

## 中国的真江蓠和英国江蓠\*

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### 提 要

英国江蓠 *Gracilaria verrucosa* (Huds.) Papenfuss 在外形上变异幅度很大, 地区性海藻志或海藻名录很少不包含本种在内; 有少数专论性的著作对本种均有详细的记述, 因此, 被认为是一个世界广布种。本文通过囊果被构造及其他特征, 将中国和日本产、曾定名为“*Gracilaria verrucosa* (Huds.) Papenfuss”的标本与英国 Devon 模式标本产地的标本进行了比较研究, 结果证明: 模式标本的囊果被构造与中国、日本产的完全不同, 因此, 中国和日本产的应为一新种——真江蓠 *Gracilaria asiatica* sp. nov.

江蓠属的模式种——英国江蓠 *Gracilaria verrucosa* (Huds.) Papenfuss 长期以来被认为是一个世界广布种。根据文献见于温度相差悬殊的寒、温、热带的各大海洋中。我国北起辽宁、南至广东、广西沿岸也都有这种江蓠的记录<sup>[1-16]</sup>。我们对象江蓠这样的广布种一直持怀疑态度, 并曾估计这是由于藻类学家一直没有发现江蓠属种类更关键的分类依据, 以致鉴定错误所致<sup>[5]</sup>。在对中国沿岸江蓠属大量种类研究的基础上发现了江蓠属种类的囊果被在构造上常随着种类的不同而有差异; 同时, 每个种的囊果被的构造又都具有一定的稳定性, 特别表现在细胞和原生质体的形状、排列、胞壁清晰及其组成<sup>[5]</sup>等等, 并曾确认囊果被的构造可以作为区别江蓠属种类的主要特征之一<sup>[4, 5]</sup>。之后, 我们获得了外国藻类学家送来的采自英国的以及加拿大温哥华和日本等国而经江蓠属分类专家鉴定为 *Gracilaria verrucosa* 的标本。比较研究结果, 已如我们在前文<sup>[16]</sup>所报道的: 英国标本的囊果被构造与中国、日本和北美太平洋岸产的 *Gracilaria verrucosa* 完全不同, 而中国和日本同属一种, 但与北美太平洋岸的种也有所不同。这一显著的特征使我们确信 *G. verrucosa* 一名用于采自中国、日本和北美太平洋岸的 *G. verrucosa* 是错误的<sup>[16]</sup>。中国和日本产的 *G. "verrucosa"* 应为一新种, 命名为真江蓠 (*G. asiatica*)。(参阅表 1)

### 真江蓠(新种) *Gracilaria asiatica* sp. nov.

(图 1—2)

Plantae ad 3—50 (—100) cm altitudine, cylindricis, 1—3mm diam. alterneque aut secundeque ramosae, ramis axi similibus; structura a transsectione visa constans e medulla praevalente e cellulis isodiametricis in centro ca. 165—365  $\mu$ m diam. infra corticem tenuem redactis composita; tetrasporangiis dispersis, 40—46  $\mu$ m

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diam.; spermatangiis in infundibulis apertis, conceptacularibus 80—180  $\mu\text{m}$  profundis, 33—100  $\mu\text{m}$  diam. in cortice impositis; cystocarpiis prominentibus, subglobosis, 664—747  $\mu\text{m}$  diam.

Specimen typicum: AST 83-55, ♀ (Holotypus), Qingdao, Shandong Province, China, July 1983.

