

中国双胞苔虫科(苔藓虫)的种类记述*

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唇口目、无囊亚目、枝室超科 (Order Cheilostomata; Suborder Anasca; Superfamily Cellularinoidea) 的双胞苔虫科 (Bicellariellidae Levinsen, 1909) 的种类十分丰富, 它的成员从潮间带至 4,000 多米的深海海底, 从热带海洋到寒冷的极地海域, 都有广泛的分布。

双胞苔虫科群体通常直立, 有时多少平卧 (recumbent), 甚至松散被覆 (encrusting) 在基质上。分枝多数为双列, 有时单列或多列。个虫 (zooids) 通常钙化弱, 但几丁化强。在一列个虫中, 每一个虫从其前位个虫的背面末端生出, 故个虫末端多少重叠在其后续个虫的始端部分上。前膜 (frontal membranes) 通常大, 常占个虫整个前表面, 但有时较小,

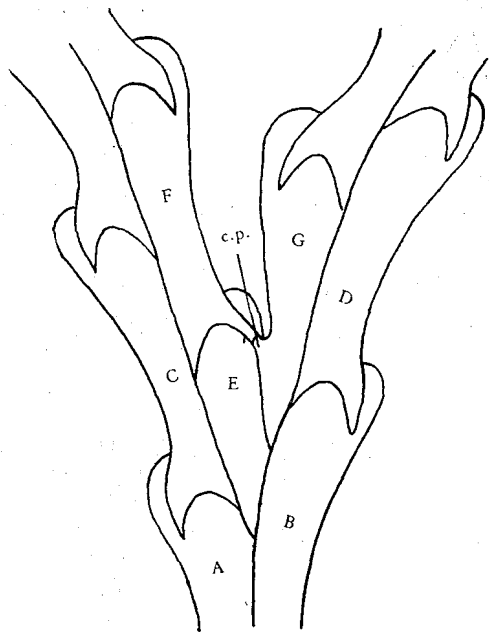


图1 双胞苔虫科 Bicellariellidae 的分枝模式

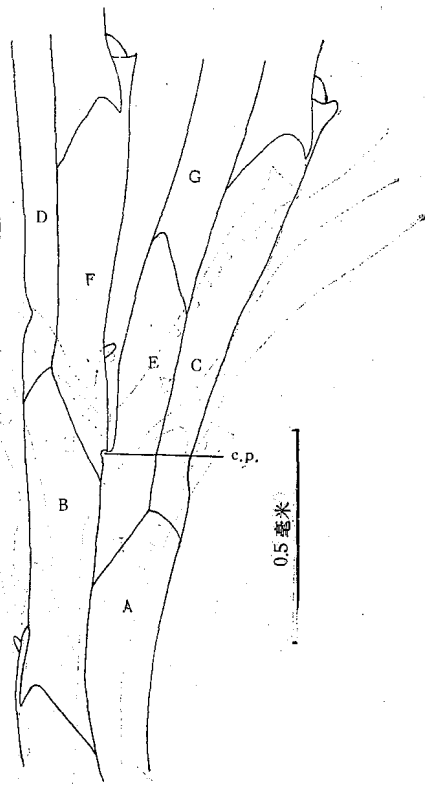


图2 太平草苔虫 *Bugula pacifica* 的背面观, 示分枝方式 (Harmer 的模式 3)

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始端裸壁发达。个虫两侧通常内卷,整个个虫常呈陀螺形。刺通常存在,有端刺 (distal spines) 和侧刺 (lateral spines)。有柄鸟头体 (pedunculated avicularia) 为双胞苔虫科所特有。有时无刺也无鸟头体。卵胞通常存在。群体分歧方式和粗胞苔虫科 (Family Scrupocellariellidae) 不同 (图 1): 两支子分枝的内列个虫来自不同的虫室。为了叙述方便,可用字母统一标注与分歧有关的个虫。A 是准备分歧的两个交替排列的始位个虫。B 是与 A 连续交替、位于分枝另一侧的末位个虫。E 是与分歧中轴密切相关的后续个虫,称为轴个虫; C 与 D 是 Y 状分枝的一枝 (子分枝) 的外列个虫,分别是 A 和 B 的直接后续个虫,在形状上它们与 A 和 B 一致,与 A 和 B 的区别在于它们彼此分歧,以便让其他两个后续个虫 E 和 F 嵌在它们中间。E 来自 A,位于 A 的内侧, F 来自 B,位于 B 的内侧,即群体分枝分歧后的两支子分枝的内列(个虫)来自不同的个虫: F 来自 B, G 来自 E。这是双胞苔虫科的分歧模式。

本文所报道的种类,群体分枝分歧方式有以下三种类型:

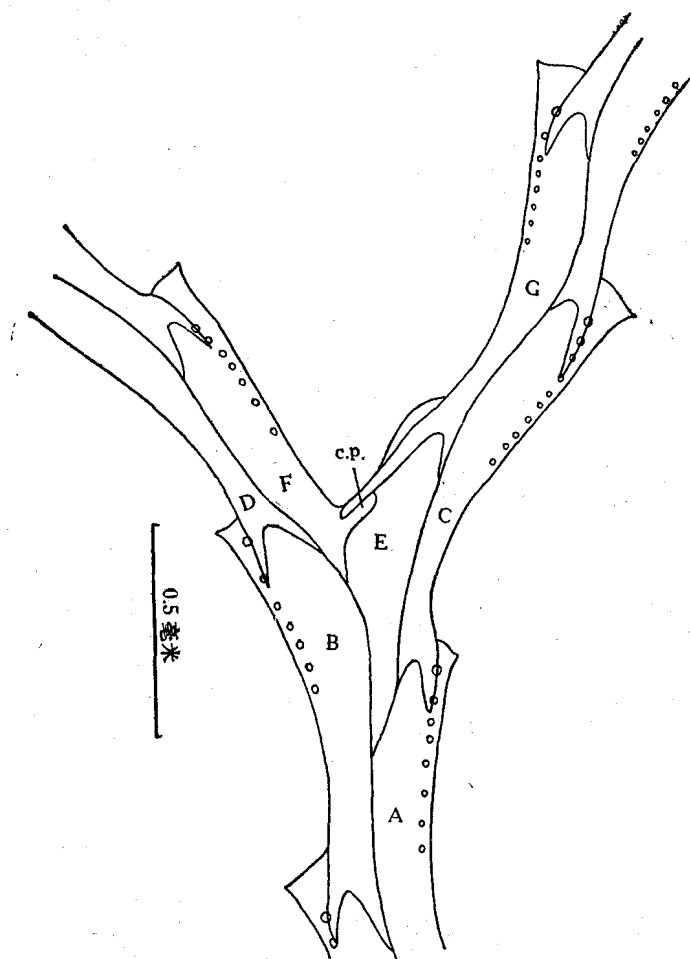


图 3 舟形草苔虫 *B. scaphoides* 的背面观,示分歧方式 (Harmer 的模式 4)

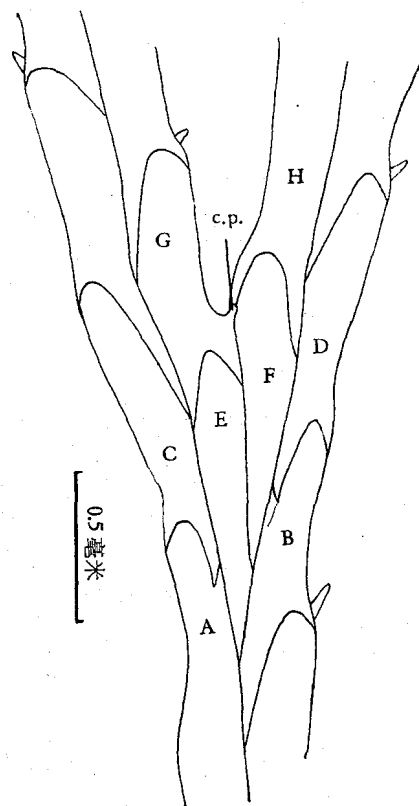


图 4 齿草苔虫 *B. dentata* 的背面观,示分歧方式 (Harmer 的模式 5)

1. 两支子分枝间的叉裂 (slit) 几乎伸至轴个虫 E 的始端, 故轴个虫内侧的大部分是游离的。E 分出连接突起 (connecting process), 与 F 的始端相遇。E 和 C、F 和 D 的始端为不完全的单叉 (其余个虫为完全的双叉)。Bugula 属的一些种属于此种分歧类型, 如太平洋草苔虫 *Bugula pacifica* Rchertson, 1905 (Harmer 的模式 3) (图 2)。

2. 两支子分枝间的叉裂向轴个虫 E 的始端伸展, 但不超过其全长的二分之一, 故轴个虫游离部分小。连接突起由 F 分出, 连接个虫 G 的分叉内叶。G 的内叶在轴个虫背面通过。属于此种分歧方式的有 Bugula 属的一些种, *Bicellariella* 属, 以及 *Caulibugula* 属的大部分种类, 如舟形草苔虫 *Bugula scaphoides* Kirkpatrick 1890 (Harmer 的模式 4) (图 3)。

3. 轴个虫几乎完全埋于母节间部 (internode) 内, 叉裂仅达到轴个虫 E 的顶端。连接突起由 G 分出, 连接 H 分叉的内叶。属于此种分歧类型的有 Bugula 属和 *Caulibugula* 属的一些种, 如齿草苔虫 *Bugula dentata* (Lamouroux, 1816) (Harmer 的模式 5) (图 4)。

在鉴别双胞苔虫科成员时, 群体的结构和个虫的形态, 鸟头体的形状、大小和着生位置, 端刺的有无及其数量, 卵胞的有无及其形态, 群体分枝的分歧方式等, 都是重要的分类性状。

本文报道中国近海双胞苔虫科 8 属, 其中有一新属, 共 31 种, 其中 9 种为新种, 16 种为中国首次记录。新种的模式标本保存在中国科学院海洋研究所(青岛)。

属 的 检 索

1. 群体始端有一单列空个虫构成的柄状长茎 茎苔虫属 *Caulibugula*
群体始端无柄状长茎, 如有长柄, 则由两列普通个虫构成 2
2. 个虫始端呈狭管状 4
个虫始端不呈狭管状 3
3. 有口盖 滨苔虫属 *Halophila*
无口盖 草苔虫属 *Bugula*
4. 群体由单列个虫构成 5
群体通常由双列或多列个虫构成 6
5. 母个虫和子个虫之间有几丁质关节, 有口盖 小草苔虫属 *Bugulella*
母个虫和子个虫之间无几丁质关节, 无口盖 假草苔虫属(新属) *Falsibugulella* gen. nov.
6. 个虫管状始端突然膨大, 群体蔓生或平卧松散附着 格苔虫属 *Beania*
个虫管状始端逐渐膨大, 群体通常直立 7
7. 个虫由几丁质关节分为界限分明的三部分, 末端部分膨大, 个虫背面无钙化区 双胞苔虫属 *Bicellariella*
个虫由始端管状部分和广阔的末端部分构成, 个虫背面有一钙化区 缨苔虫属 *Dendrobeania*

I. 格 苔 虫 属 Genus *Beania* Johnston, 1840

Beania Johnston, 1840:372 (fide Harmer 1926); Levinsen, 1909:97, 110; Harmer, 1926:410; Silén, 1941:93; Osburn, 1950:169.

Chainosa Busk, 1867:241 (see Harmer, 1923:304)

Dichoris Busk, 1852:53.

Diachoseris (sic) Ortmann, 1890:25 (see Harmer, 1923:306).

模式种 奇异格苔虫 *Beania mirabilis* Johnston, 1840

个虫始端细管状,末端膨大,由4根或6根连接管连接其他4个或6个个虫。连接管由网孔(fenestrae)间开,网孔或大或小。有些种类连接管极短,另一些种类连接管极长,与个虫等长或长于个虫。个虫始端管状部分起始于前位个虫膨大部分的背面。前膜占个虫膨大部分的整个前表面,周缘多刺或无刺。通常无卵胞或仅显痕迹,但有的种类卵胞比较发达。格苔虫属的种类非直立生长,而是平卧在各种基质上。

Canu & Bassler (1927:232) 主要根据“无卵胞”这一特征,为 *Beania* Johnston 1840 和 *Stolonella* Hincks, 1883 创立了格苔虫科(Beaniidae)。实际上 *Beania* 属的有些种类是有卵胞的,但通常较小,如盘皮格苔虫 *B. discordermiae* (Ortmann), 少数种类卵胞很发达,如歪格苔虫 *B. asymmetrica* Harmer, 1926。因此,正如 Silén (1941) 所指出, *Beania* 属和双胞苔虫科其他诸属并无重大差别,所不同的是其群体生长方式特殊和个虫具有连接管。Harmer (1926) 对这些特征作了详细研究,指出:这些特征可能都是由共同的连续排列的双胞型个虫演化而来的(见 Harmer 1926: 410—411)。我们同意 Silén 等人的意见, *Beania* 属只能归于双胞苔虫科。

种 的 检 索¹⁾

1. 群体呈网状,连接管之间形成封闭的网孔.....2
 群体不呈网状.....7
2. 连接管6根.....3
 连接管4根,网孔四方形.....矩格苔虫 *B. regularis*
3. 有鸟头体.....4
 无鸟头体.....豪猪格苔虫 *B. hirtissima*
4. 鸟头体单一或成对,大形或中等大,始端部分呈球形,吻细长,上半部较凹,鸟头球形.....5
 鸟头体成对,小形,始端部分狭管形,吻短,上半部平直,鸟头四方形.....细柄格苔虫 *B. petiolata*
5. 侧刺较多.....6
 无侧刺.....无刺格苔虫 *B. aspinosa* sp. nov.
6. 侧刺9根以上,细长,通常盖到前膜上,超越个虫中线;口刺较短,个虫长椭圆形;鸟头体吻短,上半部不太凹,鸟头极凸,典型球形.....多刺格苔虫 *B. spinigera*
 侧刺5—8根,较短,通常向外生长,有时盖到膜下孔上,但不超过个虫中线;个虫短,椭圆形;鸟头体吻长,上半部极凹,鸟头不太凸.....盘皮格苔虫 *B. discordermiae*
7. 有鸟头体.....中介格苔虫 *B. intermedia*
 无鸟头体.....格苔虫 *B. mirabilis*

1. 盘皮格苔虫 *Beania discordermiae* (Ortmann, 1890) (图5)

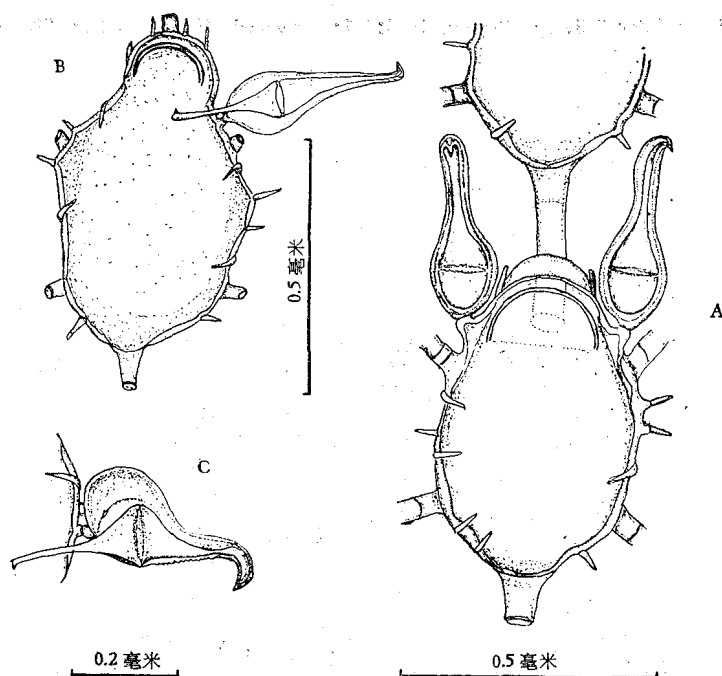
Dischoseris (sic) *discordermiae* Ortmann 1890:26, pl. 1, fig. 23.

Beania discordermiae (Ortmann) Harmer, 1926:415, pl. 28, figs. 9—10; Okada & Mawatari, 1936:57; Silén, 1941:95, text-figs. 118—119; Mawatari, 1963:7; 1965:608, figs. 79b, c.

Beania discordermiae var. *boniensis* Silén, 1941:95, text-figs. 120—123; 1944:447, pl.1, figs. 1—4. text-figs. 13—14.

群体网状,网孔小于个虫。连接管6根,细而短。个虫膨大部分几乎构成整个个虫,始端管状部分很短,管状部分向末端突然膨大成为膨大部分,整个个虫粗而短。膨大部分

1) 本文报道格苔虫属8种,另一种 *Beania farreae* Liu, 1982 已发表于《海洋与湖沼》1982年第1期。

图5 盘皮格苔虫 *B. discordermiae*

- A. 前面观, 示个虫、口刺、侧刺、鸟头体、痕迹卵胞(产地: 南海, 20°00'N, 110°15'E);
 B. 前面观, 示个虫、鸟头体、口刺、侧刺(产地: 西沙琛航岛);
 C. 前面观, 示一鸟头体(产地同 B)

在其末端最狭, 在远侧连接管 (latero-distal connecting tubes) 附近有一收缢 (constriction); 在其两侧连接管之间最宽, 始端部分钝圆。前膜大, 占膨大部分整个前区, 中部最宽, 两端较狭。口盖半圆形。室口缘有 3—5 根短刺, 前膜两侧有 5—8 根侧刺。侧刺长短不一, 通常较短, 向外生长, 有的向内生长盖到前膜上, 但不超越个虫中线。鸟头体中等大小, 单一或成对, 着生在室口侧面。鸟头呈球形, 稍隆起, 上半部很凹。吻两侧不对称, 长度变化较大, 吻端呈钩状, 两侧常呈锯齿状。颚骨长三角形, 末端有强壮的垂尖。有侧附根和背附根, 侧附根从近侧连接管 (proxilateral connecting tubes) 的下方背面分出, 背附根从与远侧连接管 (disto-lateral connecting tubes) 同一水平的背中线上分出。有痕迹卵胞, 和规矩格苔虫 *B. regularis* Thornely 的卵胞相似。

标本采集地 海南岛东北部近海 (20°00'N, 110°15'E), 水深 52 米, 附在珊瑚上; 西沙群岛琛航岛, 水深 30 米, 附在珊瑚上。

地理分布 日本(相模湾、小笠原群岛)、印度尼西亚、新西兰。在我国系首次纪录。

讨论 Silén (1941:95) 把采自日本小笠原群岛的标本, 因鸟头体小、侧刺较短, 定名为 *B. discordermiae* var. *bonienseis*。我们认为鸟头体大小和侧刺长短均有变化, 例如西沙群岛的标本, 其鸟头体普遍较小, 一般为南海标本的 4/5—3/5, 至于侧刺的长短甚至在同一群体的不同个虫也有变化。因此, 我们认为变种应归并为本种。

2. 多刺格苔虫 *Beania spinigera* (MacGillivray, 1859) (图 6)

Diachoris spinigera MacGillivray, 1859:165, pl. 2, fig. 12 (fide Waters 1913); Waters, 1887:94;

Beania spinigera (MacGillivray) Waters, 1913:467; Mawatari, 1965:608, figs. 79d. e.

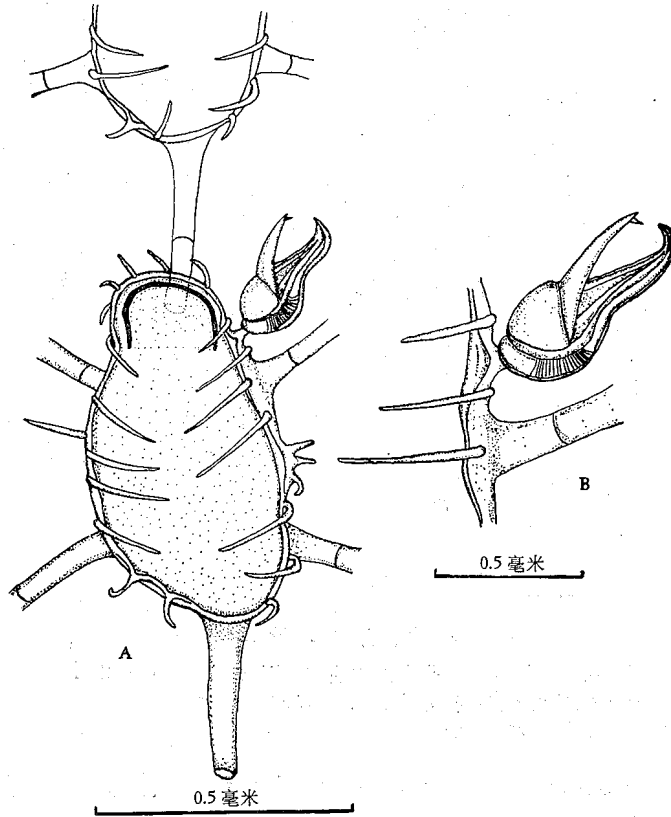


图6 多刺格苔虫 *Beania spinigera*

A. 前面观, 示个虫、口刺、侧刺、鸟头体; B. 前面观, 示一鸟头体

群体网状。网孔中等大小, 长度和宽度约等于或大于个虫。群体灰白色。连接管6根。远连接管和远侧连接管的几丁质关节远离个虫, 近连接管和近侧连接管的几丁质关节靠近个虫。个虫膨大部分椭圆形, 比无刺格苔虫(新种) *Beania aspinosa* sp. nov. 的宽, 但比盘皮格苔虫的狭, 其末端略有收缢或钝圆, 始端较狭, 中间较宽。管状部分突然膨大成为膨大部分, 与盘皮格苔虫相似。口盖小, 半圆形。室口顶缘有4—5对口刺, 较盘皮格苔虫的长, 侧刺多而细长, 每侧9—11根, 大多数向内生长, 伸展到前膜上面, 超越个虫中线。鸟头体成对或单一, 较小, 着生于和口盖同一水平的室口两侧或一侧, 吻比无刺格苔虫(新种)的短, 上半部稍凹, 末端强钩状。颚骨长三角形, 末端有一强壮的垂尖。鸟头极凸, 似无刺格苔虫(新种)。有背附根和侧附根。背附根在与远侧连接管同一水平的背中线上分出, 有时在背面始端背中线分出另一背附根。侧附根在近侧连接管和远侧连接管之间分出, 有的只有一根侧附根, 有的有两根, 有的两背附根和两侧附根同时存在。未发现卵胞。

多刺格苔虫和盘皮格苔虫十分相似, 但个虫较细长, 口刺和侧刺都较长, 两者鸟头体差别尤其显著(见表1)。

标本采集地 东海, 自 $29^{\circ}30'N$, $125^{\circ}00'E$ 至 $27^{\circ}30'N$, $126^{\circ}00'E$, 水深 90—162 米。每一采集站都获得许多群体, 常附着在贝壳、海绵上, 丛生在水螅及其他枝状苔虫之间。

地理分布 日本、澳大利亚, 东非。在我国系首次纪录。

3. 无刺格苔虫(新种) *Beania aspinosa* sp. nov. (图 7)

模式标本 标本号: 60BBS002, 1959 年 5 月 7 日采自海南岛东南部近海, $108^{\circ}30'N$, $110^{\circ}50'E$, 底质为粗砂贝壳, 水深 106 米, 2 个群体附在贝壳上。

群体网状, 淡黄色。网孔中等大小, 其长度等于或小于个虫, 但比个虫狭, 有的网孔仅为个虫宽度的 $1/2$ 。连接管 6 根; 远连接管和远侧连接管的几丁质关节靠近个虫, 近连接管和近侧连接管的几丁质关节远离个虫。个虫细长, 比盘皮格苔虫的小; 始端部分呈管状, 逐渐膨大成为膨大部分。膨大部分卵圆形, 始端宽, 末端钝圆无收缢。前膜大, 占整个膨大部分前区, 长卵圆形, 中部以下稍宽, 末端较狭, 两侧对称。口盖小, 几呈半圆形。室口顶缘有 4—5 根刺状突起。前膜两侧无刺, 但个别个虫有 1—2 根痕迹刺。鸟头体大, 大小不均, 多数单一, 少数成对, 着生于和口盖同一水平的室口侧面。鸟头典型球形, 极隆起。吻细长, 光滑无锯齿, 两侧对称, 上半部凹陷深, 末端强钩状。颚骨长三角形, 末端有一垂尖, 有时在其中部有两个并立的小刺。有背附根和侧附根。侧附根在近侧连接管和

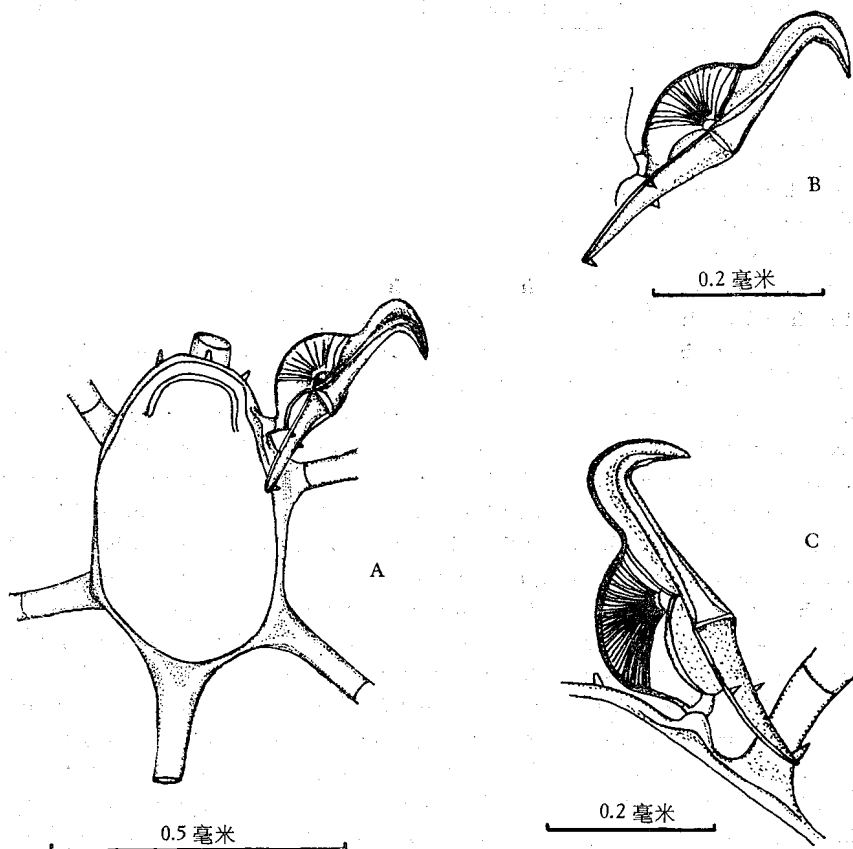


图 7 无刺格苔虫(新种) *Beania aspinosa* sp. nov.

