches tending to be percurrent; determinate and indeterminate branches verticillate at intervals of 1–2 mm, each verticillate whorl produced 1–2 elongated indeterminate branches; all branches cylindrical, 0.4–1.5 mm in diameter; determinate branchlets 0.5–1 mm, up to 1.5 mm long, clavate; transection showing a medullary cells 82–180 μ in diameter, with lenticular thickenings in the walls and a cortex of more or less broader cells 19–26 μ $\times$ 13–32 μ in dimensions, not at all projecting at the ends of branchlets; branch with a distinct axil cell, 49–65 μ in diameter and 5–7 pericentral cells, not forming a definite circle in section usually not discernible in mature axis. Longitudinal secondary pit-connections among the cortical cells are absent (text-fig. 3:3).

Stichidial ramuli of transformed branchlets, simple, or occasionally branched, terete, 554–747 μ in diam. and 407–1550 μ long, with tetrasporangia more or less in right angle arrangement; tetrasporangia ovoid to nearly spherical, 47–160 μ $\times$ 32–110 μ in dimensions, tetrahedrally divided. Cystocarps and spermatangia unknown.

Habitat Growing on corallite in the sublittoral (to 2 m) region of reef flat: Yongxingdao, Xisha Islands, in April, 1957 (AST 57-5027, ⊕, Holotype). This species was also collected from Jinqingdao, Xisha Islands, in March, 1976 (AST 76-2078, ⊕, Paratype).

This species is readily distinguished from other cylindrical laurenciae by its distinctly verticillate branches, its presence of lenticular thickenings, non-projecting surface cells, each verticillate branches whorl produced 1–2 elongated indetermined branches, cortical cells never elongated radially nor arranged like palisade cells in a transverse section and its tetrasporangial arrangement of the right angle type. The first feature verticillate branching is unique, not appearing in any other member of the genus.

1) For the Latin diagnosis of the new species, refer to page 270–271.