藻体直立, 单生或丛生, 线形, 圆柱状, 高 30—50cm, 可达 2m 左右, 基部具小盘状固着器, 主干及顶或否, 径 1—3mm, 分枝 1—4 次; 紫褐色, 有时略带绿或黄色, 干后变暗褐, 体亚软骨质, 制成的蜡叶标本不完全附着于纸上。枝多伸长, 常被有短的或长的小枝, 或裸露不被小枝, 向各个方向不规则地互生、偏生或叉分; 分枝的基部常略缩, 也可看到缢缩的个体, 甚至略缩和缢缩的现象同时出现在一个个体上, 枝径 0.5—2.5mm, 枝端逐渐尖细。

藻体内部为大的薄壁细胞组成的髓部, 细胞呈不规则圆形, 径 165—365  $\mu\text{m}$ , 壁厚 8—24(—40)  $\mu\text{m}$ , 外围有 3—5 层或更多的逐渐变小的皮层细胞; 表层细胞常含有色素体, 卵形或长圆形 7—10  $\times$  5—7  $\mu\text{m}$ , 多少有些背斜排列; 细胞自皮层向内逐渐增大, 故皮层和髓部之间界限不明显, 老时藻体常中空; 体表胶质层厚约 10  $\mu\text{m}$ 。

四分孢子囊呈十字形分裂, 偶能看到不规则四面锥形分裂, 紫红色, 散生在藻体表面, 埋于皮层细胞中; 表面观近圆形或卵圆形, 径 40—46  $\mu\text{m}$ ; 切面观为卵圆形或长圆形, 49—69  $\times$  39—49  $\mu\text{m}$ , 被不变态的皮层细胞包围。果胞枝由两个细胞组成。囊果近球形且明显地突出体表面 660  $\times$  750  $\mu\text{m}$ , 一般无喙或略具喙, 基部不缩或微缩, 内部中央有一个融合胞, 上面产生很多薄壁细胞组成的产孢丝; 果孢子囊自产孢丝, 形状近于球形或卵形, 径 16—23  $\mu\text{m}$ ; 吸收丝无或少见, 且数量不多; 囊果被由 7—13 层细胞组成, 厚 115—250  $\mu\text{m}$ , 表层细胞一层, 长圆形, 内部细胞背斜排列, 有时在局部地方显示纵列, 除最里面的 2—5 层细胞外, 其余的 6—8 层内部细胞的胞壁不清, 细胞原生质体呈星状, 具明显的次生纹孔连结, 囊果被的内面常破碎 (图 1: B); 囊果的顶端有一囊孔, 成熟的果孢子就从此孔放散出去 (图 1: B)。精子囊巢散生在藻体的皮层中 (图 1: C), 表面观呈圆形或

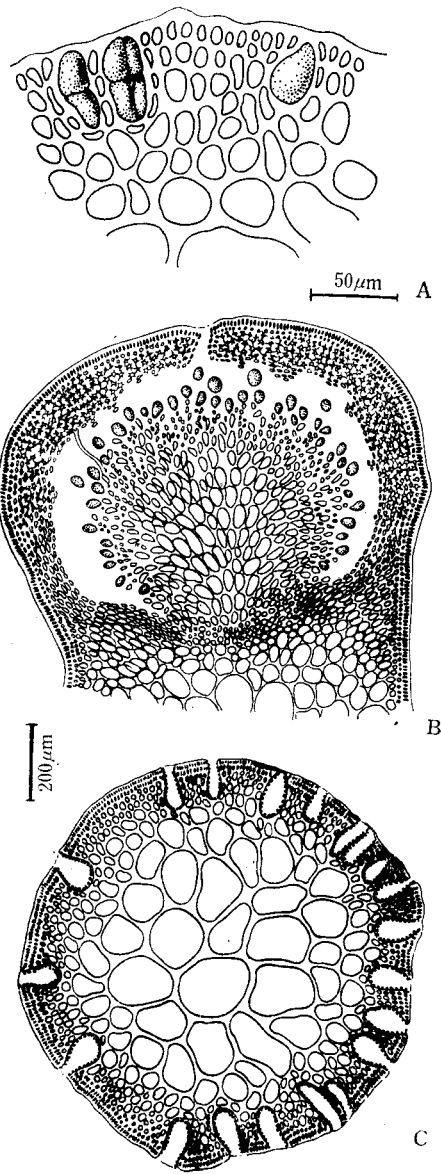
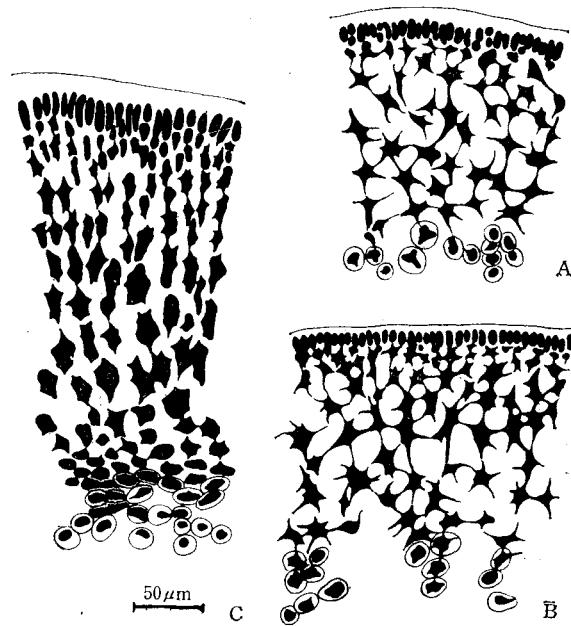