A. 前面观, 示个虫、鸟头体、口刺; B—C. 前面观, 示同一群体的两个鸟头体

表 1 无刺格苔虫(新种)、盘皮格苔虫和多刺格苔虫的比较

	无刺格苔虫(新种) <i>B. aspinosa</i> sp. nov.	盘皮格苔虫 <i>B. discordermiae</i>	多刺格苔虫 <i>B. spinigera</i>
1. 连接管	2. 6根; 远连接管和远侧连接管的几丁质关节紧靠个虫	3. 6根; 各连接管的几丁质关节离个虫大致相等	4. 6根; 远连接管和远侧连接管的几丁质关节远离个虫
5. 网孔	6. 中等大小, 长于或等于个虫, 狭于个虫	7. 较小, 长度小于个虫, 狭于个虫	8. 中等大小, 长、宽等于或大于个虫
9. 始端管状部分	10. 较长, 管状部分向膨大部分逐渐膨大	11. 极短, 管状部分向膨大部分突然膨大	12. 较长或较短, 管状部分向膨大部分突然或逐渐膨大
13. 末端膨大部分	14. 最狭, 长卵圆形, 末端钝圆, 无收缢, 中部偏下位稍宽, 始端较宽	15. 粗而宽, 椭圆形, 末端最狭, 在远侧连接管处或稍上位略有收缢	16. 末端略有收缢或钝圆, 始端最狭
17. 前膜	18. 长卵圆形	19. 椭圆形	20. 长椭圆形
21. 口刺	22. 4—5根刺状突起	23. 3—5根, 较短	24. 4—5根, 较长
25. 侧刺	26. 一般无侧刺, 仅个别个虫有1—2根痕迹侧刺	27. 6—8根, 较短, 不超过个虫中线, 有时向外生长	28. 9—11根, 常超过个虫中线, 均向内生长
29. 鸟头体	30. 大形, 鸟头极凸, 吻上半部很凹, 吻细长而光滑, 末端强钩状, 颧骨长三角形, 末端有一垂尖, 有时近中部有两个并立小刺	31. 中等大小, 鸟头稍凸, 吻上半部很凹, 吻长短不一, 两侧有锯齿, 末端强钩状, 颧骨长三角形, 末端有一垂尖	32. 中等大小, 鸟头极凸, 吻上半部稍凹, 吻较无刺格苔虫(新种)的短, 末端强钩状, 颧骨长三角形, 末端有一垂尖
33. 附根	34. 1背附根, 2侧附根, 有时无背附根, 有时在侧附根上方另有一侧附根	35. 1背附根, 2侧附根	36. 1背附根, 2侧附根; 有时始端另有一背附根
37. 卵胞	38. 未发现	39. 痕迹	40. 未发现

1. connecting tubes 2. six; chitinous joints of distal and latero-distal ones near to a zooid 3. six; slender and shorter, chitinous joints of all the tubes near to a zooid 4. six; chitinous joints of distal and latero-distal ones further away from a zooid 5. fenestra 6. moderate, equal or slightly longer than a zooid in width 7. small, smaller than a zooid in length, narrower than a zooid 8. moderate, equal to or larger than a zooid both length and width 9. proximal tubular portion 10. longer, expanding gradually toward distal-expanded portion 11. very short, expanding abruptly toward distal expanded portion 12. longer or shorter, expanding abruptly or gradually toward distal expanded portion 13. distal expanded portion 14. narrow, longioval, distal end obtusely rounded and without a constriction, broader proximally to the middle, broader proximally 15. broadest, oblong, distal end narrowest and with a constriction near the latero-distal connecting tubes or distally to the tubes 16. broader, elliptical, distal end constricted slightly or obtusely rounded, narrowest proximally 17. frontal membrane 18. longiovoid 19. oblong 20. elliptical 21. oral spines 22. 4—5, spine-like processes 23. 3—5, shorter than those of *B. spinigera* 24. 4—5, rather long 25. lateral spines 26. as a rule without lateral spines with the exception of a few zooids having 1—2 vestigial spines 27. 6—8. usually shorter, not beyond the middle of a zooid, sometimes growing outwards 28. 9—11. usually beyond the middle of a zooid, usually growing inwards 29. avicularia 30. large, head greatly raised; profile very concave; rostrum elongated and smooth, hooked strongly in the end; mandible longitriangular, a straight spike at end, and sometimes with two straight spinules 31. moderate; head raised slightly; profile very concave; rostrum variable in length, hooked strongly at end; and with a serration at sides; mandible longitriangular and with a straight spike at end 32. moderate; head very convex; rostrum shorter than that of *B. aspinosa* sp. nov., hooked strongly at end, and without a serration at sides, mandible longitriangular, and with a straight spike at end. 33. rootlets 34. 1 dorsal and 2 lateral, sometimes without the former, sometimes with another lateral 35. 1 dorsal and two lateral 36. 1 or 2 dorsal and 1 or 2 lateral 37. ovicells 38. absent 39. vestigial, or absent 40. absent

近连接管中间分出,有时在与近侧连接管同水平上方也分出一侧附根。背附根从个虫背面末端中央、与远侧连接管同水平稍上方分出,有时无背附根。

无刺格苔虫和盘皮格苔虫很相似,主要区别是前者无卵胞、无侧刺,后者有痕迹卵胞、有5—8根侧刺;前者鸟头体的鸟头极凸,吻上半部很凹,顎骨除末端有垂尖外,有时另有两个并立的小刺,后者鸟头不太凸,吻上半部稍凹,顎骨仅在末端具垂尖。无刺格苔虫、盘皮格苔虫和多刺格苔虫是彼此相似、而又有差异的类缘关系比较亲近的三个种,它们之间的异同综述于表1。

4. 细柄格苔虫 *Beania petiolata* Harmer, 1926 (图8)

Beania petiolata Harmer, 1926:416, pl. 28, fig. 18; Silén, 1941: 97, text-fig. 124.

群体呈网状,褐色或淡黄色。网孔中等大小。连接管6根。前膜在中部或近始端最宽,向末端逐渐变狭。刺很多,室口缘具口刺4—7根,前膜两侧各有侧刺14—16根,背面末端各有一背侧刺。每一个虫在室口两侧各有一小形鸟头体,鸟头部呈四方形——上

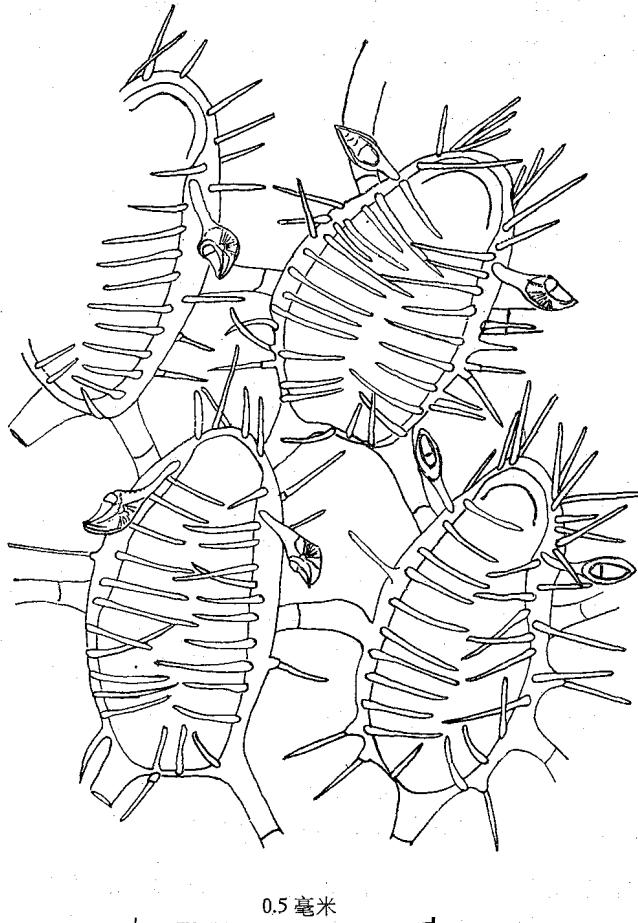


图8 细柄格苔虫 *Beania petiolata*
前面观,示个虫、口刺、侧刺、鸟头体

下缘几乎平行,吻短,稍呈钩状,颞骨短三角形,末端有一垂尖。鸟头体柄细长,呈细管形。背附根由个虫背中线和口盖同水平处分出,其位置在两远侧连接管水平以上(而不是以下),这和 Harmer (1926)的原始描述不同。有时在个虫始端与两近侧连接管同水平的背中线处分出另一背附根。未发现侧附根。无卵胞。

标本采集地 琼州海峡(海南岛海口北部), 52 米, 附在水螅上; 海南岛西南部近海 ($18^{\circ}00'N$, $108^{\circ}50'E$), 水深 83 米, 附在贝壳上。

地理分布 日本(小笠原群岛)、印度尼西亚等地。在我国系首次记录。

5. 矩格苔虫 *Beania regularis* Thornely, 1916 (图 9)

Beania regularis Thornely, 1916:161. text-fig. 6(fide Harmer, 1926); Harmer, 1926:416, pl. 28, figs 11—12; Hastings. 1932:409; Mawatari, 1965:607. figs. 78e. f.

群体呈网状,网孔大,几近四方形。个虫与网孔平面几乎垂直。每一个虫始端有 4 根连接管。一条附根从个虫膨大部分始端背中线分出,有时有两条附根。通常室口缘有短刺 5 根。个虫膨大部分始端最宽,末端最狭,两侧几乎与网孔平面垂直,前表面十分鼓凸。个虫管状部分极短。前膜占膨大部分整个前区。鸟头体成对或单一,附在前膜始端裸壁上,其吻基部宽,末端呈钩状,颞骨短三角形,末端具垂尖。我们的标本大多数未见鸟头体。有痕迹卵胞。

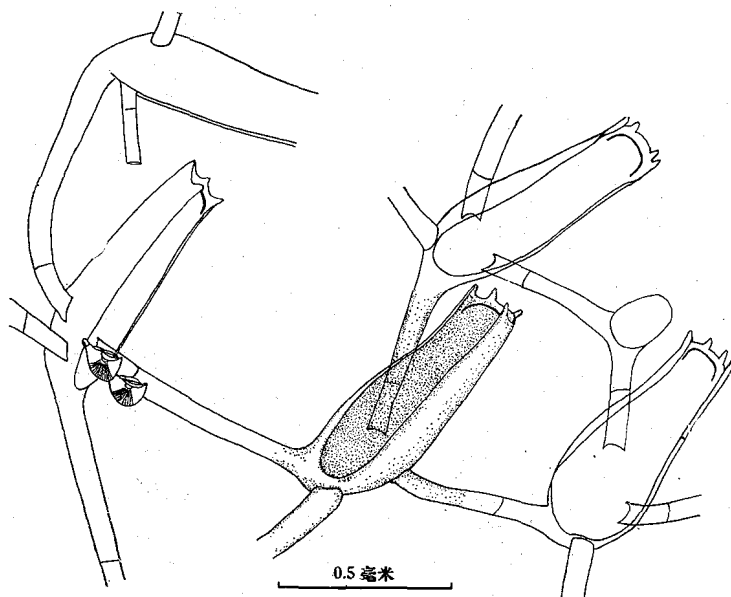


图 9 矩格苔虫 *Beania regularis*

前面观, 示个虫、口刺、鸟头体

标本采集地 广东省南部近海和海南岛南部浅海, 水深 20—80 米, 常附着在贝壳上, 与冠粗胞苔虫 *Scrupocellaria diadema* Busk 和拟眼尼苔虫 *Nellia oculata* Busk 丛生在一起。

地理分布 印度西北部和东岸、望加锡海峡、佛罗勒斯岛西部、伊里安岛北部、日本。在我国系首次纪录。

6. 豪猪格苔虫 *Beania hirtssima* (Heller, 1867) (图 10)

Diachoris hirtssima Heller, 1867:18, pl. 1, figs. 6—7(fide Kluge, 1914); Busk, 1884:61.

Beania hirtssima (Heller) Waters, 1899:15; Norman, 1906:286; Kluge, 1914:646, text-fig. 26; Osburn, 1950:172, pl. 26, figs. 4—5; Lagaarj, 1963:180, pl. 8, fig. 4; Maturo, 1966:579, text-fig. 17.

群体通常形成一层附着松散的刺状丛,像一只倒立的豪猪,给人以多刺感觉。个虫中等大小,始端部分呈管状,约占个虫全长的 1/5。个虫间有网孔间开,网孔较小,约为个虫大小的 1/2。个虫膨大部分几呈卵圆形。连接管 6 根。刺的排列有三种类型:(1)端刺 8 根或 10 根,向前侧突出,指向末端;(2)前膜两侧各有 12—14 根侧刺,盖在前膜上,其末端在前膜上常有交错;(3)背刺 5 根,在近侧连接管和近连接管之间,以及远侧连接管和远连接管之间,每侧 1 根,在个虫背中线上末端有一背中刺,背侧刺较长,背中刺短小。有时在个虫背中线始端有 1 根和附根同粗的背刺,其末端膨大成圆盘状,周缘密生许多细刺,这与 Osburn (1950) 的描述相符。有时在背面出现细管状附根,但位置不定。

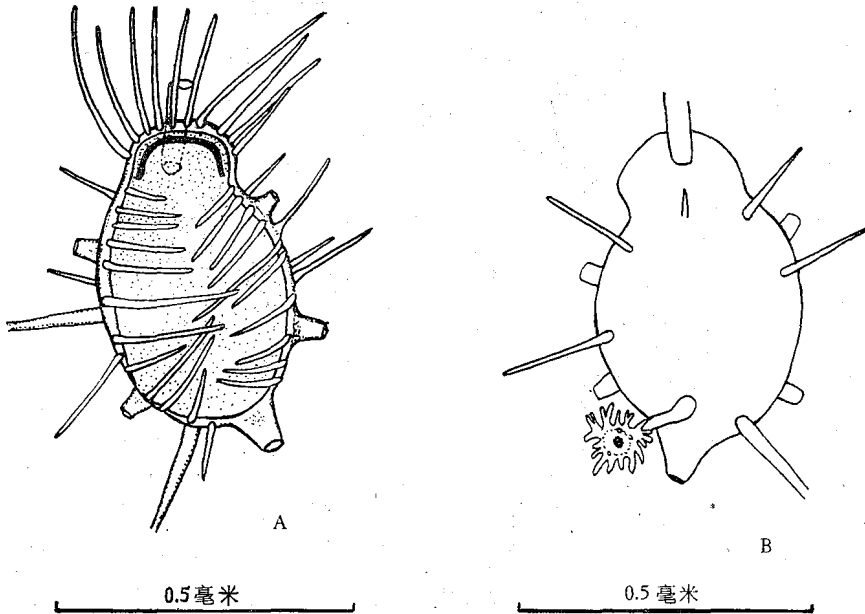


图 10 豪猪格苔虫 *Beania hirtssima*

A. 前面观,示个虫、口刺、侧刺; B. 同一个虫背面观,示背刺

标本采集地 海南岛南部近海 (18°30'N, 108°50'E), 水深 54 米, 与拟眼尼苔虫生活在一起。

地理分布 亚得里亚海、地中海、马德拉岛、佛得角群岛、百慕大群岛、波多黎各岛、墨西哥湾; 美国 (卢克奥特角、北卡罗来纳、佐治亚、费尔南迪纳岛、佛罗里达)、巴拿马、巴西 (圣多斯)。在我国系首次记录。

附记 Harmer (1926) 报道的 *Beania hirtssima* var. *cylindrica* Hincks, 1886 无论是群体形态 (胞苔虫状而非网状)、个虫形状 (其膨大部分呈长筒形而卵圆形) 或者刺的数目、排列, 都与本种有明显的区别, 似是一独立种 (见 Harmer 1926:417, pl. 28, figs. 16—17)。

7. 中介格苔虫 *Beania intermedia* (Hincks, 1881) (图 11)

Diachoris intermedia Hincks, 1881:133, pl. 5, fig. 8; Thornely, 1907:184.

Beania intermedia (Hincks) Waters, 1906:15, pl. 1, figs. 16—18; 1909:137; Thornely, 1912:142; Kluge, 1914:644, text-fig. 25; Hastings, 1927:334; 1943:419, text-fig. 46b; Osburn, 1947:25; Well et al., 1964:558; Shier, 1964:624; Maturo, 1966:579, text-fig. 18.

群体纤细,由半直立或松散被覆的单列个虫构成,借附根附着在基质上。个虫膨大部分呈舟形,始端部分呈管状。此管状部的始端向末端突然膨大成为两侧多少平行的膨大部分。膨大部分前表面平坦,前膜占其整个前区,其顶端圆形,有 2—3 个齿状突起。鸟头体成对,着生在和口盖基部同水平的小突起上。前膜两侧无刺或有 1—2 根痕迹刺。子个虫从每个虫三处分出:一处位于和口盖基部同水平的背中线,另两处位于前膜始端侧面。附根从膨大部分近始端的背中线分出。

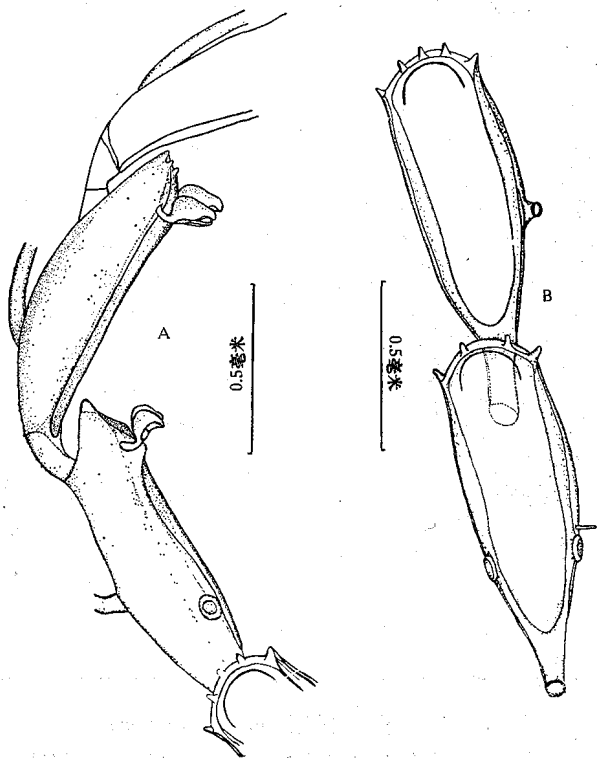


图 11 中介格苔虫 *Beania intermedia*

A. 侧面观,示个虫、鸟头体和背附根; B. 前面观,示个虫、口刺和一痕迹刺

标本采集地 海南岛西北部 (20°00'N, 110°20'E), 水深 70 米,与冠粗胞苔虫生活在一起;西沙群岛羚羊礁礁盘,与匙粗胞苔虫 *S. spatulata* (D'Orbigny) 生活在一起。

地理分布 澳大利亚(塔斯马尼亚岛、维多利亚州),新西兰(查塔姆群岛),印度洋,红海,苏伊士,佛得角群岛,圣赫勒拿岛,北美大西洋沿岸(卢克奥特角、北卡罗来纳)等地。在我国系首次记录。

讨论 Hincks (1881) 的原始描述有一对侧刺。根据 Hastings (1943) 的记述,其新西兰标本每侧有 1—3 对侧刺,而 MacGillivray (1890) 的图一侧或两侧有一根侧刺。

Waters (1909) 的红海标本和 Hastings (1927) 的苏伊士标本无侧刺。Maturo (1966) 的描述也未提及侧刺。我们的西沙群岛标本无侧刺，而海南岛标本则有一个虫有一痕迹侧刺。故侧刺的有无是极不稳定的。在现有标本中，个虫在有柄鸟头体的上方有两个较粗的刺状突起，这与 Hincks (1881), Hastings (1927, 1943) 及 Maturo (1966) 的描述相符。该种个虫大小变化较大，西沙群岛标本的个虫只有海南岛标本的 3/5。

8. 奇异格苔虫* *Beania mirabilis* Johnston, 1840 (图 12)

Beania mirabilis Johnston, 1840:272, text-figs. 1—2 (*vide* Harmer, 1926); Busk, 1852:32, pl. 24, figs. 4—5; Hincks, 1880:96, pl. 4, figs. 8—10; Harmer, 1926:419, pl. 28, fig. 15; Okada & Mawatari, 1938:453; Silén, 1941:98; Osburn, 1950:170, pl. 26, fig. 8; Mawatari, 1963:7; 1971:607, figs. 78a, b; Anderosova, 1963:27, pl. 2, fig. 9; 1971:145.