图 1. 真江藻 *Gracilaria asiatica* sp. nov.  
A. 四分孢子囊切面观, AST83—55; B. 囊果切面观, AST83—55; C. 雄配子体切面观 AST83—56

表 1 英国江藻 *G. verrucosa* 和中国的真江藻 *G. asiatica* 的主要分类特征比较表

特 征	英 国 江 藻 <i>Gracilaria verrucosa</i> (England)	真 江 藻 <i>Gracilaria asiatica</i> (China)
四分孢子囊	33—40 $\mu\text{m}$ × 20—23 $\mu\text{m}$	49—69 $\mu\text{m}$ × 39—49 $\mu\text{m}$
精子囊深度	60 $\mu\text{m}$	80—180 $\mu\text{m}$
吸 收 丝	少或较多	少 或 无
果孢子囊径	30—40 $\mu\text{m}$	16—23 $\mu\text{m}$
囊 果 被	275—425 $\mu\text{m}$ 厚, 自边缘向内由许多长形细胞组成, 原生质连丝不明显	115—250 $\mu\text{m}$ 厚, 由明显的星状细胞组成, 原生质之间常有连丝

图 2. 真江藻 *Gracilaria asiatica* sp. nov. 和英国江藻 *G. verrucosa*

A. 真江藻 *G. asiatica* sp. nov. 的囊果被切面观, AST82-800 (中国); B. 真江藻 *G. asiatica* sp. nov. 囊果被的切面观, AST3779 (日本); C. 英国江藻 *G. verrucosa* (Huds.) Papenfuss 囊果被的切面观, AST3781 (英国)

长圆形, 径 33—50  $\mu\text{m}$  或更多, 切面观呈卵形至长椭圆形腔状, 长 80—180  $\mu\text{m}$ , 宽 33—100  $\mu\text{m}$ , 周围的皮层细胞变态或不变态, 顶端有一开口; 精子囊色淡, 反光强, 位于腔壁上。

**习性** 多生长在潮间带至潮下带上部的岩礁、石砾、贝壳以及木料和竹材上, 而生长在肥沃、平静的浅水内湾中的真江藻藻体更长, 更为繁盛。

**模式标本和采集地** 新种的主模式标本为 AST<sup>1)</sup> 83-55 号, 雌配子体, 系 1983 年 8 月 6 日张峻甫、夏邦美采自山东省青岛市湛山湾; 异性模式标本为 AST58-576, ♂, AST83-57, ⊕; 副模式标本有 AST60-538, AST82-183, AST82-800, AST83-56 等。本种标本共计 560 号, 分别采自我国北起辽东半岛, 南至广东省南澳岛, 向西至广西省的防城县沿岸; 日本的北海道 (AST3779, ♀; 3780, ♀)<sup>2)</sup>。研究标本(包括日本及英国标本)均存于中国科学院海洋研究所海洋植物标本室。