群体为不规则分枝的单列枝条，纤细而透明。每一个虫由膨大的垂直部分和从其背面中央近始端生出的管状部分构成。在膨大部分下半部中央背面分出一对侧连接管，每一侧连接管连接一个个虫。前膜长椭圆形，占膨大部分整个前区。前膜两侧各有若干侧刺，侧刺数目变化较大，长短不一，5—11 根，多数为 9 根。口刺 4 根。群体管状部分匍匐在各种基质上，借个虫膨大部分背中央分出的附根附着在海藻、水媳、贝壳、石块和其他基质上。

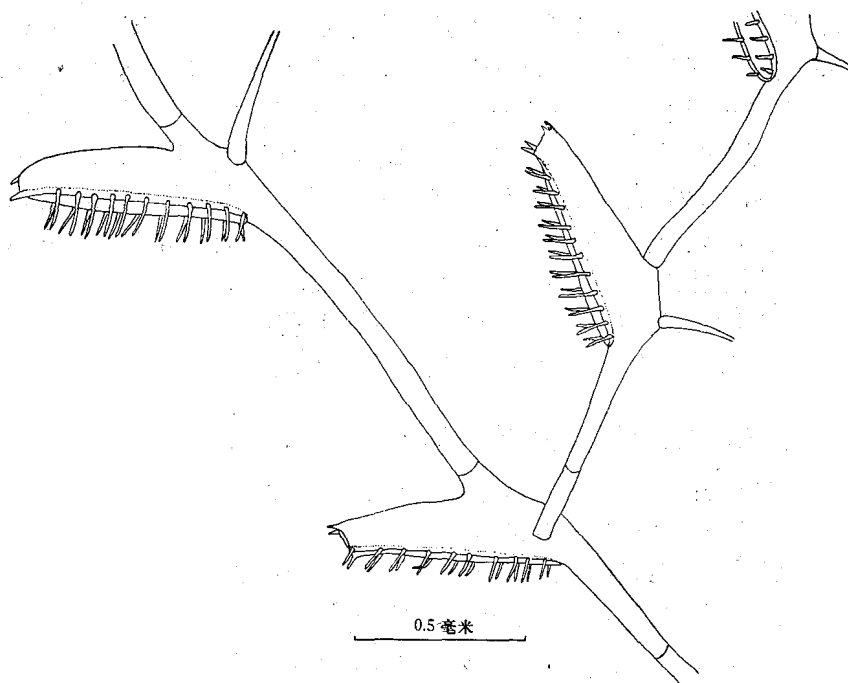


图 12 奇异格苔虫 *Beania mirabilis*

侧面观，示个虫、口刺和侧刺

* 曾名为枝棘苔虫，因该属绝大多数成员群体呈网格状，枝状群体只是少数特例，故种名仍按拉丁文原义译作奇异格苔虫。

标本采集地 底拖网标本采自渤海、黄海、东海和南海, 自 $39^{\circ}45'N$, $121^{\circ}15'E$ 至 $18^{\circ}15'N$, $108^{\circ}30'E$, 水深 18—88 米; 潮间带标本采自长山列岛、青岛。

地理分布 日本太平洋沿岸、苏禄群岛、托雷斯海峡、澳大利亚南岸(维多利亚)、美洲太平洋沿岸(不列颠哥伦比亚至哥伦比亚南方)、英国沿岸、亚速尔群岛、西班牙北部沿岸、地中海、非洲东岸(桑给巴尔)、斯里兰卡、丹老群岛。

II. 小草苔虫属 Genus *Bugulella* Verrill, 1879

Bugulella Verrill, 1879:472 (fide Harmer, 1926); Hincks, 1887:122; Harmer, 1923:300; Bassler, 1953:154; Maturo & Schopf, 1968:30; Hayward & Cook, 1979:64.

模式种 细脆小草苔虫 *Bugulella fragilis* Verrill, 1879

群体系由单列个虫构成的直立分枝, 子个虫由母个虫背面以端芽或端侧芽产生。个虫细棒形, 末端膨大, 始端细管形, 从末端向始端逐渐变细。母个虫和子个虫之间有几丁质关节相连。前膜占个虫膨大部分之大部分前表面。口盖通常半圆形。刺或有或无。鸟头体有柄, 乳头状, 附着在个虫末端中央或两侧。卵胞属口上型。

讨论 小草苔虫属的分类地位长期未有定论。Verrill (1879) 在创立该属时, 认为它既与 *Bicellaria* 类近, 又可能与 *Brettia* 类同。Canu & Bassler (1929) 把它放入软壁类的 *Gemellariidae* Busk, 1889 内。Hincks (1887) 在确认该属另一独立种 *B. clavata* 时, 则把它归入双胞苔虫科。自 Silén (1941) 创立无囊亚目的微室类 *Division Scrupariina* 后, Bassler (1953) 把小草苔虫属和 *Scruparia* Oken, 1815, *Brettia* Dyster, 1858 和 *Eucratea* Lamouroux, 1812 一起放入 *Scrupariidae* 内。自 Bassler 以后, 许多学者主要根据群体单列生长的特性, 都把小草苔虫属置于微室类内。Mawatari (1973) 指出, 属于微室类的 *Scruparia*, *Eucratea*, *Brettia* 都以前芽方式繁殖群体。事实上单列生长的特性, 在唇口类许多科属中存在, 如 *Corynopenella*, *Beania*, *Cothuronicella* Savignyella, *Vitaticellata*, *Halysisis* 等, 群体都由单列个虫构成, 但它们都以端芽方式繁殖群体。小草苔虫属的成员都行端出芽繁殖群体, 而其乳头状的有柄鸟头体及口上卵胞与草苔虫属 *Bugula* 相似, 故作者同意 Hayward & Cook (1979) 的意见, 把小草苔虫属归入双胞苔虫科。

9. 中国小草苔虫(新种) *Bugulella sinica* sp. nov. (图 13)

模式标本 标本号: 75BBE001, 1975 年 10 月 9 日采自东海, $28^{\circ}30'N$, $126^{\circ}50'E$, 底质为砂质泥, 水深为 210 米, 一丛状群体与水螅丛生在一起。

群体为直立丛状分枝, 淡黄色。每一个虫由膨大的末端部分和细长的管状部分构成。膨大部分较短, 管状部分很长, 后者约为前者的 1—1½ 倍。前膜几呈卵圆形, 两端较狭, 中部较宽, 占末端膨大部分之大部分前表面。每一个虫近末端膨大部分稍向一侧弯曲, 因而整个个虫不呈直立棒状, 中部一侧略呈弧形。室口每侧各有一口刺。前膜每侧各有 3 根侧刺, 横盖在前膜上, 始端另有 2 根并立的小刺, 弯向末端, 盖在前膜上。墙缘薄而十分隆起。隐壁细狭, 始端比两侧和末端稍宽, 但不呈片状。几乎每一个虫的膨大部分顶端中央都有一乳头状鸟头体, 着生在个虫顶端中央一个突起上, 但受孕个虫无鸟头体。鸟头呈球形, 吻和颚骨皆短, 三角形。卵胞发达, 表面光滑, 长大于宽, 球形。每一个虫膨大部分末

端有两个端孔板(较小)、始端侧面有一大形多孔型孔板,由此分出细管状附根,在每侧内侧有一列4—5个小孔。

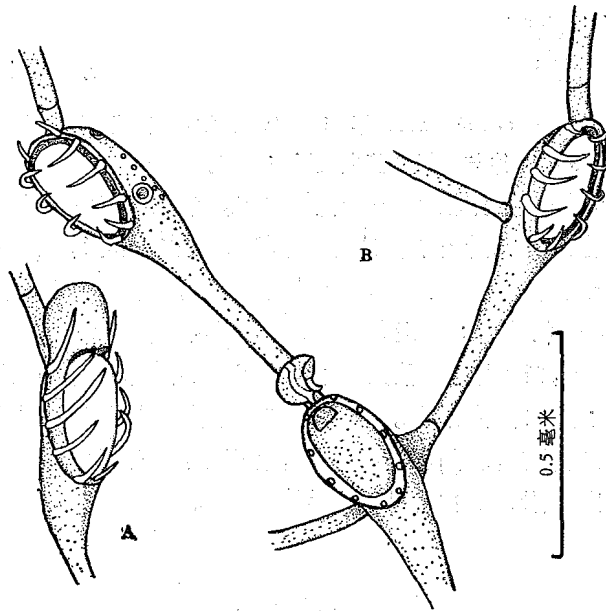


图 13 中国小草苔虫(新种) *Bugulella sinica* sp. nov.

A. 侧面观, 示个虫、侧刺和卵胞; B. 前面观和侧面观, 示个虫、侧刺、鸟头体、孔板、侧壁小孔和附根

新种的群体生长方式颇特殊。一个个虫的膨大部分在其末端借一几丁质关节与后续个虫的管状部分相连接, 此几丁质关节通常在其始端 1/3 处有一收缢, 即其始端 1/3 属于前位个虫, 而末端 2/3 属于后续个虫。该个虫的第三个后续个虫接续一个端位个虫 (distal zooid) 和一个侧位个虫 (lateral zooid)。此端位个虫和侧位个虫各自的第三后续个虫又接续一个端位个虫和一个侧位个虫, 如此不断反复, 以致形成复杂的直立分枝丛状群体。

新种个虫形状、细狭的隐壁和刺的形态与澳洲小草苔虫 *Bugulella australis* Hayward et Cook (Hayward & Cook 1979: 64, figs. 4A—B) 相似。但两者区别明显: (1) 新种口盖半圆形, 澳洲种口盖半椭圆; (2) 新种卵胞表面光滑无孔, 澳洲种表面有盘格纹饰和若干小孔; (3) 新种以简单的端芽或端侧芽产生新个虫, 侧芽和母个虫的前位个虫末端无联系, 而澳洲种侧芽和母个虫的前位个虫末端有管状连索 (tubular bridge)。

III. 假草苔虫属(新属) *Falsibugulella* gen. nov.,

群体直立, 无关节, 由附根支持。分枝由单列个虫构成。个虫细长, 末端膨大, 始端呈管状, 基部双分叉。前膜小, 卵圆形, 周缘有许多细刺。无口盖。无鸟头体。无振鞭体。有口上卵胞。群体系由个虫产生端芽和端侧芽形成。

模式种 中华假草苔虫(新种) *Falsibugulella sinica* sp. nov.

讨论 新属的个虫末端膨大、始端呈管状,形状与小草苔虫属 *Bugulella* Verrill, 1879 相似,但其母个虫和子个虫之间无关节,个虫无鸟头体。个虫背面基部双分叉,无口盖,又与草苔虫属 *Bugule* Oken, 1815 相似,不同处在于其前膜周缘多刺。新属在分类上介于小草苔虫属和草苔虫属之间。

10. 中华假草苔虫(新种) *Falsibugulella sinica* sp. nov. (图 14, 15)

模式标本 标本号: 59BBS006, 1959 年 11 月 19 日采自海南岛西南部近海, $18^{\circ}15'N, 108^{\circ}30'E$, 底质为中砂,水深 98 米, 3 个群体与冠粗胞苔虫生活在一起。

群体直立枝状,无关节。分枝由单列个虫构成。个虫细长,末端膨大,始端呈管状,背面基部呈双叉形。前膜小,位于个虫末端,卵圆形,仅占前区 $1/3$ 或稍大,墙缘较厚而隆起。无隐壁。前膜周缘有 6—9 根细刺,基部均有关节。其中端刺 2 根,始终指向末端,始端刺 2—4 根,均斜向分枝末端;侧缘刺 2—4 根,通常指向外侧,但有时弯向内侧。无口盖。无鸟头体。卵胞大,口上型,宽稍大于长;外卵室和内卵室之间的腔隙细狭,内卵室前表面光滑,中央鼓凸;胞口指向始端。附根通常从个虫三处分出:末端背面、末端侧面和始端前面。背附根始终存在,侧附根通常存在,前附根或有或无。有时在个虫始端长出侧附根,在前膜下侧长出前附根。虫体小,触手约 14 根。

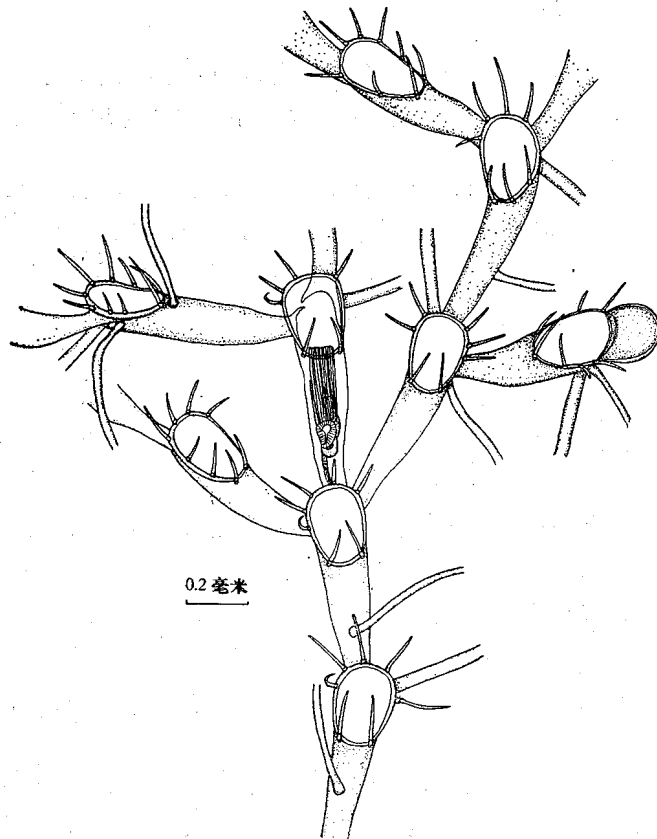


图 14 中华假草苔虫(新种) *Falsibugulella sinica* sp. nov.
前面观,示分枝方式、个虫、刺、卵胞、附根、虫体

子个虫由母个虫末端背面分出。通常由母个虫以端芽方式产生子个虫形成单列枝条。分歧方式特殊,通常在母个虫末端背面产生两个端侧芽,这两个端侧芽(子个虫)各以端芽方式形成单列枝条。有时在两个端侧芽之间又长出端芽,因而由一母个虫产生三分歧单列的枝条。这种三分歧现象在校室类其他单列分枝的属(如 *Brettia*, *Corynoporella*, *Bugulella*) 未曾见过。

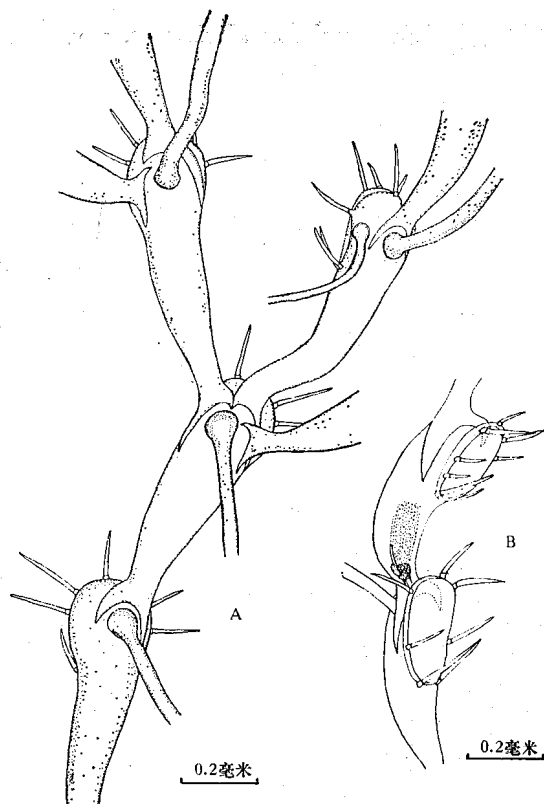


图 15 中华假草苔虫(新种) *Falsibugulella sinica* sp. nov.

A. 背面观,示个虫基部双分叉、分歧方式和背、侧附根; B. 侧面观,示个虫基部双分叉和虫体

VI. 双胞苔虫属 Genus *Bicellariella* Levinsen, 1909

Bicellariella (part) auctt.

Bicellariella Levinsen, 1909: 431; Harmer, 1926: 420; Osburn, 1950: 152.

模式种 纤毛双胞苔虫 *Sertularia ciliata* Linnaeus, 1758

个虫陀螺形,有许多口刺和端刺。每一个虫由两几丁质关节分为三部分,末端部分呈漏斗状,通常向外突出。附根由个虫背面分出。鸟头体或有或无。卵胞斜,长在一个虫列两个虫交界处。

Levinsen (1909) 把老属 *Bicellaria* de Blainville (*s. l.*) 分为三属,由其新分出的两属为 *Bicellarina* 和 *Cornucopina*, 而另一属 *Bicellaria* (*s. str.*) 已为双翅目昆虫 *Bicellaria*

Macquart, 1823 所先占名,故用 *Bicellariella* 来代替 *Bicellaria*, 并设立了 Bicellariellidae。

种的检索

个虫中间部分较短,长刺8—10根,轴个虫有1根背刺,群体借附根形成的膜质附着基盘附着在基质上..... 中华双胞苔虫(新种) *B. sinica* sp. nov.
 细双胞苔虫 *B. gracilis*
 个虫中间部分细长,长刺3—6根,轴个虫无背刺,群体借附根附着在基质上.....

11. 中华双胞苔虫(新种) *Bicellariella sinica* sp. nov. (图16,17)

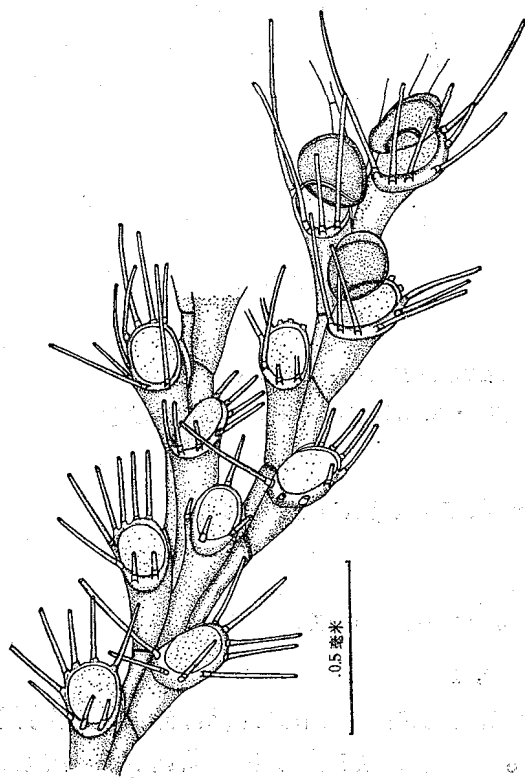


图16 中华双胞苔虫(新种)

Bicellariella sinica sp. nov.

模式标本,前面观,示个虫、长刺和卵胞

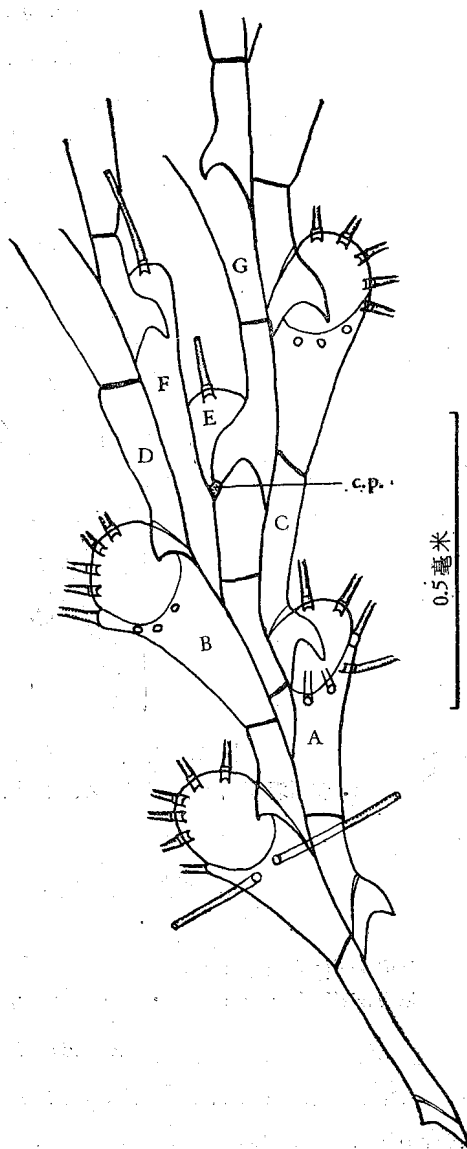


图17 中华双胞苔虫(新种)

Bicellariella sinica sp. nov.

模式标本,背面观,示分歧方式

模式标本 标本号：59BBE001，1959年4月6日采自东海北部， $33^{\circ}30'N$ ， $122^{\circ}30'E$ ，底质为泥质砂、碎壳，水深37米，一个群体附在贝壳上。

其他标本 标本号：75BBY001，1975年6月14日采自南黄海， $37^{\circ}35'N$ ， $123^{\circ}10'E$ ，底质为细砂，水深68米，一个群体附在贝壳上；75BBY002，1975年4月9日采自南黄海， $36^{\circ}47'N$ ， $124^{\circ}10'E$ ，底质为细砂，水深76米，一个群体附在贝壳上。

群体开始于一根由双列个虫交互排列而成的长柄。柄个虫呈倒圆锥形，前膜周缘有10—12根短刺；由这些个虫分出沿柄下行的附根，在群体基部若干附根膨大成葡萄状，许多葡萄状膨大部分形成膜质的附着基盘，用以附着在贝壳上。

分枝由双列个虫构成。每一个虫由两几丁质关节分为明显的三部分，末端部分膨大成陀螺形，向外侧中度延伸。前膜圆形或卵圆形，具有卵圆形前膜的个虫始端较细狭，这与 Harmer (1926) 描述的 *B. levenseni* 相同。前膜自由缘密生8—10根长刺，其基部均有关节，各刺间距通常均匀，未分上、下两组。无鸟头体。卵胞特征和 *B. levenseni* Harmer 的相似，宽大于长，着生在个虫膨大部分的内顶角，常覆盖在膨大部分上，胞口指向背面或

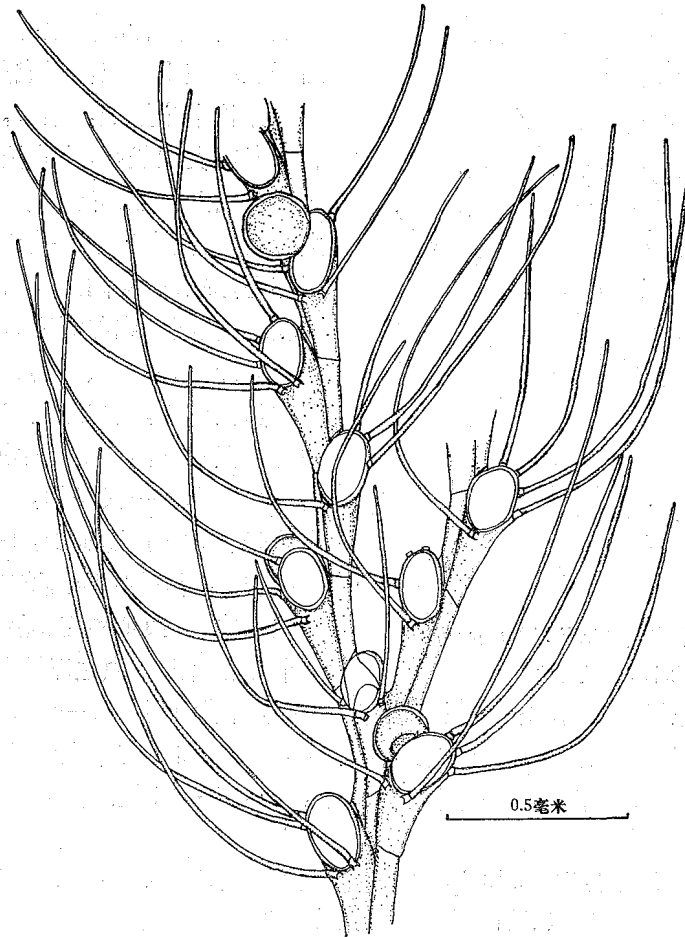


图 18 细双胞苔虫 *Bicellariella gracilis*
前面观，示个虫、长刺和卵胞

始端。分岐方式属 Harmer 的模式 4, 与 *B. levenseni* 相似, 但其轴个虫位于分岐中心。轴个虫与普通个虫之不同在于其前膜和刺的排列呈对称性, 一根背刺位于其背面顶端, 指向末端, 前膜始端有一前刺, 近始端两侧各有一侧刺。

新种和 *Bicellariella levenseni* Harmer, 1926 相似, 但新种刺较多, 不分上、下两组, 无鸟头, 后者刺较少但分上下两组, 有鸟头体。

12. 细双胞苔虫 *Bicellariella gracilis* Busk, 1852 (图 18, 19)

Bicellaria gracilis Busk, 1852: 42, pl. 32, figs. 1—5.

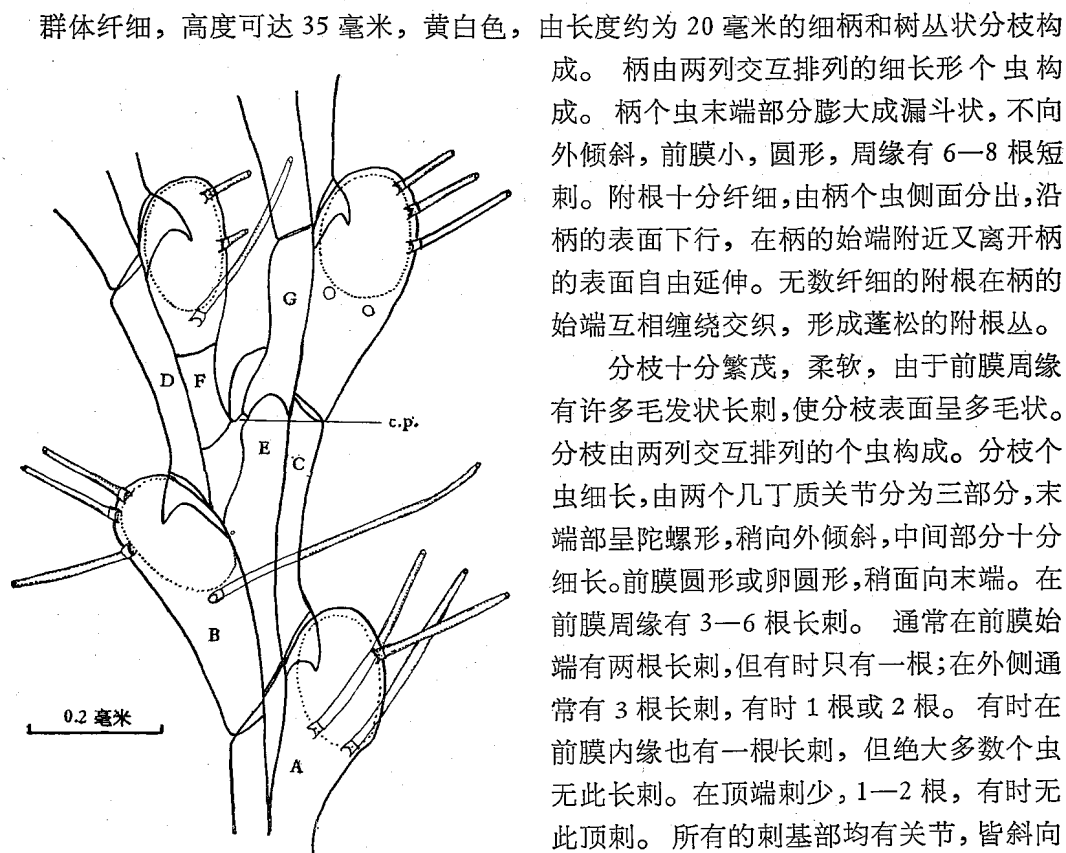


图 19 细双胞苔虫 *Bicellariella gracilis*

背面观, 示分岐方式

群体纤细, 高度可达 35 毫米, 黄白色, 由长度约为 20 毫米的细柄和树丛状分枝构成。柄由两列交互排列的细长形个虫构成。柄个虫末端部分膨大成漏斗状, 不向外倾斜, 前膜小, 圆形, 周缘有 6—8 根短刺。附根十分纤细, 由柄个虫侧面分出, 沿柄的表面下行, 在柄的始端附近又离开柄的表面自由延伸。无数纤细的附根在柄的始端互相缠绕交织, 形成蓬松的附根丛。

分枝十分繁茂, 柔软, 由于前膜周缘有许多毛发状长刺, 使分枝表面呈多毛状。分枝由两列交互排列的个虫构成。分枝个虫细长, 由两个几丁质关节分为三部分, 末端部呈陀螺形, 稍向外倾斜, 中间部分十分细长。前膜圆形或卵圆形, 稍面向末端。在前膜周缘有 3—6 根长刺。通常在前膜始端有两根长刺, 但有时只有一根; 在外侧通常有 3 根长刺, 有时 1 根或 2 根。有时在前膜内缘也有一根长刺, 但绝大多数个虫无此长刺。在顶端刺少, 1—2 根, 有时无此顶刺。所有的刺基部均有关节, 皆斜向分枝末端。顶刺和侧刺从个虫背缘长出。

轴个虫和普通个虫之不同处在于其两侧对

称。其刺的排列也呈两侧对称: 前膜始端有一前刺, 始端两侧各有一侧刺, 但无背刺。卵

胞呈球形, 宽大于长, 通常附着在个虫末端部分内顶角, 胞口指向个虫背面, 但有时着生个

虫顶端, 胞口指向始端。未发现鸟头体。虫体小, 触手 12—14 根。分岐方式属于 Harmer

的模式 4。

标本采集地 浙江省近海, 27°30'N, 122°00'E, 底质为软泥, 水深 80 米, 与水螅丛生在一起。

地理分布 澳大利亚南岸(巴斯海峡)。我国系首次纪录。

讨论 我们的标本与 Busk (1852) 的描述基本相符, 区别在于现有标本刺较少但

较长、无鸟头体。据 Busk 的描述, 刺的数目较多: 外侧刺 3 根(与我们的标本相符), 顶

刺 2—3 根(我们的标本 1—2 根, 有时无顶刺); 始端前刺 1—2 根(和我们的标本相符)。Busk 在其描述中指出: 鸟头体小, 锤头形, 位于个虫侧面, 稀少, 但他未画图。我们认为, 就群体结构、个虫形状、卵胞形态及其附着位置以及刺的排列等特征, 我们的东海标本与 Busk 的澳洲标本基本相符, 又与双胞苔虫属的其他已知种有明显区别, 因此, 确定为 Busk 的种是无疑的。至于鸟头体, 正如 Busk 所指出, 既小又少, 可能现有标本的鸟头体已脱落(但未见其附着痕迹), 可能尚未发育, 也有可能鸟头体的存在与否这一特征并不稳定。本种自 Busk (1852) 定名以来从未有人在其他地区记录过, 在北太平洋系首次记录。

V. 草苔虫属 Genus *Bugula* Oken, 1815

Bugula Oken, 1815: 89 (pars) (*fide* Harmer, 1926); Harmer, 1926: 432(pars) (reference); Osburn, 1950: 153; Kluge, 1962: 339.

模式种 多室草苔虫 *Sertularia neritina* La Linnaeus, 1758

草苔虫属是人们熟知的一类苔虫, 种类较多, 一般群体呈树丛状。大多数种类为双列分枝, 但有的种类为单列或多列群体。个虫背面始端分叉显著。每一个虫末端重叠在其后续个虫的始端上。前膜占个虫前区大部分, 侧壁略缩小, 两隅呈锐角或钝圆。端刺或有或无。鸟头体具柄, 系“鸟头”型。卵胞典型球形, 一般固着在个虫顶端, 但少数种类固着在个虫内角, 有时卵胞退化, 缩小成僧帽状。老成群体始端分枝常断损丢失, 用以附着的下行附根形似“细柄”。分枝方式有三种类型: Harmer 的模式 3, 4, 5 (见本文图 2, 3, 4)。

种 的 检 索

1. 无鸟头体..... 多室草苔虫 *B. neritina*
- 有鸟头体..... 2
2. 个虫双列..... 3
- 个虫多列..... 11
3. 鸟头体固着在个虫末端..... 加州草苔虫 *B. californica*
- 鸟头体固着在个虫始端..... 4
4. 分枝方式属于模式 3..... 太平草苔虫 *B. pacifica*
- 分枝方式属于模式 4..... 5
- 分枝方式属于模式 5..... 10
5. 有大小两种鸟头体, 无卵胞..... 6
- 鸟头体小型, 有卵胞..... 7
6. 群体柔软, 分枝作同心状卷曲, 鸟头体柄很长, 个虫顶边圆形、前翘.....
- 中介草苔虫(新种) *B. intermedia* sp. nov.
- 群体柔软, 但分枝不作同心状卷曲, 个虫顶边圆形但不前翘..... 无刺草苔虫(新种) *B. aspinosa* sp. nov.
7. 群体有钙质栅..... 8
- 群体无钙质栅..... 9
8. 分枝部分和柄部个虫都有钙质栅, 附根仅一种类型, 附根末端不膨大..... 艇草苔虫 *B. vectifera*.
- 分枝部分和柄部末端个虫才有钙质栅, 附根有粗细两型, 粗附根末端膨大成椭圆形, 周缘有许多刺状突起.....
- 东方草苔虫(新种) *B. orientalis* sp. nov.
9. 鸟头体两侧扁平, 内卵室表面有显著的六角形纹饰..... 舟形草苔虫 *B. scaphoides*
- 鸟头体球形, 内卵室表面光滑无纹饰..... 球形草苔虫 *B. subglobosa*

10. 无端刺,鸟头体吻两侧有三角形尖突..... 粗壮草苔虫 *B. robusta*
 端刺发达,鸟头体吻无尖突..... 齿草苔虫 *B. dentata*
 11. 有卵胞.....12
 无卵胞,个虫顶端中央有一小结节..... 普峡草苔虫 *B. pugeti*
 12. 个虫始端分叉细长,鸟头体吻端逐渐弯曲,吻钩不明显..... 杯草苔虫 *B. calathus*
 个虫始端分叉短,鸟头体吻端突然弯曲成强钩状..... 扇草苔虫 *B. flabellata*

13. 多室草苔虫 *Bugula neritina* (Linnaeus, 1758) (图 20, 21)。

Sertularia neritina Linnaeus, 1758: 38 (*fide* Harmer, 1926)

Bugula neritina (Linnaeus) Busk, 1852: 44, pl. 43, figs. 1—5; 1884:42; Ortmann. 1890:24, pl. 1, fig. 7; Robertson, 1905:260, pl. 9, fig. 47, pl. 16, fig. 97; Waters, 1909:135. pl. 11, figs. 1—3; Okada, 1929: 13, pl. 1, fig. 1; Okada & Mawatari, 1937:456; Osburn, 1950:154, pl. 23. fig. 3, pl. 24, fig. 3; Maturo, 1957: 42, text-fig. 7; Anderosova, 1958:145; 1963: 26, pl. 2, fig. 8; Shier, 1964: 624; Maturo, 1966: 560, text-fig. 14; Mawatari, 1965, figs. 70a, b,c; Anderosova, 1971: 145; 王复振,蔡如星 1977: 18, fig. 14.

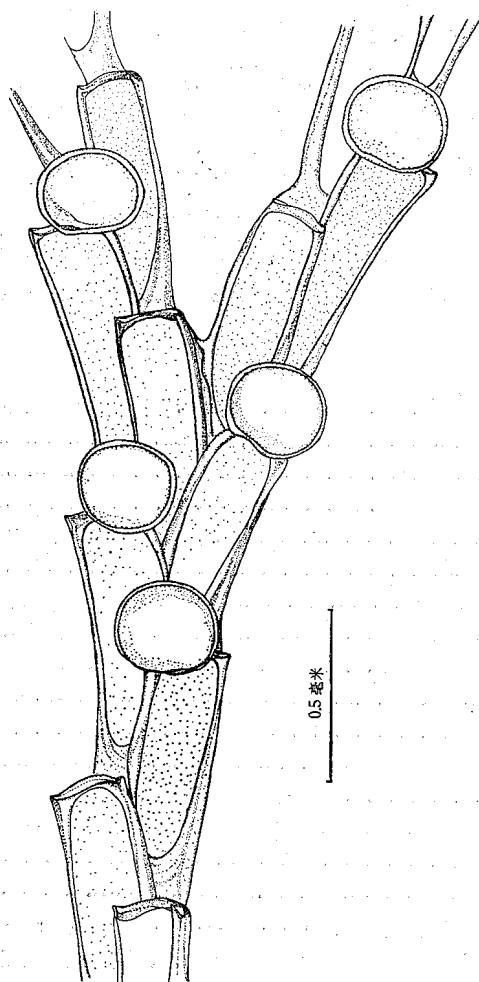


图 20 多室草苔虫 *Bugula neritina*
前面观,示个虫和卵胞

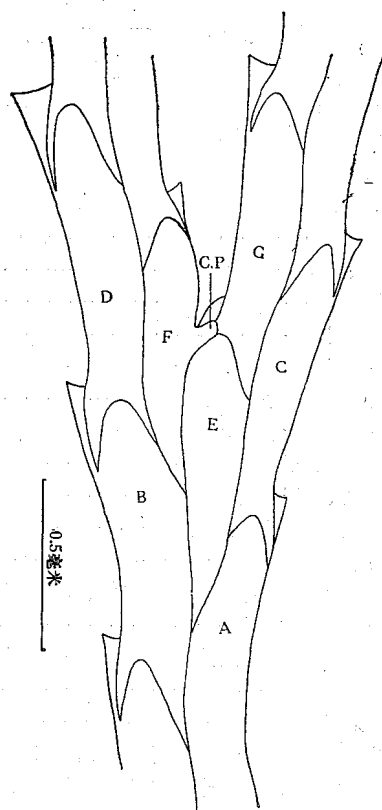


图 21 多室草苔虫 *Bugula neritina*
背面观,示分歧方式

幼小群体红棕色,呈扇形,老成群体红棕色或紫褐色(偶尔能见到黑褐色),呈树丛状,高度可达40—100毫米,有的甚至可达150毫米。个虫双列,略呈长方形,始端比末端稍狭。前膜大,几占个虫整个前区。无鸟头体。卵胞球形,白色,附着在个虫末端背面内角。分岐方式属于 Harmer 的模式3和4。

标本采集地 山东烟台、青岛及胶州湾邻近地区,江苏连云港,浙江东福山、石浦,福建东山,广东宝安、汕尾、湛江以及海南岛的三亚、榆林等地潮间带。在东海近海(32°30'N, 123°00'E, 水深14米; 29°30'N, 123°00'E, 水深59米)采到2个底栖拖网标本,系生活群体的两支断枝。

地理分布 除两极地区外,广泛分布于世界各地:日本海(舞鹤湾)及日本太平洋沿岸,澳大利亚南部,塔斯马尼亚岛,新西兰,美洲太平洋沿岸,大西洋(百慕大群岛、英国沿岸、亚速尔群岛)和地中海。

附记 多室草苔虫在我国沿岸从山东半岛至海南岛榆林港,几乎皆有分布,各地数量都很大,但在南方地区最多。比较北方(如青岛)和南方(如榆林)的标本,发现南方标本比北方标本群体更加粗壮而分枝密集,个虫也是南方标本较大,但群体外形、个虫轮廓及卵胞形态南北并无差异。多室草苔虫是我国主要的污损苔虫之一,它们附着在船底、航标等水下设施上,生长在经济贝类、藻类上,具有较大的危害性。

14. 粗壮草苔虫 *Bugula robusta* MacGillivray, 1869 (图22,23)

Bugula robusta MacGillivray, 1869:129 (*vide* Harmer, 1926); Harmer, 1926: 435. pl. 32, figs. 1—7 (reference).

Bugula neritina var. *minima* Waters, 1909: 136, pl. 11, figs. 4—7; 1913:471; Okada & Mawatari, 1938:

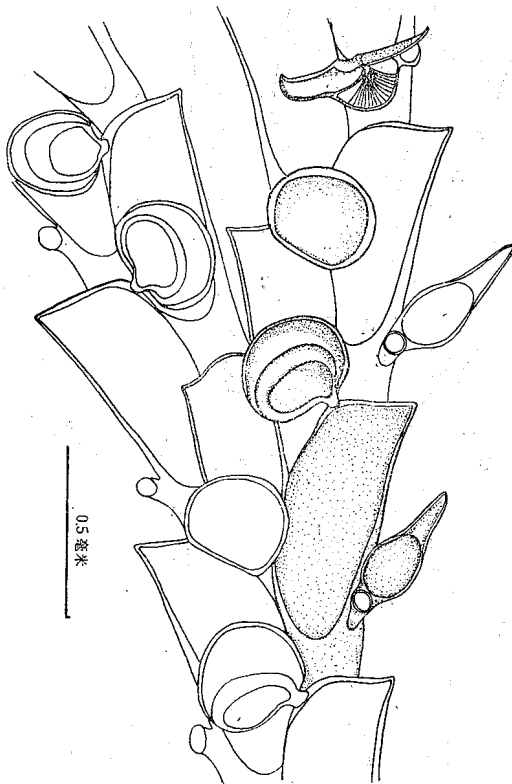


图22 粗壮草苔虫 *Bugula robusta*

前面观,示个虫、鸟头体和卵胞

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Bugula neritina var. *rubra* Thornely, 1912: 142, pl. 8, fig. 1.*Bugula neritina* var. *tenuata* Thornely, 1912: 142, pl. 8, fig. 2.*Bugula neritina* forma *minima* Marcus, 1921:1, pl. 1, fig. 1.

群体粗壮, 由双列个虫构成, 大多数粉红色, 少数红色或红褐色。分岐方式属于 Harmer 的模式 5。个虫外顶角呈尖形, 向外显著突出, 致使分枝边缘呈锯齿状, 内顶角钝圆。前膜大, 末端加宽, 始端稍狭, 占个虫前区 $2/3$ 以上。鸟头体很大, 借粗短的柄固着在前膜底侧的裸壁上, 吻长, 强钩状, 通常在其两侧各有一尖突, 有的标本尖突不明显, 颚骨末端具小钩。卵胞大, 借一细柄固着在个虫内顶角。胞口周围有一加厚的环带。分枝背面有显著的“Z”字形关节线。个虫背中线有一指向末端的背刺, 背刺较短。附根由个虫始端外侧分出, 沿枝背或两侧向始端延伸。

标本采集地 采自东海和南海(包括北部湾), 自 $30^{\circ}00'N$, $123^{\circ}30'E$ 至 $17^{\circ}15'N$, $108^{\circ}30'E$, 水深 34—106 米。

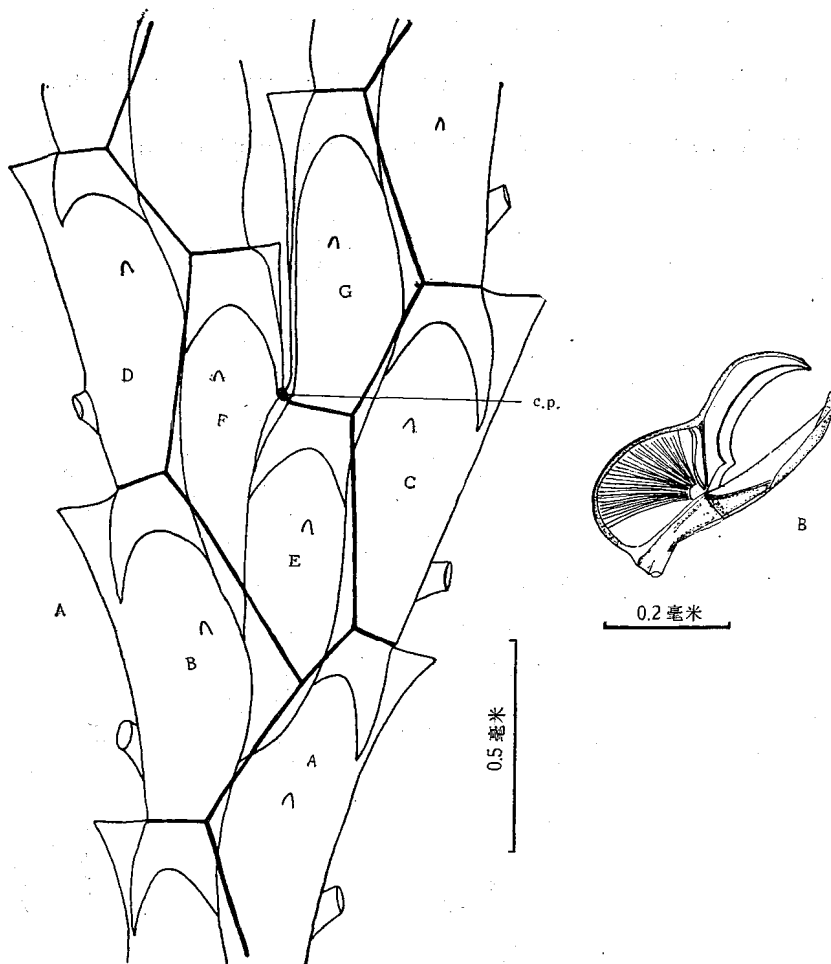


图 23 粗壮草苔虫 *Bugula robusta*

A. 背面观, 示分岐方式、个虫背面钙质刺和“Z”字形关节线; B. 前面观, 示一鸟头体

地理分布 澳大利亚、印度尼西亚、菲律宾、日本、阿米兰特群岛、卡加多斯群岛、红海等地。在我国系首次记录。

15. 齿草苔虫 *Bugula dentata* (Lamouroux, 1816) (图 4, 24, 25)

Acamaroshis dentata Lamcuroux, 1816: 135, pl. 3, fig. 3(fide Harmer, 1926).

Bugula dentata (Lamouroux) Busk, 1852: 46, pl. 36, figs. 1—5; Ortmann, 1890: 25, pl. 1, fig. 26; Yanagi & Okada, 1918: 421; Harmer, 1926: 439, pl. 30, figs. 5—6, pl. 32, figs. 21—25 (reference); Okada, 1934: 5, pl. 1, fig. 9; Okada & Mawatari, 1937: 435; 1938: 450; Silén, 1941: 105, pl. 8, figs. 27—28, text-figs. 141—143; Mawatari, 1965: 605, figs. 70d, e, f.

Bugula dentata var. *africana* Ortmann, 1892: 669.