**主要特征** (1) 精子囊窠为深腔状; (2) 囊果被的内部细胞壁不清楚, 细胞原生质体呈明显的星状, 具次生纹孔连结; (3) 吸收丝少或无。

新种真江蓠长时期来一直被误定为模式标本产地的英国江蓠(*Gracilaria verrucosa*)。作者等曾在第十一届国际海藻学术讨论会上, 根据以前<sup>[4,5]</sup> 曾经提出以囊果被构造做为江蓠属种类分类的新依据, 在新证据下进一步作了阐述。1984 年 6 月在关岛召开的一次“几种太平洋重要经济海藻分类”讨论会上进一步被与会专家接受并使用。日本著名的江蓠属分类专家山本弘敏博士也同意我们的看法, 即日本过去报道的江蓠 *Gracilaria verrucosa* 与我国产的 *G. "verrucosa"* 完全相同, 因而我们命名其为真江蓠 (*G. asiatica*)。

新种真江蓠易与龙须菜 *Gracilaria lemaneiformis* (Bory) W. V. B. (即 *G. sjoestedtii* Kylin) 和细基江蓠 *G. tenuistipitata* C. F. Chang et B.M. Xia 混淆, 它们之间的区别已在前文<sup>[5]</sup>中加以讨论。

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1) AST 系中国科学院海洋研究所植物标本编号的缩写。

2) 日本藻类学家山本弘敏博士赠送。

## ON *GRACILARIA ASIATICA* SP. NOV. AND *G. VERRUCOSA* (HUDS.) PAPENFUSS\*

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### ABSTRACT

For more than two hundred years *Gracilaria verrucosa* (Huds.) Papenfuss, (known as *G. confervoides* (L.) Greville) originally described from Devon, England by Hudson in 1762, has been reported from various places in the world from the arctic to the tropics and regarded as a cosmopolitan species. In China, since Martens first reported the occurrence of this species from Macao, China in 1866, many other phycologists (Gepp in 1904; Cotton, 1915; Ariga, 1919; Tseng, 1936; Tseng and Li, 1935; Howe 1924; 1934; Setchell, 1931; Chang and Xia, 1976; Zhang and Xia, 1984) have reported the same species from various places in China. Determination of the species of *Gracilaria* is difficult because of their great variability and the lack of reliable characteristics in differentiating related species. Several years ago we found the structure of the pericarp to be quite constant with the species and valuable in differentiating species (Chang & Xia, 1976). However we still identified our common Chinese species with *G. verrucosa* (Huds.) Papenfuss. Yet we did suspect the cosmopolitan distribution of the English species and the Chinese species different from the English species, but the lack of specimens from England and other places for comparative studies prevented us from dealing with this problem any further. A few years ago we had access to specimens collected from Wemoury, Devon, England (courtesy of Dr. Jack McLachlan) and Japan (courtesy of Dr. H. Yamamoto). We made a comparative studies of these and our specimens identified as "*Gracilaria verrucosa*". As we have expected, the Chinese species does differ specifically from the English *Gracilaria verrucosa* (Huds.) Papenfuss. We also found that the "*Gracilaria verrucosa*" of Japan, at least the specimen collected by H. Yamamoto from Hokkaido, belonged to the same species as the Chinese species, now described as *Gracilaria asiatica* Zhang and Xia, sp. nov<sup>1)</sup>. The Asiatic species may be readily distinguished from the *Gracilaria verrucosa* from Wemburg, Devon, England by the deeper spermatangial conceptacles, by the larger tetraspores, by the smaller carpospores and by the structure of pericarp (Table 1), as already comparatively studied by Zhang and Xia (1984).