群体粗壮。现有标本大部分呈灰白色，少数呈青绿色。分枝双列，节间部个虫较多。个虫狭长。宽度几乎均匀。个虫外缘多少内卷。前膜短，仅占个虫前区 1/2 甚至更小，末端较宽，稍向外倾斜，始端狭。端刺 3—1，一般较长，在分枝外侧尤其发达，基部均有关节。鸟头体细长，位于前膜中部偏下外侧，长在一个疣突上。鸟头体着生位置和群体发育程度有关：老成群体偏始位，年幼群体偏末位。吻强钩状（有的标本吻钩不明显），吻上半部略有凹陷，颧骨长三角形。Harmer(1926)曾记述本种在群体分歧处外个虫的鸟头体增大，增大的鸟头体吻狭长，颧骨呈三叶形。现有标本无此种增大的鸟头体。卵胞球形，斜向内侧，部分突出在分枝边缘。附根相当粗壮，由个虫背面和侧面分出。群体基部的个虫钙化强，从其背面和侧面分出附根，因此，分枝厚而粗；分枝末端部分的个虫钙化弱，未见分出附根，个虫呈半透明状。这和 Silén(1941)的描述相符。分歧方式属于 Harmer 的模式 5。

标本采集地 黄海、东海和南海(包括西沙群岛)，自 38°15'N, 122°00'E 至西沙群岛全富岛，从潮间带至水深 162 米均有分布。它们主要栖息在 50—100 米，常与冠粗胞苔虫、美髯松苔虫 *Caberea lata* Busk 和拟眼尼苔虫 *Nellia oculata* Busk 等枝状苔虫混生在一起。栖息环境多半为泥质砂和砂质泥。

地理分布 本种系广分布的暖水种，从非洲南部到佛得角群岛，马德拉斯沿岸、阿米兰特群岛、托雷斯海峡、澳大利亚、印度尼西亚、新加坡、日本南部及中国。

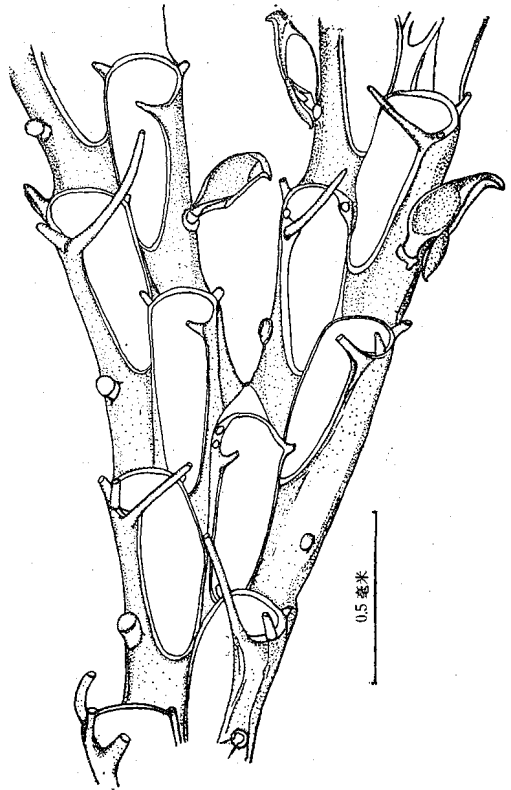


图 24 齿草苔虫 *Bugula dentata*

前面观，示个虫、端刺和鸟头体

16. 挺草苔虫 *Bugula vectifera* Harmer, 1926 (图 26)

Bugula vectifera Harmer, 1926: 442, pl. 31, figs. 1—6; Okada & Mawatari, 1938: 451; Mawatari, 1965: 606.

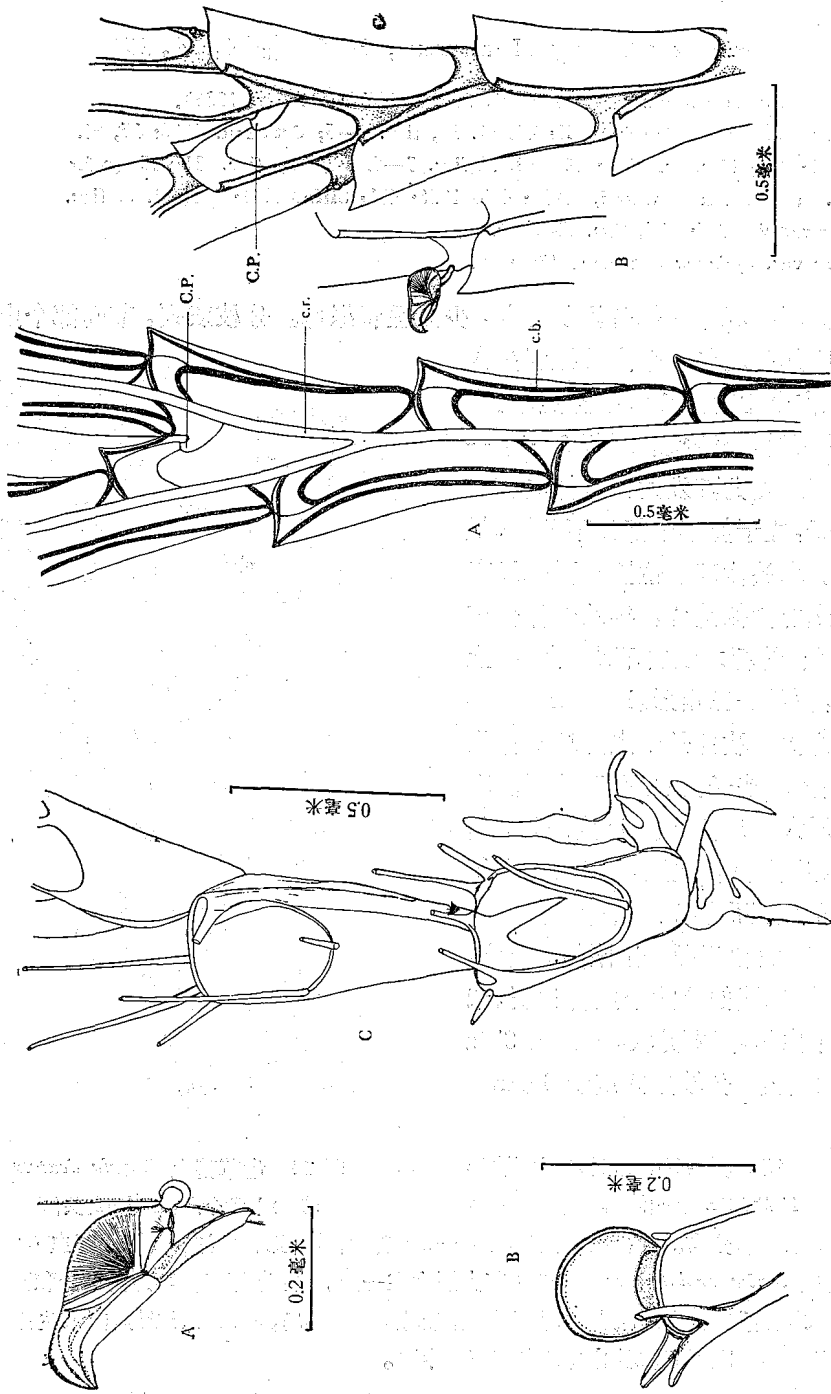


图 25 齿草苔虫 *Bugula dentata*

A. 前面观, 示一鸟头体; B. 前面观, 示一卵胞; C. 前面观, 示初虫

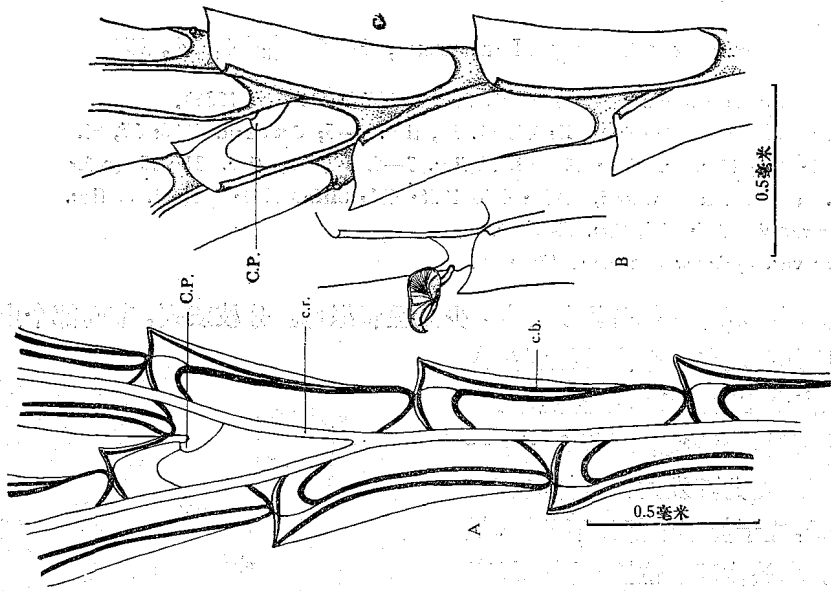


图 26 挺草苔虫 *Bugula vectifera*

A. 背面观, 示分歧方式、钙质栅(c.b.)和纵向钙质脊(c.r.); B. 前面观, 示一鸟头体; C. 前面观, 示个虫

我们的标本与 Harmer (1926) 的原始描述完全相符。群体纤细,由许多细长的分枝构成,分枝前表面中央隆起。群体呈淡黄色,但年幼群体呈灰白色。每一群体开始于一根很长的细柄。柄由两列交互排列的个虫构成。柄个虫与分枝个虫同形,大小一致,但无虫体。枝条向内卷曲。个虫长而狭,其前面对分枝中央隆起部非常倾斜,倾斜度在群体始端部分最大,致使交互排列的两个虫前表面彼此成直角。前膜长而狭,几乎伸达个虫始端。个虫外顶角有一尖形小刺或无刺。每一个虫外壁由两层平行的钙质加厚强固,此钙质加厚(Harmer 称之为钙质栅 calcaeous bar)在群体始端部分尤其发达。在两列个虫之间有一条纵向的钙质脊(calcaeous bridge)。鸟头体很小,位于个虫前表面始端裸壁上,长在一个短柄上;鸟头膨大成球形,其前缘与吻接合处常有凹陷,末端呈钩状,颚骨为长三角形。卵胞宽大于长,常盖在相邻个虫上,借一细柄附着在个虫内顶角,外卵室在胞口周围有一环带,内卵室薄。

挺草苔虫有两个最显著的特征:第一,群体有一根长的细柄;第二,两个虫列之间有纵向钙质脊,每一个虫外壁有钙质栅。其长柄系由形状和大小与普通个虫相同(但无虫体)的两列交互排列(而非单列接续排列)的个虫构成,因此,构造上和茎苔虫属 *Caulibugula* 的长茎不同,但柄个虫外壁钙质栅和茎苔虫长茎之空个虫(keno-zooids)的侧壁钙质加厚是同源的[见下述海南茎苔虫(新种) *Caulibugula hainanica* sp. nov.]。每一个虫外壁的钙质栅在其末端和始端分出的细枝都与两个虫列之间的纵向钙质脊相连接。

标本采集地 海南岛北部, $20^{\circ}15'N$, $109^{\circ}45'E$, 水深 32 米,附在贝壳上;海南岛南部, $18^{\circ}00'N$, $110^{\circ}00'E$, 水深 83 米,与冠粗胞苔虫丛生在一起。

地理分布 马都拉海峡、望加锡海峡,日本南部。从潮间带至水深 100 米皆有分布。在我国系首次纪录。

17. 东方草苔虫(新种) *Bugula orientalis* sp. nov. (图 27)

模式标本 标本号: 59BBE007, 1959 年 2 月 4 日采于东海, $30^{\circ}00'N$, $123^{\circ}30'E$, 底质为褐色泥质砂,水深 61 米,一个群体与水螅丛生在一起。

群体系由一长柄和双歧分枝构成,高度约 20 毫米,柄长约 15 毫米,占群体高度的 $3/4$ 。长柄是由两列交互排列、形状、大小和分枝个虫大致相同的正常个虫构成。柄个虫钙化强,但柄末端部分的个虫钙化弱。在长柄的背面(末端部分例外)两个虫列之间有一纵向钙质脊;每一柄个虫背面都有一大致呈新月形的钙质栅,其末端与后续个虫始端分叉的基部相吻合,内侧与纵向钙质脊相愈合,外侧内凹成新月形,向始端外侧延伸后,又斜向上方,并与钙质脊相连接。在柄个虫背面外侧分出许多粗细不均的附根,沿柄的表面(背面与前面)伸向始端,其中粗的附根末端膨大成为一个椭圆形或长椭圆形结构,其周缘有许多刺状突起。

柄的末端和分枝部分极其柔软。分枝由双列交互排列的个虫构成,两列个虫稍向外倾斜,因此,分枝中央部分较凸。个虫大小不均,轴个虫尤小,约为其他个虫大小的 $1/2$ 。多数个虫细长形,末端向外倾斜,外缘常斜,近始端内凹,内缘向内鼓凸,两侧向前表面翻卷,顶边圆形,始端呈管形。前膜细长形,两端较狭,中部较宽,有柄鸟头体小,固着在个虫始端裸壁外侧的疣突上;鸟头略呈球形,稍膨大;上半部稍凹,吻较短,吻端强钩状;颚骨长三角形,末端无垂尖。未发现卵胞。分岐方式属于 Harmer 的模式 4。只有轴个虫的前膜

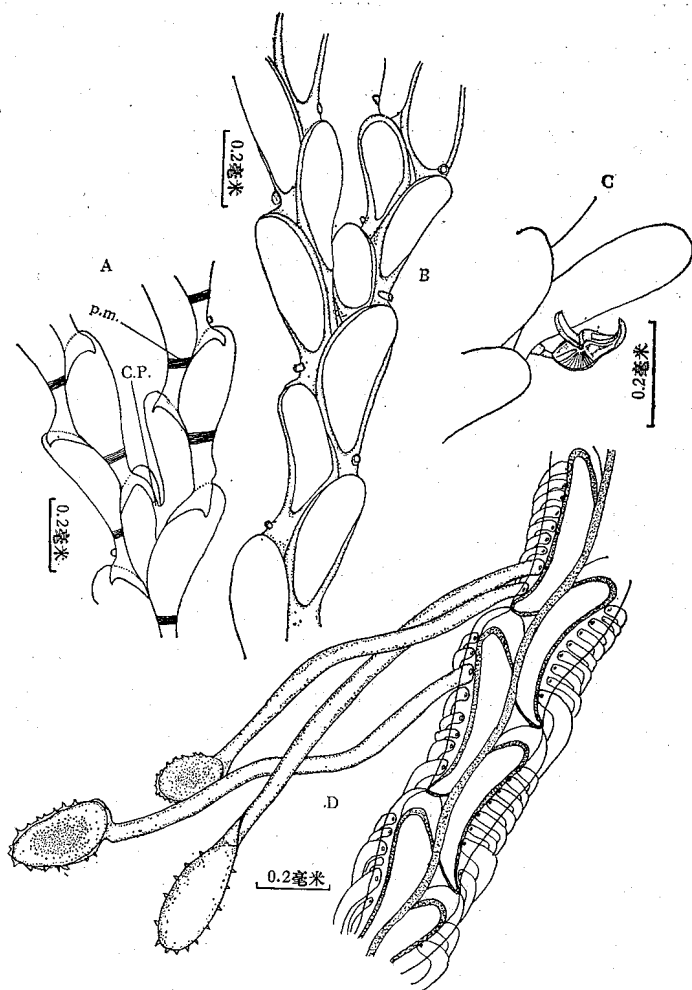


图 27 东方草苔虫(新种) *Bugula orientalis* sp. nov.

- A. 背面观, 示分歧方式 (p. m. 体壁肌); B. 前面观, 示个虫; C. 前面观, 示鸟头体
D. 柄部背面观, 示纵向钙质脊、钙质栅、附根以及粗附根末端的长椭圆形构造

与分枝前表面在同一水平, 其余个虫都向枝背倾斜。

在草苔虫属的已知种中, 只有艇草苔虫的分枝个虫和柄个虫都有钙质栅。与艇草苔虫一样, 本新种的群体也由一长柄和双列分枝构成。本新种和艇草苔虫的相似处在于其长柄具有钙质栅, 不同处在于其分枝个虫和柄末端的个虫无钙质栅。无论艇草苔虫或本新种, 附根都是由柄个虫背面外侧分出, 但本新种的附根有粗细两种, 较粗的附根末端膨大成椭圆形或长椭圆形结构, 其周缘有许多刺状突起。两者的分枝个虫的差别显著: 艇草苔个虫外顶角具小刺, 外突成锐角, 新种外顶角无刺呈圆形。

18. 舟形草苔虫 *Bugula scaphoides* Kirkpatrick, 1890 (图 3, 28)

Bugula scaphoides Kirkpatrick, 1890:18, pl. 4, fig. 1; Harmer, 1926:443. p. 31, figs. 7—8, p. 433, text-fig. 23b.

(?) *Bugula robusta* Waters (not MacGillivray 1869) 1913:471, pl. 69, figs. 15—16.

我们的标本与 Harmer (1926) 的描述完全相符。群体鲜红色, 卵胞和鸟头体呈白色。分枝不繁, 细而直, 由双列个虫构成。个虫细长, 外缘稍向内凹, 外顶角常有一锥形小突起, 内缘圆形。前膜细长, 几乎占个虫整个前区, 伸达个虫始端。个虫背面无卵圆形膜质区, 但有“Z”字形关节线, 这和球形草苔虫 *B. subglobosa* Harmer, 1926 不同。鸟头体小, 着生于个虫始端圆柱形的细柄上, 两侧扁平, 鸟头略呈球形, 不太隆起。现有标本大多数鸟头体都已脱落。卵胞大, 长大于宽, 有细柄, 着生于个虫内顶角, 内卵室上有许多六角形纹饰。附根由个虫侧面和背面分出。分岐方式属于 Harmer 的模式 4 (图 3)。

标本采集地 西沙群岛琛航岛, 水深 30 米, 附在珊瑚上, 广东南部近海, $21^{\circ}30'N$, $114^{\circ}30'E$, 水深 74 米, 附在水螅上。

地理分布 望加锡海峡、佛罗勒斯海、阿鲁群岛 (Aru Is.)、托雷斯海峡, 日本和中国 (南沙群岛及西沙群岛)。

讨论 西沙群岛标本与 Harmer (1926) 的描述完全相符。南海标本群体为鲜红色, 但鸟头体不呈白色。由于群体结构、个虫形状和鸟头体特征和西沙群岛标本相符, 故把南

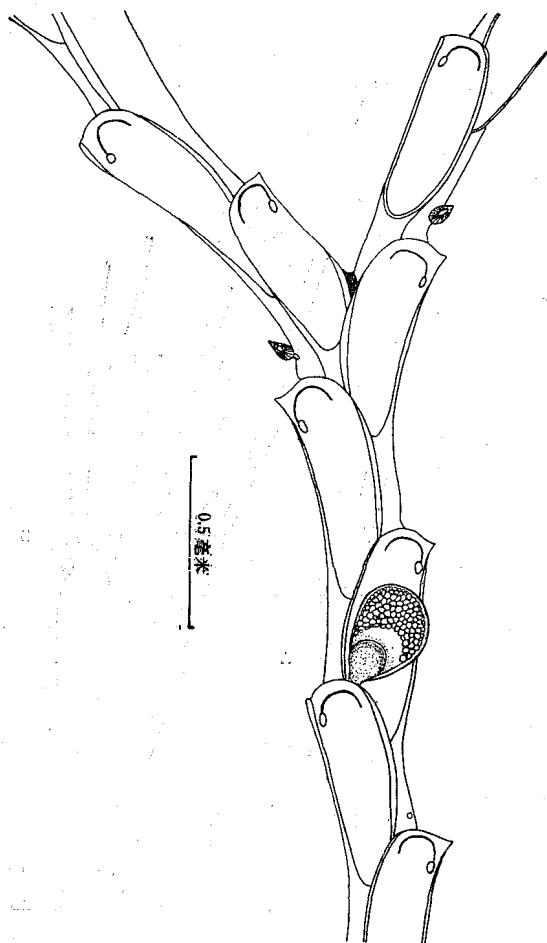


图 28 舟形草苔虫 *Bugula scaphoides*
前面观, 示个虫、鸟头体和卵胞

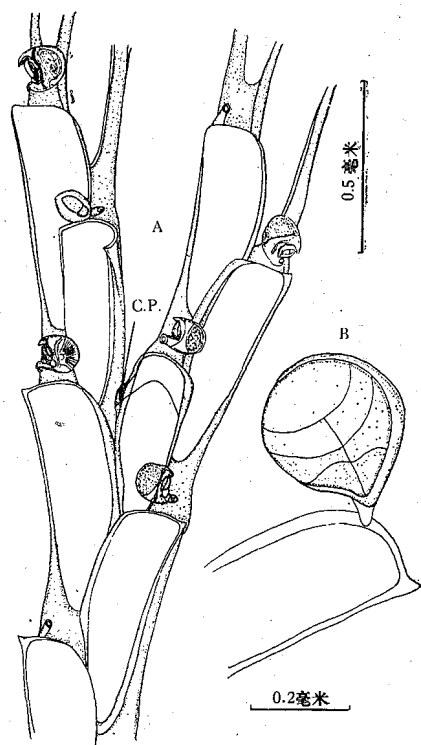


图 29 球形草苔虫 *Bugula subglobosa*
A. 前面观, 示个虫、球形鸟头体; B. 前面观, 示一卵胞

海标本归于本种,但南海标本比较粗壮。

Yanagi & Okada (1918) 订的一个变种 *B. scaphoides* var. *constricta* 与典型种的主要区别是,每一个虫基部外侧有一个缺刻 constriction,个虫外顶角有一刺状突起。但是刺状突起在典型种标本中是常有的。至于外侧壁基部的缺刻我们未曾发现,它同刺状突起一样,可能是属于本种个体变异范围之内。

19. 球形草苔虫 *Bugula subglobosa* Harmer, 1926 (图 29, 30)

Bugula subglobosa Harmer, 1926L444, pl. 32, figs. 15—18; Silén, 1941: 105, text-figs. 144—148; Mawatari, 1965: 606, 71d, c.

群体中等粗壮,分枝由双列个虫构成。现有标本有淡褐色和黄色两组,淡褐色标本鸟头体呈白色,黄色标本鸟头体带黄色。在同一产地,两种颜色的标本同时存在。个虫比舟形草苔虫的短但较宽。前膜较细长,末端较宽,始端较狭,占个虫前区 $3/4$ 以上,但未伸达个虫始端,这与舟形草苔虫不同。个虫外隅成斜角,内隅圆形。鸟头体中等大小,着生于个虫最始端侧面的一个细柄上,恰好位于前位个虫的顶端。鸟头典型球形,两侧较凸(这与舟形草苔虫两侧扁平的鸟头体不同),吻短,钩状,颚骨长三角形,末端有一垂尖。卵胞球形,有柄,内卵室无六角形纹饰,胞口周围有一环带。每一个虫背面有一卵圆形膜质区,

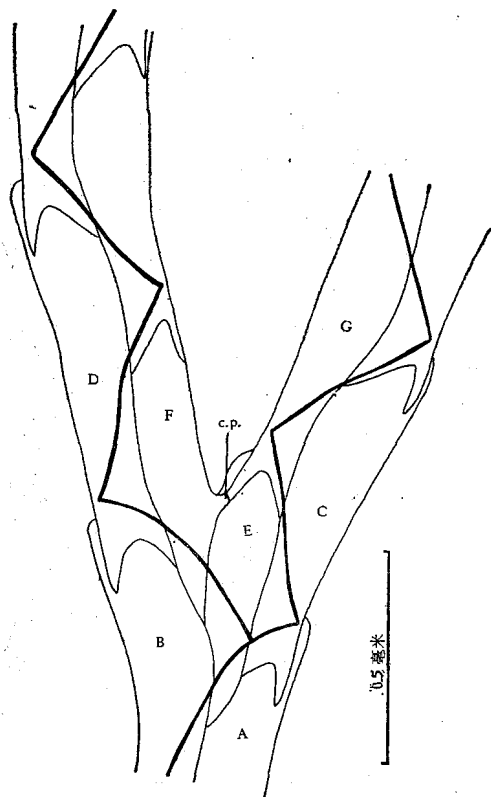


图 30 球形草苔虫 *Bugula subglobosa*
背面观,示分枝方式和“Z”字形关节线

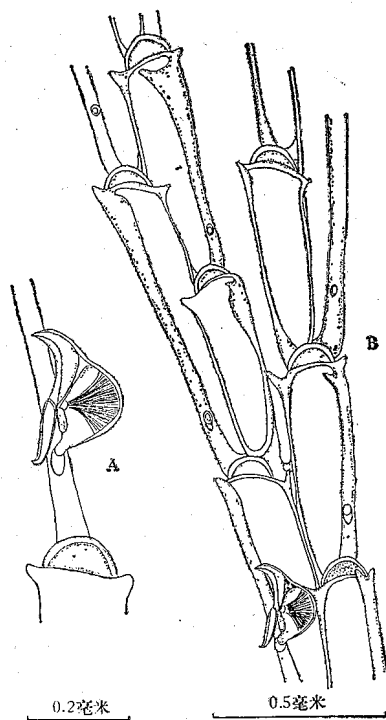


图 31 太平草苔虫 *Bugula pacifica*
A. 前面观,示鸟头体和卵胞; B. 前面观,示个虫、端刺、卵胞和鸟头体

与周围钙化区界限分明;在外侧壁末端有一列小孔(3—4个),群体背面有一条鲜红色的“Z”字形关节线,这与 Silén (1941) 的描述相符。分岐方式属于 Harmer 的模式 4。

标本采集地 东海,自 31°00'N, 123°30'E 至 29°00'N, 124°00'E, 水深 61—82 米,常与美髯松苔虫丛生在一起。

地理分布 帝汶岛西部、苏拉威西海北部、佛罗勒斯海东部、松巴哇岛东部,日本东京沿岸和九州。在我国系首次纪录。

20. 太平草苔虫 *Bugula pacifica* Robertson, 1905 (图 2,31)

Bugula pacifica Robertson, 1905: 268, pl. 10, fig. 50, pl. 16, fig. 101; O' Donoghue, 1926: 45; Osburn, 1950: 158, pl. 22, fig. 6, pl. 23, fig. 4; Kubanin, 1975: 114, figs. 2b—d.

群体树丛状,稍呈螺旋生长,双歧分枝,以其最始端的个虫分出的附根附着在基质上,整个群体呈漏斗状。群体呈淡黄色,分枝柔软,但比加州草苔虫粗壮,与西方三胞苔虫 *Tricellaria occidentalis* (Trask) 和加州草苔虫 *Bugula californica* Robertson 混生在一起。

个虫细长形,始端稍狭。前膜占个虫整个前区。端刺 2—1,外刺斜向外侧,内刺指向末端。鸟头体较大,有柄,着生在个虫始端前膜外侧。鸟头中等凸,吻呈钩状,颚骨长三角形。卵胞很小,不完全,未盖没个虫顶端。分岐方式属于 Harmer 的模式 3。在我国沿海的草苔虫中,太平草苔虫借其不完全的卵胞、鸟头体着生位置和群体生长方式,很容易与其他种区别。

标本采集地 辽宁旅顺。

地理分布 美洲太平洋沿岸:白令海(阿拉斯加)、加拿大和美国加利福尼亚南部,太平洋西岸:鄂霍次克海、日本海。在中国系首次纪录。

21. 加州草苔虫 *Bugula californica* Robertson, 1905 (图 32,33)

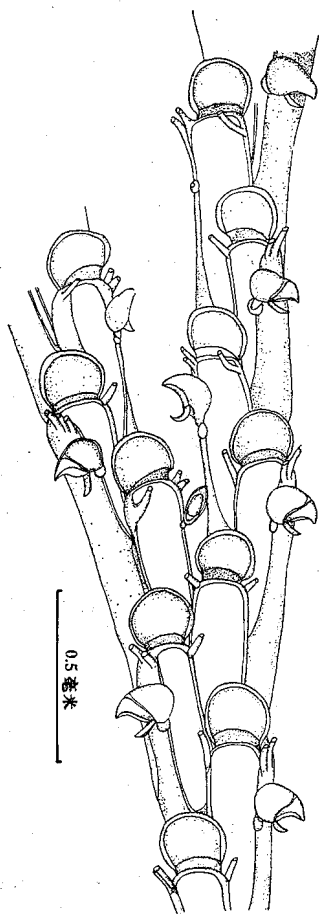
Bugula californica Robertson, 1905: 267, pl. 10, fig. 49, pl. 14, fig. 100; O'Donoghue, 1926: 45; Mawatari, 1946: 21; 1956: 121; Soule, 1959: 41; Mawatari, 1963: 7; 1965: 606, figs. 69a, b, c; 王复振、蔡如星, 1977: 18, fig. 15.

群体直立,各分枝作螺旋生长,借其基部个虫分出的附根附着在各种基质上。分枝由双列个虫构成。个虫壁薄,呈透明状。整个个虫细而长,宽度几乎相等。前膜大,约占个虫前区的 2/3,末端宽,始端较狭。端刺 2—1,基部均无关节。鸟头体着生于个虫末端外侧,常伸展到个虫前表面。在同一群体内鸟头体大小不均,一般分枝外列个虫的鸟头体比分岐处内列个虫的稍大,但有时两者均较小。卵胞球形,着生于个虫顶端,完全盖没个虫顶端。

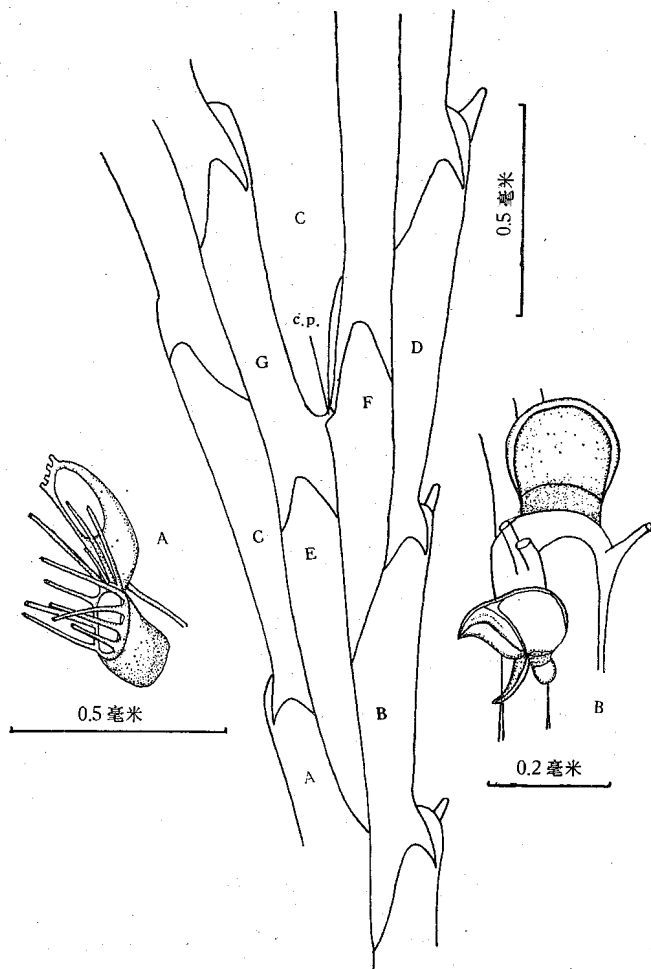
标本采集地 辽宁旅顺、海洋岛,河北秦皇岛、北戴河,山东烟台、青岛及其邻近地区,江苏连云港,浙江东福山、大陈岛,广东汕尾、湛江以及海南岛榆林港,均栖息于潮间带。

地理分布 太平洋东岸:加拿大南部至科隆群岛(加拉帕戈斯群岛),中太平洋的夏威夷群岛,太平洋西岸:鄂霍次克海,日本、中国。Marcus (1937) 曾报道本种分布于大西洋的巴西沿岸。

附记 加州草苔虫主要是北温带太平洋两岸种,最早由 Robertson (1905) 记录于加利福尼亚,分布范围很广,甚至在热带地区的夏威夷群岛也有记录(Soule, 1959)。它是我国北方海岸(如大连、青岛)的主要污损苔虫之一,南方海岸虽也有大批附着,但附着量不如北方大。一般,北方标本群体相对比较粗壮,但较矮,通常在 20—25 毫米之间,很少超过 30 毫米,个虫较粗短,但端刺较强壮;南方标本(如

图 32 加州草苔虫 *Bugula californica*

前面观,示个虫、端刺、鸟头体和卵胞;

图 33 加州草苔虫 *Bugula californica*

A. 前面观,示初虫; B. 前面观,示一鸟头体和卵胞;

C. 背面观,示分枝方式

榆林地区)群体柔软,但较高大,通常在 30 毫米以上,个虫比较细长但端刺比较短小。

22. 无刺草苔虫(新种) *Bugula aspinosa* sp. nov. (图 34,35)

模式标本 标本号: 59BBE002, 1959 年 2 月 4 日采自东海, 36°00'N, 123°30'E 底质为褐色砂,水深 61 米,两个群体与冠粗胞苔虫丛生在一起。

现有标本的两个群体基部都已丧失。群体呈淡黄色,但近基部为黄棕色。群体柔软,半透明,树枝状,由两列个虫构成,分枝先端稍向前表面弯曲。个虫细长,两侧稍内卷而游离,末端比始端稍宽,始端狭管形,顶边圆形。前膜广阔,占个虫前区的 2/3 以上。分枝近始端的个虫略呈背向排列,其末端向外倾斜。全无刺。每一个虫都有一个有柄鸟头体,位于个虫始端侧面一个疣状突起上。鸟头体有大、小两型。大鸟头体鸟头较凸,吻典型舟形,吻端强钩状,上半部稍凹,颞骨长三角形,末端有细长的垂尖。大鸟头体大小为小鸟头体的 3—4 倍。一般的小鸟头体属细长型,鸟头不太凸,吻端呈钩形,其上半部几乎平直,

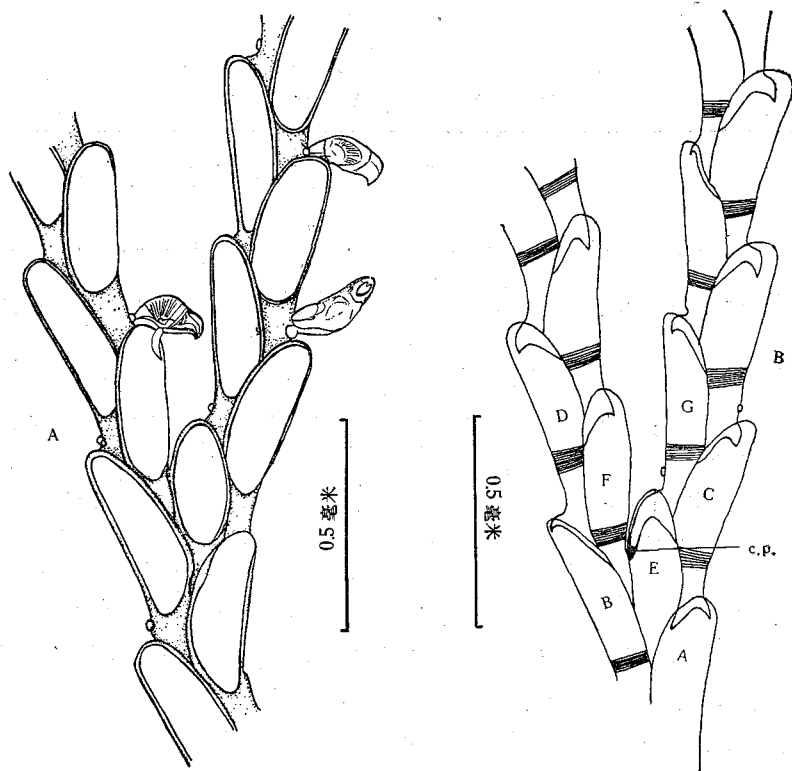


图 34 无刺草苔虫(新种) *Bugula aspinosa* sp. nov.

A. 前面观,示个虫和鸟头体; B. 背面观,示分歧方式

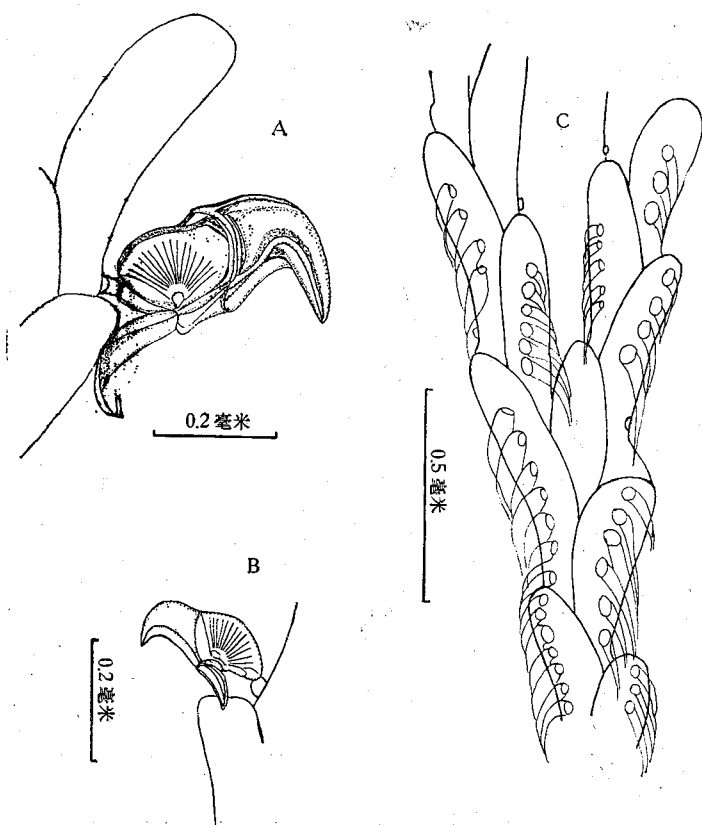


图 35 无刺草苔虫(新种) *Bugula aspinosa* sp. nov.

A. 前面观,示一大形鸟头体; B. 前面观,示一小形鸟头体; C. 背面观,示分枝始端个虫分出的附根

颚骨也呈长三角形,但末端无垂尖。由于鸟头体突出在分枝边缘,使分枝呈明显的锯齿状。未发现卵胞。分歧方式属于 Harmer 的模式 4。

新种借其无刺的个虫和两种差别显著的鸟头体,很易与其他草苔虫相区别。它的鸟头体与 *B. dispar* Harmer, 1926 的相似,但后者鸟头体着生在个虫末端,个虫有端刺。

23. 中介草苔虫(新种) *Bugula intermedia* sp. nov. (图 36,37)

模式标本 标本号: 76BBE001, 1976 年 7 月 21 日采自东海, $31^{\circ}30'N$, $126^{\circ}00'E$, 底质为软泥,水深 75 米,一个群体与水螅丛生在一起。

其他标本 标本号: 76BBE002, 1976 年 6 月 27 日采自东海, $29^{\circ}30'N$, $126^{\circ}00'E$, 底质为泥质砂、碎壳,水深 96 米,一个群体与水螅丛生在一起。76BBE003, 1976 年 6 月 27 日采自东海, $30^{\circ}30'N$, $126^{\circ}00'E$, 底质为砂质泥,水深 75 米,一支断枝,与水螅丛生在一起;59BBE003, 1959 年 2 月 1 日采自东海, $28^{\circ}00'N$, $124^{\circ}00'E$, 底质为泥质砂、碎壳,水深 80 米,一个群体附于贝壳上。

群体开始于约 7 毫米长的长柄,柄的末端可以清晰见到两列交互排列的个虫,末端部分以下布满了紧密拥挤的下行附根。柄部的个虫与分枝部分的个虫同形,但钙化较强,几乎背向排列。附根由柄部个虫和近柄部的分枝个虫分出,沿柄的表面下行。这些附根至

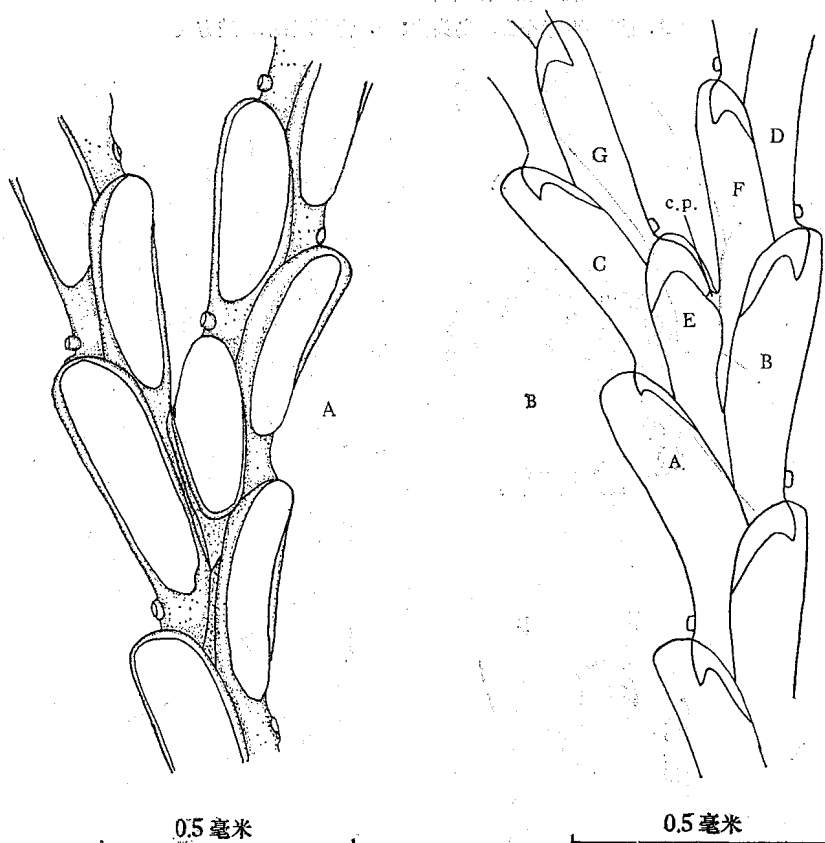


图 36 中介草苔虫(新种) *Bugula intermedia* sp. nov.

A. 前面观,示个虫; B. 背面观,示分枝方式

柄的基部又分出细枝,形成蓬松的附根丛,用以附着在基质上。群体分枝细长而极其柔软,常向分枝前表面作同心状卷曲,因而使分枝部分呈花丛状。一个完整的群体高度可达20—25毫米。群体分枝部分半透明,分枝基部和柄部呈黄棕色。

分枝由双列个虫构成。个虫细长,末端比始端稍宽,中部最宽,外缘稍内凹,末端向外倾斜,末端两隅钝圆,顶边圆形而前翘,内缘稍隆起,内卷而游离。前膜细长,始端最狭,占个虫前区 $2/3$ 以上。

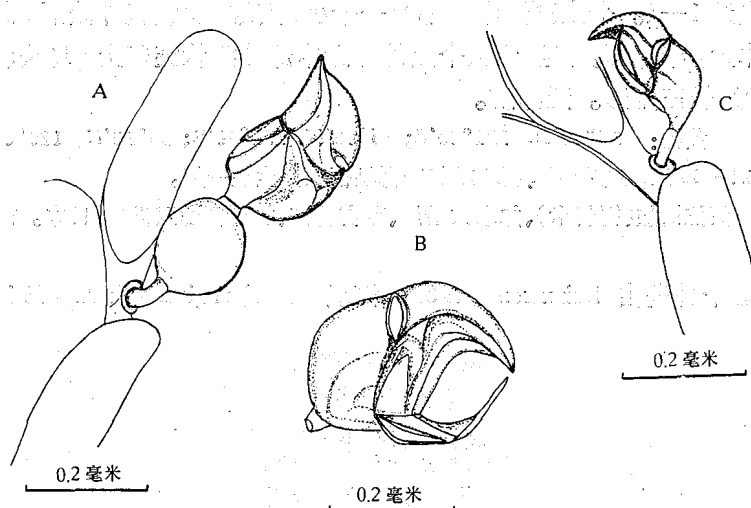


图 37 中介草苔虫(新种) *Bugula intermedia* sp. nov.

A. 前面观,分枝先端示一增大的鸟头体; B. 前面观,示一大形鸟头体; C. 前面观,示一普通鸟头体

有柄鸟头体位于个虫始端裸壁上。鸟头体柄的长度变化较大,有的为鸟头体本身长度的 $1/3—1/2$ 。有时在分枝末端可见到柄的长度与鸟头体同长的长柄鸟头体。此种鸟头体粗大,其柄呈球形,基部较粗,连接鸟头体的一端较细。通常的鸟头体属细长型,鸟头不凸,吻端弯曲成钩状,颞骨长三角形。有时这种细长型的鸟头体被一个大小为其三倍的大形鸟头体所取代。大鸟头体的鸟头膨大但不凸,吻极短,呈强钩形,颞骨为长三角形,末端有一细长的垂尖。大鸟头体并非始终存在,有的群体有大形鸟头体,有的群体则无。分歧方式属于 Harmer 的模式 4。未发现卵胞。

中介草苔虫最引人注意的是其鸟头体具有动柄苔虫属 *Camptoplites* Harmer, 1926 的特征。本种鸟头体的柄比草苔虫属任何其他种都长,因而活动自如,但个虫背面始端显著双分叉,柄部由正常个虫构成。然而与动柄苔虫属的成员相比,本种的柄仍很短。这一新种是草苔虫属中具有动柄苔虫属性质的一个特殊种,在一定程度上或许可以反映 *Camptoplites* 是 *Bugula* 演变而来。

24. 普峡草苔虫 *Bugula pugeti* Robertson, 1905 (图 38, 39)

Bugula flabellata (not Thompson, 1847) Robertson, 1900: 321.

Bugula pugeti Robertson, 1905: 271, pl. 10, figs. 58—49, pl. 11, fig. 55; O' Donoghue, 1925: 100; 1926: 45; Osburn, 1950: 158, pl. 23, figs. 7—8.

Bugula pugeti var. *umbelliformis* Yanagi & Okada, 1918:424, pl. 6, fig. 8; Okada & Mawatari, 1938: 451; Silén 1941: 167; Mawatari, 1965: 606, figs. 71a, b.

Bugula pugeti var. *kiuschiensis* Silén, 1941:107, text-figs. 149—152.