***Gracilaria asiatica*** sp. nov. (Figs. 1—2)<sup>2)</sup>

Thallus erect, solitary or caespitose, cylindrical throughout, habit variable, 3—50 (—200) cm in length, 1—3 mm diam., arising from a small discoid holdfast with 1—4

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1) While in Guam in June, 1984, the second author had discussed this problem with Yamamoto, who agreed that the Chinese and the Japanese species long known as "*Gracilaria verrucosa*" (*G. confervoides*) belonged to the same species.

2) For the Latin diagnosis of the new species, refer to page 175—176.

orders of branches; purplish brown to dark brown, sometimes to greenish or yellowish, subcartilaginous in substance, adhering imperfectly to paper on drying; branches irregularly alternately, secundly or subdichotomously, sometimes with shorter or longer ramuli, 0.5—2.5 mm in diam., gradually tapering towards the apex and slightly or occasionally abruptly constricted or nonconstricted at the base; thallus in transverse section consisting of a medulla of large parenchymatous cells, 165—365  $\mu\text{m}$  in diam, with thicker walls, 8—24 (—40)  $\mu\text{m}$ , surrounded by 3—5 or more layers of small ovoid or elongate rounded cells, more or less anticlinally arranged; the outermost layer of cells, 7—10  $\times$  5—7  $\mu\text{m}$  in dimensions, pigmented and with surface jelly 10  $\mu\text{m}$  thick; transition from medulla to cortex gradual; empty in central portion when old.

Tetrasporangia scattered among the surface layer of frond, subspherical or ovoid in shape in surface view, 40—46  $\mu\text{m}$  in diam., ovoid or oblong in transverse section, 49—69  $\mu\text{m} \times$  39—49  $\mu\text{m}$  in dimensions, surrounded by unmodified cortical cells, cruciately or occasionally tetrahedrally divided (Fig. 1:A). Carpogonial branches two-celled; cystocarps prominently protruding, subspherical to hemispherical in shape, 660  $\times$  750  $\mu\text{m}$  in diam. nonrostrate or slightly rostrate, unconstricted or slightly constricted at base; gonimoblast developing from a fusion-cell, parenchymatous, connected with the pericarp by rare or without absorbing filaments; carpospores round or ovoid in shape, 16—23  $\mu\text{m}$  in diam.; pericarp 115—250  $\mu\text{m}$  in thickness, consisting of 7—13 layers of cells: of which one layer of outermost pigmented cells and about 6—8 layers of cells with obscure cell walls except for 2—5 innermost layers of cells with clearer cell walls, the distinct stellate cell protoplasm of inner layer cells connected anticlinally and radially with each other by means of more distinct pit-connections (Figs. 2:A, B). Spermatangial conceptacles scattered over the surface of the blade in well-separated, spherical to oblong in shape in surface view, 33—50  $\mu\text{m}$  or more, ovoid to long elliptical conceptacle in sectional view, 80—180  $\mu\text{m}$  deep and 33—100  $\mu\text{m}$  wide, well-separated by modified or unmodified cortex cells. (Fig. 1:C).

**Habitat** On gravels, pebbles and rocks, which are often covered with sand and mud in the intertidal to upper subtidal. Qingdao, Shandong Province, China, on August 6, 1983 (HOLOTYPE: AST 83-55, ♀; ALLOTYPE: AST 58-576, ♂, AST 83-57, ⊕; PARATYPE: AST 60-538, AST 82-183, AST 82-800, AST 83-56). This species has also been collected from the coasts of Liaoning, Hebei, Shandong, Zhejiang, Fujian, Guangdong and Guangxi Provinces, Usu near Muroran in Hokkaido, Japan, on July 31, 1972 (AST 3779, ♀); Shinori, near Hakodate in Hokkaido, Japan, on Aug. 21, 1969 (AST 3780, ♀). The specimens studied including the type specimens are all deposited in the Herbarium of the Institute of Oceanology, Academia Sinica.