群体粗壮,分枝呈扇状,淡黄色或白色,开始于一根短柄。柄由若干钙化强的老成个虫(正常个虫)构成。这些老成个虫分出无数的附根用以附着在贝壳、石块等基质上。群体边缘因大形鸟头体的存在而呈明显的锯齿状。分枝由2—7列个虫构成。个虫长椭圆形,末端较宽,始端较狭,两侧顶缘内折,顶边圆形。刺皆短,边缘个虫端刺刺式为1—1或2—1,中央个虫为1—1。个虫顶边中央都有一个小结节。前膜长卵圆形,约占个虫前区的2/3。鸟头体大,半球形,着生边缘个虫外侧近中部的疣状突起上,鸟头较凸,吻短,吻端呈钩状,颞骨为长三角形。无卵胞。

标本采集地 黄海: 36°00'N, 121°00'E; 36°00'N, 121°30'E; 35°30'N, 120°00'E; 35°30'N, 121°00'E; 水深24—30米,附在贝壳、石块或与美髯松苔虫丛生在一起。

地理分布 阿拉斯加(锡特卡)、加拿大沿岸、普吉特湾、加利福尼亚沿岸,日本。在我国系首次纪录。

讨论 这个种是由 Robertson (1905) 订名的。Yanagi & Okada (1918) 根据日本

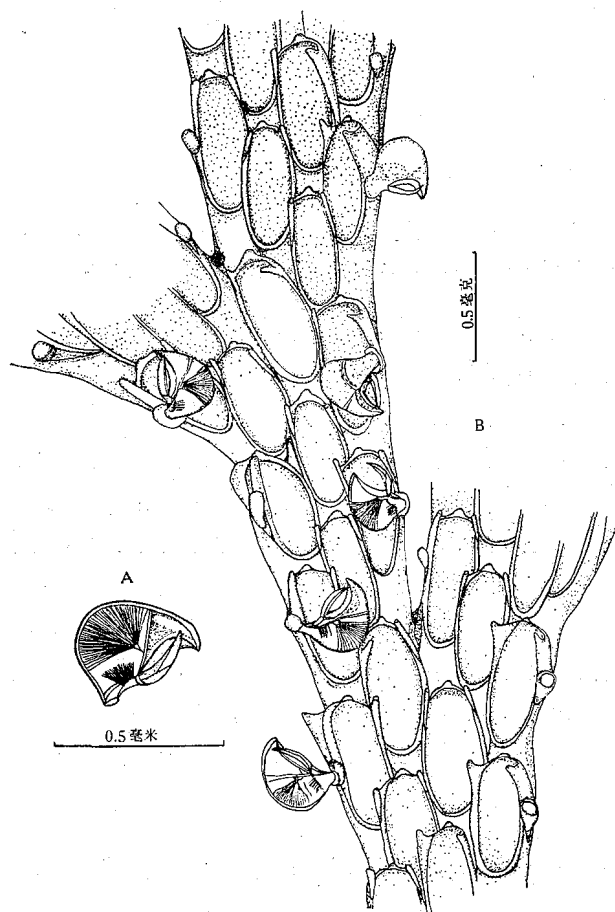


图 38 普峡草苔虫 *Bugula pugeti*

A. 前面观,示一鸟头体; B. 前面观,示个虫、端刺、鸟头体、个虫顶边的小结节

标本群体生长特点, 以及边缘端刺为 1—1, 订了一个变种 *B. pugeti* var. *umbelliformis*。Silén (1941) 根据日本九州冲绳岛标本群体结构(群体有一细柄, 分枝双列), 以及多数个虫端刺为 1—1, 而近柄的两个虫端刺为 2—1, 订了另一个变种 *B. pugeti* var. *kuschiensis*。我们从 36°00'N, 121°00'E 获得的标本分枝由 2—7 列个虫构成, 与 Yanagi & Okada 的变种相似: 端刺皆为 1—1, 个虫顶边中央小结节明显, 群体分枝呈明显的扇状。从 35°30'N, 120°00'E 获得的标本与 Silén 的变种在某些方面相似, 群体不呈扇状, 分枝多少旋转生长成丛状。取自 36°00'N, 121°30'E 的标本是双列分枝, 近柄部的两个虫端刺为 2—2, 其余个虫为 1—1, 这些端刺比其他标本的相对长些。取自 35°30'N, 121°00'E 的标本端刺皆为 1—1, 个虫顶边的中央小结节绝大多数明显。应着重指出的是取自 35°30'N, 120°00'E 的标本。它是一支完整的群体, 其生长方式正如 Silén (1941) 所述, 由钙化强的老成个虫构成群体的柄部, 这些个虫周围以许多附根, 附着在美髯松苔虫上。其近柄部的两个虫端刺为 2—2, 第一次分歧后产生两子分枝, 其中一支按双列分枝生长, 另一支开始为双列, 但其分歧后产生的两子分枝, 一支仍为双列分枝, 另一支发育成为 5 列分枝。这与 Robertson (1905) 的描述相符, 但与 Silén (1941) 描述的变种有些相近。所有标本除少数个虫外, 个虫顶边中央的圆形小结节始终存在, 鸟头体的形态和大小较稳定。尽管它们的端刺数目不稳定, 但中央个虫始终是 1—1。至于群体结构, 扇形是其基本形态, 多列性是其主要特征, 双列性和群体螺旋生长似乎是个体变异。故我们把 Yanagi & Okada (1918) 和 Silén (1941) 的变种并入本种范围之内。

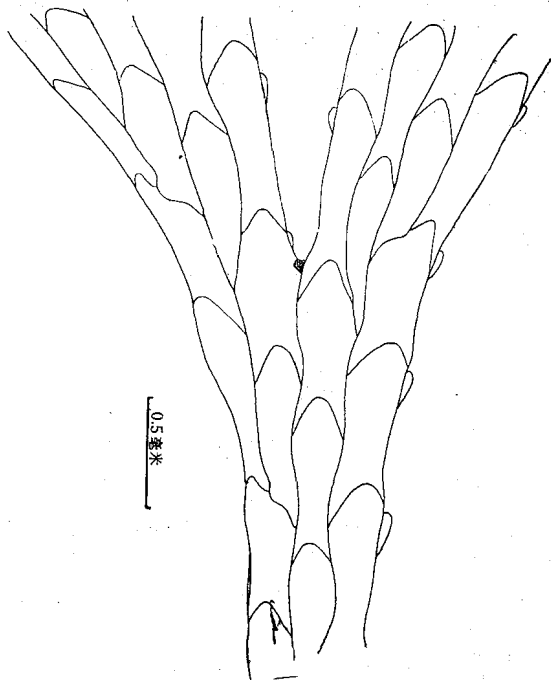


图 39 普峡草苔虫 *Bugula pugeti*
背面观, 示分枝方式

25. 扇草苔虫 *Bugula flabellata* (J. V. Thompson, 1847) (图 40, 41)

Avicularia flabellata Thompson, 1847:106(fide Robertson, 1905).

Bugula flabellata (Thopson) Busk, 1852:44, pls. 51—52; Hincks, 1880:80, pl. 11, figs. 1—3; Robertson, 1905(not 1900): 270, pl. 10, figs. 51—52; Osburn, 1950:157.

群体淡黄色, 由双分歧的扇形分枝构成。分枝的宽度即使在同一群体也是变化的, 通常由 2—7 列个虫构成, 一般 3—6 列, 接近群体基部为 2 列。附根在群体基部集聚成束, 用于附着在基质上。分枝常绕群体中轴作螺旋生长。个虫细长, 宽度均匀, 侧缘游离。前膜细长, 几乎占个虫整个前区。端刺 2—2 或 1—1, 常指向末端, 未发现盖在前膜上。鸟

头体中等大小,比普峽草苔虫的小,位于个虫末端附近,附着在侧面一个锥形突起上。只有边缘个虫有鸟头体,这与 Osburn (1950) 的描述相符。鸟头稍膨大,吻短,上半部不凹,吻端突然弯曲成钩状,颞骨为长三角形。卵胞较小,半球形,透明光滑,基部短而宽,位于个虫末端,与个虫中轴成一直线,胞口较大。

尽管本种个虫多列,但由于个虫背面无特殊的钙化区,始端双分叉,两叉伸至其前位个虫的侧面,故显然属于草苔虫属。群体基部分歧方式属于 Harmer 的模式 5,其余为简单的双分歧。

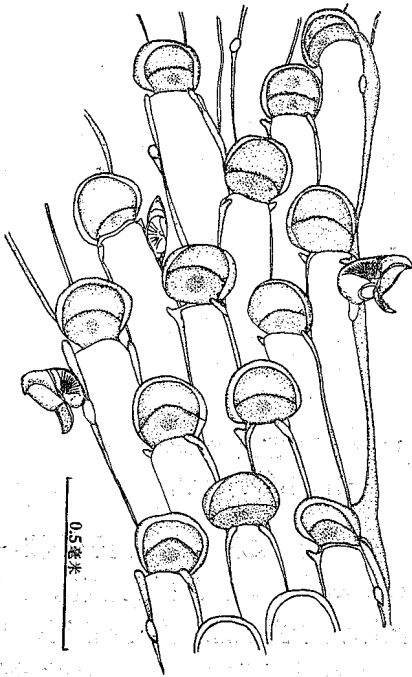


图 40 扇形草苔虫 *Bugula flabellata*

前面观,示个虫、端刺、鸟头体和卵胞

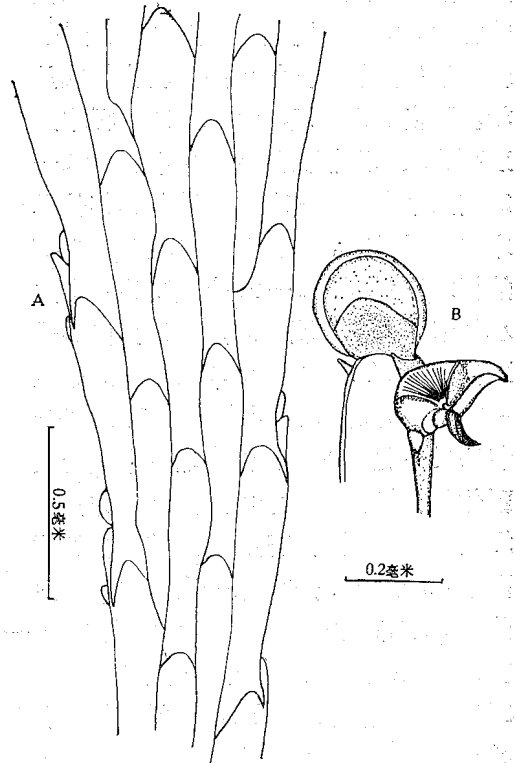


图 41 扇形草苔虫 *Bugula flabellata*

A. 背面观,示分歧方式; B. 前面观,示鸟头体和卵胞

标本采集地 辽宁旅顺,系用挂板取得,数量较多,与加州草苔虫和西方三胞苔虫混生在一起。

地理分布 系广分布的冷水种。在大西洋西岸分布于佛罗里达,南界是巴西,在大西洋东岸分布于亚得里亚海、马德拉岛、那不勒斯,南界是好望角。在美洲太平洋沿岸分布于圣地亚哥湾、加利福尼亚湾及秘鲁沿岸。在我国系首次纪录。

26. 杯草苔虫 *Bugula calathus* Norman, 1868 (图 42, 43)

Bugula calathus Norman, 1868; 218, pl. 6, figs. 3—8; Hincks, 1880; 82, pl. 11, figs. 4—6; 1886; 260; Kluge, 1914; 636, text-figs. 22; Hastings, 1943; 426.

Bugula avicularia forma *flabellata*, Waters 1879; 117.

Bugula flabellata (not of J. V. Thompson) O'Donoghue & Watteville, 1935; 205.

群体白色,由扇状对生分枝构成。分枝宽度多变,由 2—10 列个虫组成。分枝基部分

歧方式属于 Harmer 的模式 3,其余部分为简单双分歧。

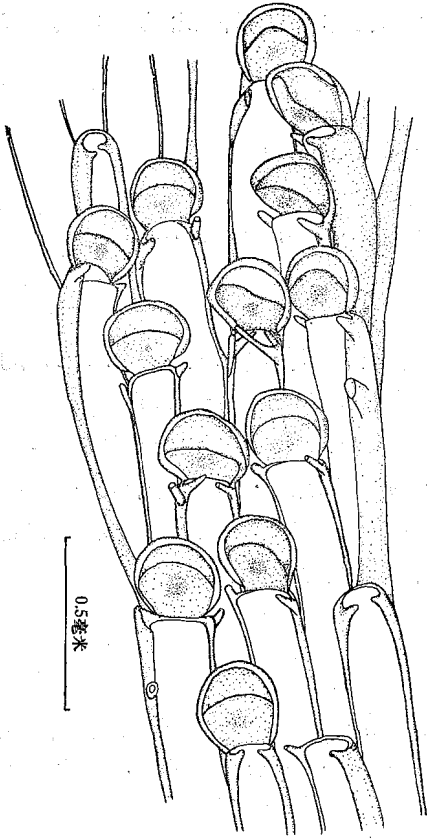


图 42 杯草苔虫 *Bugula calathus*

前面观,示个虫、端刺和卵胞

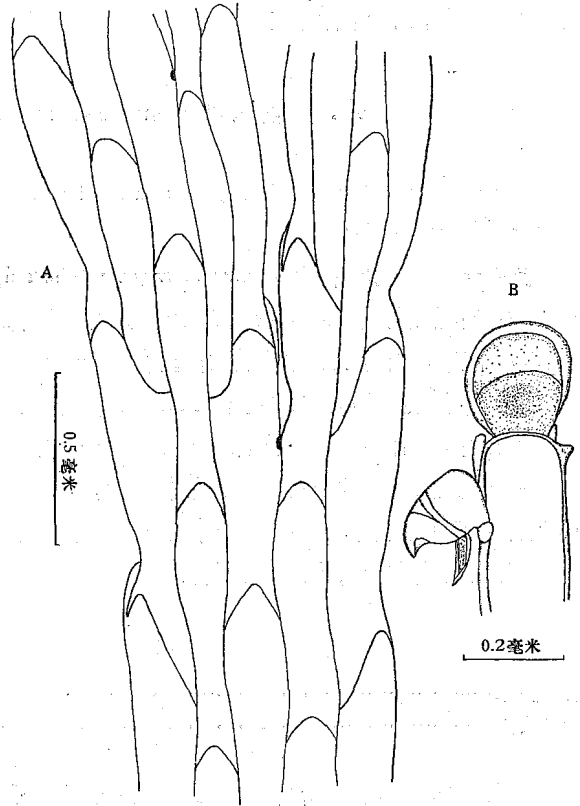


图 43 杯草苔虫 *Bugula calathus*

A. 背面观,示分歧方式; B. 前面观,示鸟头体和卵胞

群体基部分枝均为双列,大部分为 4—6 列。附根在群体基部集聚成束,用以附着在基质上。群体生长方式和扇草苔虫不同,各分枝不作螺旋生长,而是有规则地向各方向对生分枝,因此,群体直立,象一只花杯。个虫长椭圆形,宽度多少均匀。端刺为 1—1 或 2—2,皆短。在刺式为 2—2 的情况下,有时个别个虫下面一根刺粗而长,伸展到前膜上。前膜细长,占个虫整个前区。鸟头体中等大,附着在个虫末端外侧的锥形突起上,只有边缘个虫有鸟头体。鸟头稍膨大,吻端逐渐弯曲,吻钩不明显,颞骨为长三角形。卵胞较大,近球形,透明光滑,基部长而宽,位于个虫顶端,和个虫中轴成一直线,胞口大。

本种易与扇草苔虫混淆,两者主要区别是: (1) 群体生长方式不同,前者分枝不作螺旋生长,后者分枝典型螺旋生长; (2) 分歧方式不同,前者群体基部双列分枝,分歧方式属 Harmer 的模式 3,后者则属模式 5; (3) 个虫背面始端分叉长度不同,前者较长,后者较短; (4) 前者鸟头体吻端逐渐弯曲,吻钩不明显,后者突然弯曲,吻钩明显。

标本采集地 辽宁海洋岛, 4 个完整群体,附着在独角裂孔苔虫 *Schizoporella unicornis* 上。

地理分布 英国西南部、地中海、南非。在我国系首次纪录。

附记 本种是分布于大西洋沿岸的常见种,常栖息在潮间带。Kluge (1908) 曾报道本种分布于

白海, 但 Nordgaard(1918:24), Borg(1933:528), Hastings (1943:427) 持有怀疑, Kluge (1962) 本人也未肯定它分布于白海。在太平洋地区尚未见报道。但根据群体生长特点、个虫多列性、个虫前表面及始端分叉特征以及鸟头体的形态, 我们认为海洋岛的四个群体是属于本种。或许是由于船舶航行携带使本种扩散到了北太平洋地区。

VI. 纓苔虫属 Genus *Dendrobeania* Levinsen, 1909

Dendrobeania Levinsen, 1909:99; Canu & Bassler, 1929:133; Silén, 1941: 99; Osburn, 1950:165.

Bugula auctt (pars).

模式种 穆雷纓苔虫 *Flustra murrayana* Johnston.

纓苔虫属系由 Levinsen (1909) 从草苔虫属中分出, 它与草苔虫 *Bugula* (*s. str.*) 的区别在于其有明显的口盖以及端壁有大形的多孔型孔板 (multiporous roset plates)。

群体直立。分枝方式属于 Harmer 的模式 3。分枝双列或多列。个虫始端部分呈管状, 始端背面和侧壁有一特殊的钙化区, 钙化区上有一个端孔板和一个(或两个)侧孔板。

纓苔虫属通常多列, 分枝呈叶片状, 直立或多少平卧在基质上, 但有的分枝为双列。鸟头体通常有大、小两型, 边缘个虫的鸟头体较大, 但有的种类无鸟头体。

该属在我国至今仅发现两种。

种 的 检 索

有鸟头体..... 中华纓苔虫(新种) *D. sinica* sp. nov.
无鸟头体..... 长刺纓苔虫 *D. longispinosa*

27. 中华纓苔虫(新种) *Dendrobeania sinica* sp. nov. (图 44)

模式标本 标本号: 81BBY001, 1981 年 8 月 5 日采自山东胶州湾, 底质为石砾, 水深 45 米, 许多群体附于石块上。

群体淡黄色或桔黄色, 扇形或不规则叶片形, 由多列个虫构成, 以每一个虫背面末端分出的背附根附着平卧在基质上。个虫始端呈管状, 大部分被前位个虫的膨大部分所覆盖。末端膨大部分呈舟形。前膜长椭圆形, 几占膨大部分整个前区。室口和口盖半圆形。口盖底边稍内凹, 外缘有几丁质加厚。端刺、侧刺都十分粗壮。受孕个虫端刺 2 根, 非受孕个虫端刺 2 或 4 根, 均指向末端。侧刺 7—9 根, 两侧排列不对称, 通常外侧刺 5 根, 内侧刺 3—4 根。侧刺基部皆与个虫表面垂直, 但都向内弯曲覆盖在前膜上。所有的刺基均无关节。每一个虫膨大部分背面都有一大型钙化区, 占背面表面积 2/3。有一大型端孔板及两个侧孔板, 位于末端一个侧孔板较小。鸟头体有大小两型。中央个虫鸟头体较小, 附着在个虫始端管状裸壁上的圆柱形的疣突上。边缘个虫鸟头体较大, 附着在个虫膨大部分始端侧面的一个疣突上。大小两种鸟头体的指向多变, 或指向侧面, 或指向前面、背面。大、小两种鸟头体皆呈球形, 颞角和吻皆呈三角形, 末端均呈强钩状。口上卵胞球形, 宽大于长, 前表面凸, 饰有许多放射线。

新种个虫一般形态与 *D. murrayana* (Johnston, 1847) 十分相似, 但区别明显: 后者群体通常直立, 附根由群体基部边缘个虫分出, 卵胞长大于宽, 鸟头体吻和颞骨不呈钩状,

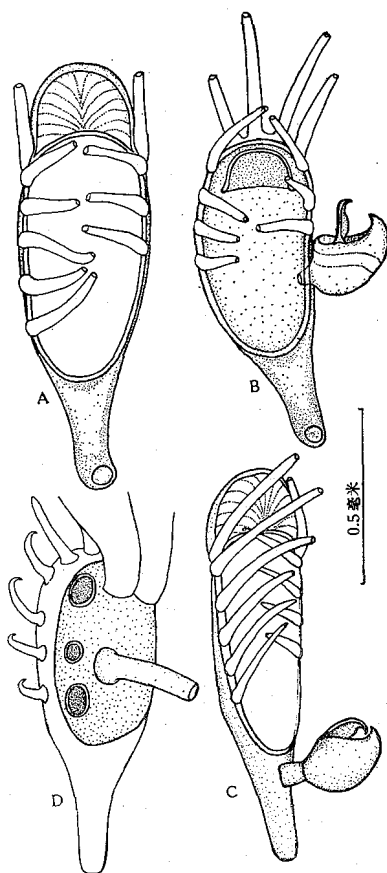


图 44 中华缨苔虫(新种) *Dendrobeania sinica* sp. nov.

- A. 一中央个虫前面观, 示卵胞、端刺、侧刺; B. 一边缘个虫前面观, 示端刺、侧刺、口盖和鸟头体;
C. 一中央个虫侧面观, 示卵胞、侧刺、端刺、鸟头体; D. 一中央个虫背面观, 示钙化区、孔板和附根

个虫末端背面钙化区小; 而新种群体平卧, 附根由每一个虫末端背面分出, 卵胞宽大于长, 鸟头体颞骨和吻皆呈强钩状, 个虫末端背面钙化区大。

28. 长刺缨苔虫 *Dendrobeania longispinosa* (Robertson, 1905) (图 45)

Beania longispinosa Robertson, 1905; 277, pl. 12, figs. 65—66.

Dendrobeania longispinosa (Robertson) Osburn, 1950; 168, pl. 25, figs. 4—5.

群体直立, 借个虫背面末端或始端侧面分出的附根附着在基质上。个虫始端呈管状, 被基前位个虫膨大部分所重叠。膨大部分呈舟形。前膜长椭圆形, 占膨大部分整个前区。室口顶缘有 2—3 根端刺, 长而粗, 指向末端, 前膜每侧有 6—7 根侧刺。侧刺较粗长, 方向不一, 有的盖在前膜上, 有的与个虫表面垂直, 但都比 Robertson 和 Osburn 的描述短。未发现卵胞。

讨论 我们的标本与 Robertson (1905) 和 Osburn (1950) 的描述基本相符。群体直立, 个虫端壁和侧壁有一钙质加厚区, 加厚区上有一个端孔板和一个侧孔板。虫室壁钙化强, 壁厚, 未发现连接管, 因此, 我们同意 Osburn (1950) 的意见, 把本种归于缨苔虫

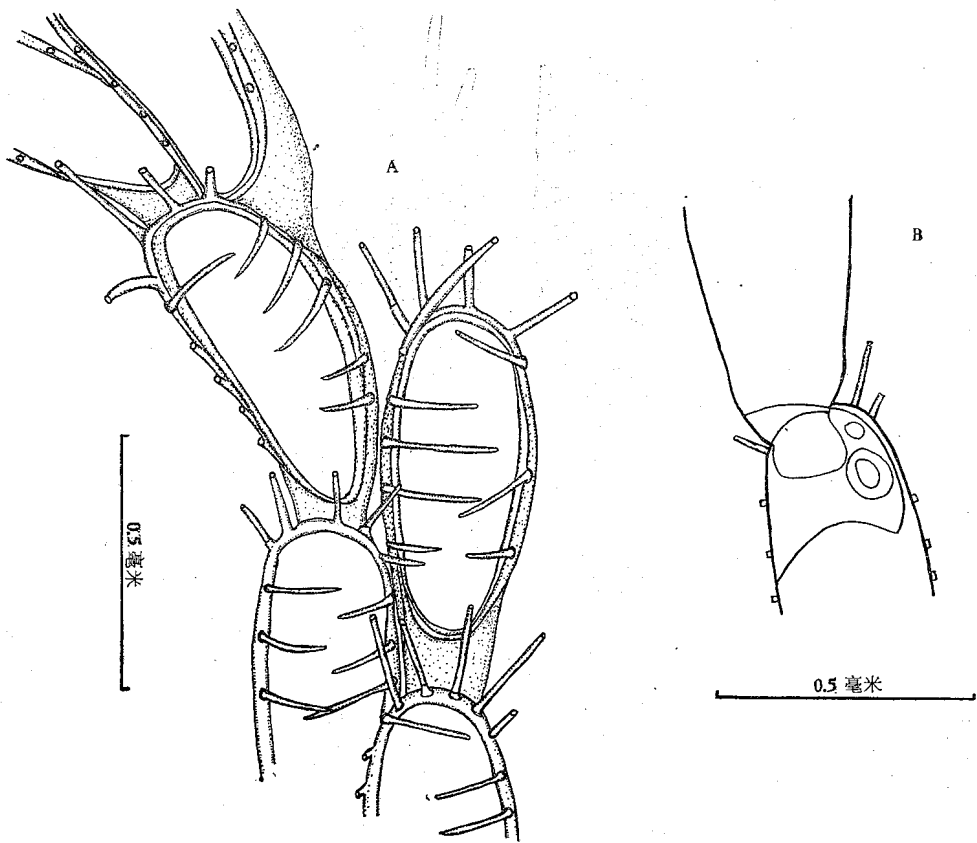


图 45 长刺缢苔虫 *Dendrobeatia longispinosa*

A. 前面观, 示个虫、侧刺、口刺; B. 个虫末端背面观, 示钙化区和两孔板。

属。

标本采集地 渤海北部, $39^{\circ}45'N$, $121^{\circ}15'E$, 水深 45 米, 附在粗糙无鞭苔虫 *Amastigia rudis* 上。

地理分布 美国加利福尼亚南部及圣卡塔林纳群岛; 墨西哥下加利福尼亚等地。中国系首次记录。

VII. 滨苔虫属 Genus *Halophila* Gray, 1843

Halophila Gray, 1843:292 (*vide* Harmer, 1933); Busk, 1852:43; Levinsen, 1909:97; Canu & Bassler, 1929; 195; Bassler, 1953: 181.

Bugula (pars) Harmer, 1926; 450; et auctt (non Oken, 1815).

模式种 长叉滨苔虫 *Bugula johnstonae* Gray, 1843.

群体直立, 分枝由双列个虫构成。分岐方式属于 Harmer 的模式 3。个虫细长, 末端部分粗而宽, 始端部分细而狭, 呈圆柱形, 基部双分叉, 分叉细管形。每一个虫末端重叠在其后续个虫的始端上。前膜小, 卵圆形或长椭圆形。口盖强壮, 半圆形。无鸟头体。卵胞或有或无。

本属有两种, 即长叉滨苔虫 *Halophila johnstonae* Gray, 1843 和长室滨苔虫 *Halophila*

longicauda (Harmer, 1926)。

滨苔虫属与草苔虫属相似。Harmer (1923, 1926) 认为前者是后者的同物异名; 他认为, 尽管草苔虫普通个虫无口盖, 但其异形个虫(鸟头体)是有口盖(颚骨)的, 并指出这两种滨苔虫可能是由典型的草苔虫, 因鸟头体或卵胞退化演化而成。作者同意某些学者意见: 虽然草苔虫异形个虫的颚骨和滨苔虫的口盖是同源的; 但它们都因执行不同的生活机能而在形态上有极大的差别; 口盖的有无仍是这两个属的主要区别特征。根据群体结构、个虫形态以及有口盖、无鸟头体等特征, 我们认为, *Halophila* 应从 *Bugula* (auctt) 中分出, 自成一属。

29. 长室滨苔虫 *Halophila longicauda* (Harmer, 1926) (图 46)

Bugula longicauda Harmer, 1926: 450, pl. 30, figs. 15—16; Silén, 1941: 108.

Bugula johnstonae (not Gray, 1843) Ortmann, 1890: 24, pl. 1, figs. 16a, b;

Halophila longicauda (Harmer) Mawatari, 1965: 606. 74a, b.

群体中等粗壮, 树枝状, 分枝由双列个虫构成, 通常有关节。个虫细长, 末端部分粗而宽, 始端部分细狭, 呈圆柱形。许多个虫始端在其前位个虫端壁附近有一收缢, 收缢处有几丁质关节通过。个虫外顶角有一锥形小刺, 始端背面双分叉; 分叉内叶较短。前膜细长; 长度大大超过宽度, 始端较狭, 约占个虫前区的 2/3。口盖强壮, 膜质, 略呈半圆形。无卵胞 (Harmer 在其原始描述中指出本种有痕迹卵胞, 但我们未发现)。分岐方式属于 Harmer 的模式 3。

标本采集地 东海, 26°23.5'N, 125°58.3'E, 底质为软泥, 水深 2150 米。

地理分布 日本(相模湾)、印度尼西亚等地。在我国系首次纪录。

附记 本种和长叉滨苔虫(见 Harmer 1926: 448, pl. 30, fig. 14; pl. 31, figs. 19—21) 很相似, 但后者卵胞发达, 个虫背面始端分叉内叶极长, 轴个虫沿个虫 F 的始端部分向下延伸; 本种无卵胞(或仅显痕迹), 个虫背面始端分叉内叶极短, 轴个虫的连接突起以 F 的始端为界, 不再沿 F 的始端向下延伸。另一明显区别是本种前膜很长, 长度大大超过宽度, 而长叉滨苔虫的前膜很短, 宽度和长度相差无几。我们的标本与 Harmer (1926) 的描述基本相符, 外顶角锥形, 刺有时强壮, 有时无刺钝圆, 群体呈淡黄色; 触手较 Harmer 的描述(24 根) 为多, 约 30 根, 未发现痕迹卵胞。

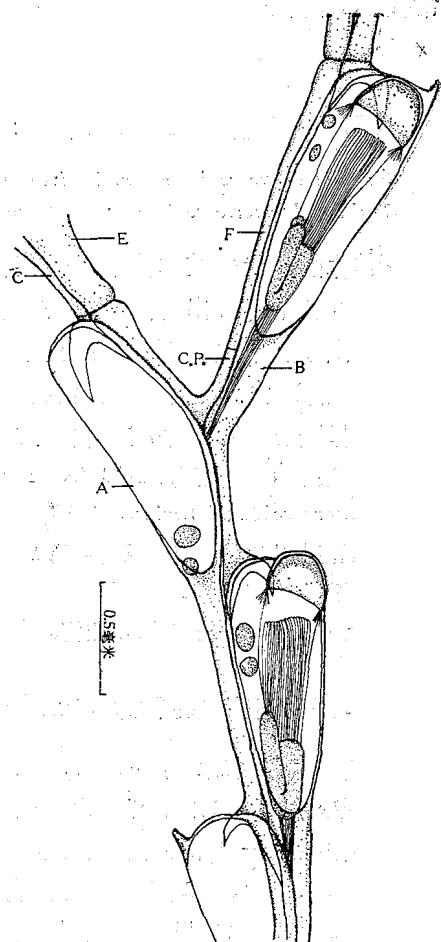


图 46 长室滨苔虫 *Halophila longicauda*
前面观, 示个虫(其中两个虫有端刺、虫体和卵子)和分岐方式

VIII. 茎苔虫属 Genus *Caulibugula* Verrill, 1900

Stirparia Goldstein 1880:75 (*vide* Harmer, 1923); Robertson, 1905: 278.

Stirpariella Harmer, 1923: 317.

Bugula (pars), Levinsen, 1909:101.

Caulibugula Verrill, 1900:593 (*vide* Harmer, 1923); Harmer, 1923:317; 1926:457; Osburn, 1950:160; Maturity, 1966:574.

模式种 武装茎苔虫 *Bugula* (*Caulibugula*) *armata* Verrill, 1900.

群体由扇状分枝的分节的长茎构成。长茎由细长的空个虫 (kenozooids) 组成。空个虫的长度与宽依种而异;每一空个虫都有一细长的前膜、侧壁有钙质加厚。分枝由两列个虫 (很少单列) 交互排列而成,一般排列成扇形。扇形分枝始端第一个虫与其后续个虫不同,初虫型。个虫或为草苔虫型,或双胞胎型。鸟头体或有或无。卵胞属口上型,但通常很小。附根一般由茎部始端的个虫分出;在许多种类,有些附根膨大变态成为泡状体 (vesicles)。

30. 莫顿茎苔虫 *Caulibugula mortenseni* (Marous, 1925) (图 47)

Stirparia mortenseni Marcus, 1925:153 (*vide* Harmer, 1926).

Caulibugula mortenseni (Marcus) Harmer, 1926: 465, pl. 33, figs. 19—22.

群体由扇状分枝和分节的长茎构成。构成长茎的空个虫纤细,长圆柱形。附根由长茎始端的空个虫分出,许多附根常变态成为泡状体。泡状体柄纤细,单生。扇状分枝始端第一个虫为空个虫。分枝由两列个虫组成。个虫细长,外缘略凹。前膜狭长,约占个虫前区 2/3。刺退化,仅显微小刺状突起。鸟头体小,附着在个虫始端裸壁的小突起上,吻和颚骨皆呈长三角形。分枝分歧方式属于 Harmer 的模式 3。

标本采集地 南海, 19°30'N, 112°00'E, 泥质砂海底,水深 120 米,一个完整群体与中国网藻苔虫 *Retiflustra schönaui* Levinsen 生活在一起; 17°00'N, 109°00'E, 泥质砂海底,水深 128 米,一个群体与拟眼尼苔虫丛生在一起。从南海另 10 个采集站(水深 79—115 米)分别采得若干长茎,而分枝部分全都断损丢失。

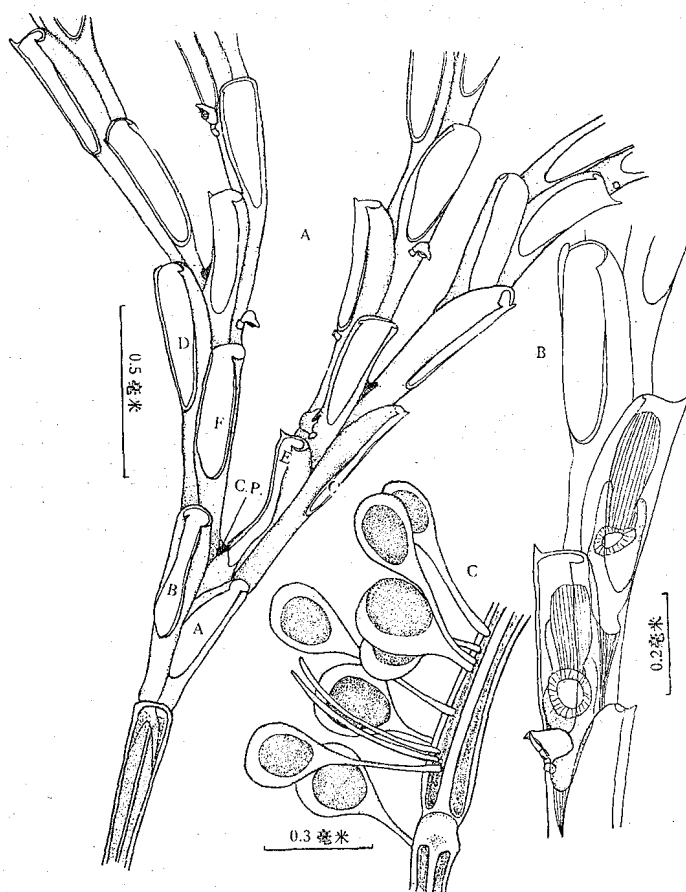
地理分布 巽他海峡、爪哇海。中国系首次纪录。

31. 海南茎苔虫(新种) *Caulibugula hainanica* sp. nov. (图 48—49)

模式标本 标本号: 59BBS007, 1959 年 3 月 20 日采自海南岛南部近海, 18°20'N, 109°00'E, 底质为泥质砂,水深 102 米,两个群体及一根断茎与中国网藻苔虫混生在一起。

群体由一分节的长茎和扇丛状分枝构成,高度可达 30 毫米以上(我们的标本群体高度约为 30 毫米,但茎的基部已被折断丢失),分枝高度约为 15 毫米。分枝部分呈鲜艳的红棕色,长茎部分呈淡黄色,但茎末端呈淡褐色。

长茎系由若干单一的空个虫连续排列而成。位于长茎始端的个虫细而长,向末端个虫逐渐缩短加宽,长茎末端的个虫短而宽,几乎与分枝个虫同形。无论是始端个虫或末端个虫,其两侧缘都向前表面翻卷,前表面都有一细长的前膜,几乎伸至个虫的始端。每一茎

图 47 莫顿茎苔虫 *Caulibugula mortenseni*

A. 前面观, 示个虫、鸟头体和分枝方式; B. 前面观, 示个虫及其虫体、鸟头体; C. 前面观, 示空个虫及其泡状体

个虫的始端与其前位茎个虫的末端都借一锥形构造相连接。锥形构造的前表面十分鼓凸, 背面平坦, 始端双分叉。每一茎个虫的背面两侧各有一钙质加厚, 两钙质加厚在个虫末端相遇, 与后续茎个虫锥形构造始端双分叉的基部相愈合, 而在始端则各与其前位茎个虫的钙质加厚相连接。

值得注意的是, 整个长茎的个虫, 越近茎的始端越细长, 形如一根细长的棍棒, 与茎苔虫 *Caulibugula* 其他种长茎的细长型空个虫相似; 但越近茎的末端, 个虫越变粗加宽, 个虫形状与通常的空个虫不同, 而与分枝个虫相仿。茎末端个虫有虫体。在现有两个标本中, 一根断茎由 6 个个虫构成, 末端四个个虫有虫体, 始端两个个虫细棒形, 无虫体; 另两个群体长茎末端两个个虫有虫体, 其余细棒形个虫无虫体。

分枝始端第一个虫在形状上与分枝个虫基本同形, 因有虫体, 故不是空个虫。在第一个虫背面分出两个交互排列的子个虫, 两列个虫交互排列至第六个虫才参与分枝的分歧。分岐方式属于 Harmer 的模式 4。分枝个虫属草苔虫型, 细长, 稍向外侧倾斜, 外顶角向外突出成锐角, 内顶角圆形, 内侧缘向前表面翻卷而游离, 顶边钝圆, 稍斜向始端。前膜宽广, 占个虫前区 3/4 以上。鸟头体小, 着生在个虫始端裸壁外侧的小柱形突起上; 鸟头膨

胀,凸出;吻极短,末端强钩状;颚骨长三角形,末端无垂尖。无卵胞。附根细而长,由茎部始端的个虫分出。

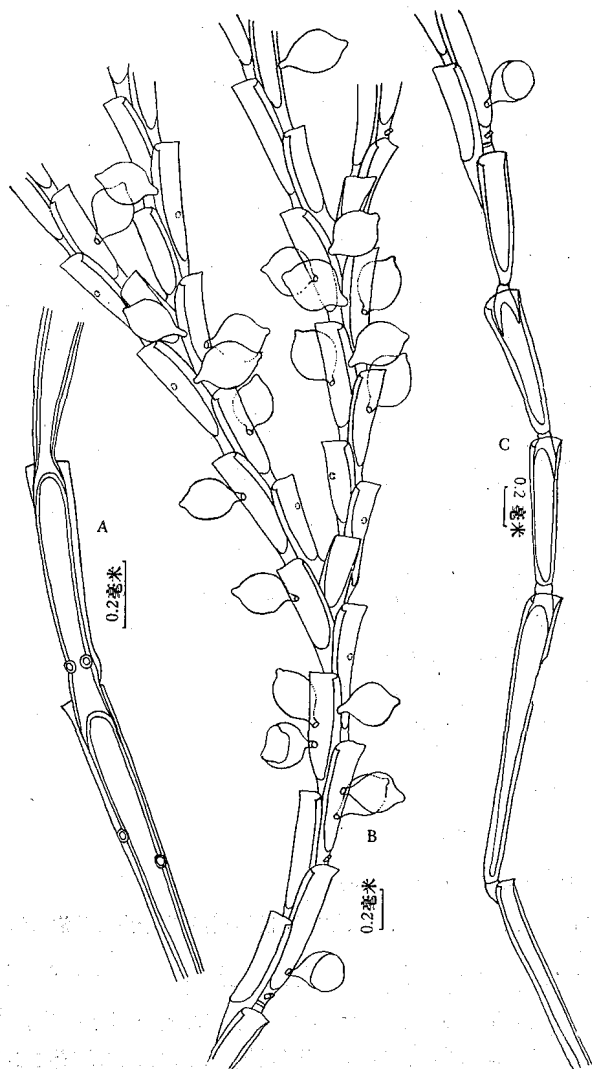


图 48 海南茎苔虫(新种) *Caulibugula hainanica* sp. nov.

A. 茎个虫背面观,示钙质栅和泡状体附着痕; B. 分枝前面观,示个虫和泡状体; C. 前面观,示末端茎个虫和分枝始端第一个虫

在分枝背面,两个虫列之间有一条较粗的纵向钙质脊;每一个虫背面外侧都有一钙质加厚。此钙质加厚当延伸至个虫始端后又斜向上方,与纵向钙质脊相连接;在个虫末端,此钙质加厚沿个虫顶边伸向枝背中央,与纵向钙质脊相愈合。

在分枝始端和中部——分枝第一、第二次分岐处附近,几乎每一个虫都有 1—2 个泡状体。多数泡状体着生在个虫背面外侧,少数长在该虫前面内侧。泡状体呈梨形,柄粗而短,在自由缘与柄对应的一端有一乳头状突起。长茎部分未发现泡状体,但在有的茎个虫背面有明显的泡状体附着痕迹,表明泡状体已脱落。

讨论 这一新种在群体外形及个虫与泡状体的形状上与莫顿茎苔虫 *C. mortenseni* Marcus, 1925 有些相似,但其分枝个虫外顶角呈锐角,背面有钙质加厚,分枝个虫与茎个虫都有泡状体,泡状体柄短而粗,柄的对应端有乳头状突起;而莫顿茎苔虫的分枝个虫外顶角常呈圆形,背面无钙质加厚,泡状体仅分布在茎部,其柄细而长,柄的对应端无乳头状突起。

Harmer (1926:442, 443) 在讨论挺草苔虫的柄部特征时曾指出:“挺草苔虫在揭示茎苔虫属之长茎的进化方式上是很有价值的。”象挺草苔虫那样,“由那些具有钙质栅的虫室(个虫)构成的单列长柄,乃是茎苔虫侧壁有钙质加厚的单列空个虫构成的长茎之演化起点。”从挺草苔虫和东方草苔虫(新种)的柄部都具有钙质加厚这一特殊的特征,我们可以推测:茎苔虫之由侧壁具钙质加厚的单列空个虫构成的长茎,或许是由类似挺草苔虫,或东方草苔虫(新种)的草苔虫型祖先的单列长柄演化而来;这种草苔虫型祖先具有一根单列的长柄,柄个虫具有与挺草苔虫或东方草苔虫(新种)相类似的钙质栅。

如上所述,海南茎苔虫(新种)的茎个虫越近茎的末端越变粗加宽,形状与通常的草苔

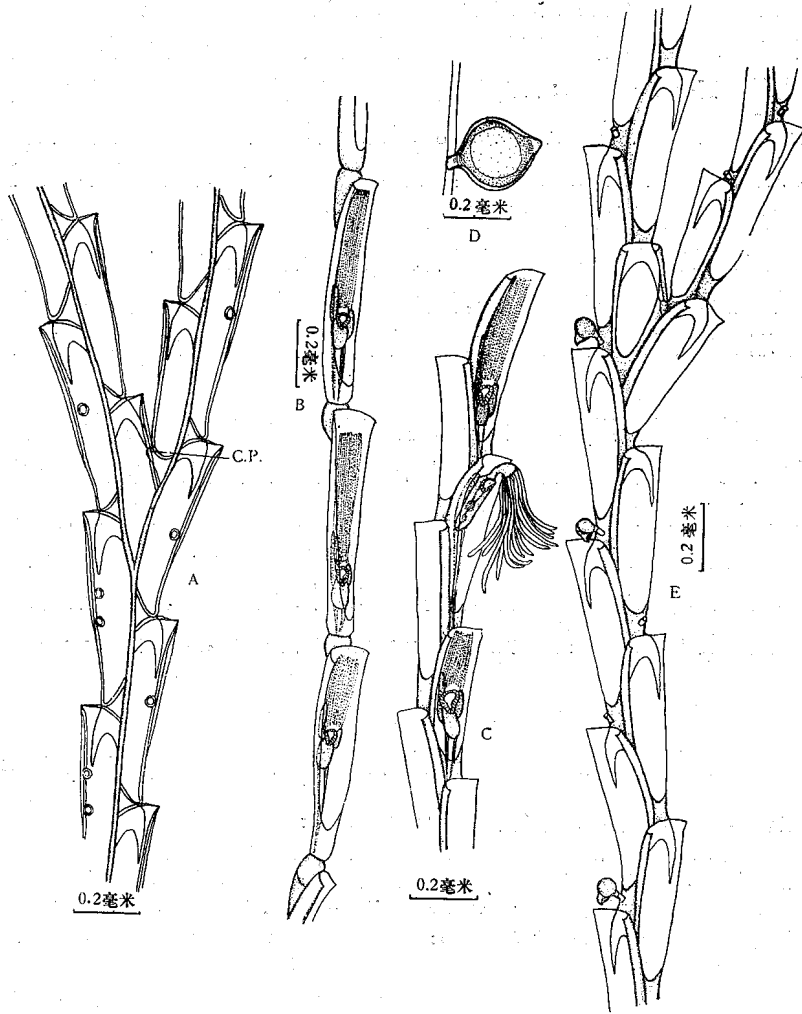


图 49 海南茎苔虫(新种) *Caulibugula hainanica* sp. nov.

A. 分枝中部背面观, 示分岐方式、纵向钙质脊和侧钙质栅; B. 茎的侧面观, 示末端三个虫有虫体; C. 分枝前面观, 示三个虫体, 其中一虫体触手冠已伸出体外; D. 一放大的泡状体; E. 分枝前面观, 示个虫和鸟头体

虫型个虫相似, 而始端的茎个虫则与其他茎苔虫的细长形空个虫相近。无论茎个虫或分枝个虫, 都有和挺草苔虫或东方草苔虫(新种)相类似的钙质加厚(在功能上与钙质栅相同); 而且在群体结构上, 海南茎苔虫(新种)完全与其他茎苔虫相同(由一根长茎和扇丛状分枝构成)。因此, 如果说挺草苔虫和东方草苔虫(新种)反映了由草苔虫向茎苔虫发展的演化起点, 那么, 新种海南茎苔虫则表明这一演化进程已到达演变为茎苔虫型的阶段, 它已具备了通常茎苔虫所固有的群体结构。

在现代苔藓动物的分类研究中, 一般认为群体结构类型的意义不大, 因为相似的群体结构类型(如网状群体和枝状群体)会平行出现在不同的种或属, 甚至不同的科或目中。但是在茎苔虫属中, 无论是具有草苔虫型个虫的种类(如莫顿茎苔虫)或者具有双胞型个虫的种类(如桑给巴尔茎苔虫 *C. zanzibariensis* (Waters, 1913)), 它们的群体都由两部

分——单列空个虫构成的长茎和两列个虫交互排列而成的扇丛状分枝组成。因此，茎苔虫的群体结构在分类上是值得重视的形态特征，由单列空个虫构成的长茎是具有属级价值的分类性状(见 Harmer 1926:457)。新种海南茎苔虫已具备了茎苔虫属所固有的群体结构，但仍保留草苔虫型个虫的某些特征。综合艇草苔虫、东方草苔虫(新种)和海南茎苔虫(新种)的群体结构和个虫的形态特征，似乎可以推断：茎苔虫是由草苔虫演化而来，而海南茎苔虫(新种)是茎苔虫属的原始种类。

在茎苔虫属的所有已知种类中，凡是有泡状体的种类，泡状体都只分布在它们的长茎部分，长在空个虫上。但异常奇特的是，海南茎苔虫(新种)的泡状体却主要集中在扇状分枝的中部和始端。由于泡状体的生理功能至今尚未搞清楚，因而，难以确切解释这种奇特的现象。

众所周知，泡状体是由附根膨大而成。茎苔虫附根由茎部空个虫分出，分枝部分不分出附根，因此，泡状体只长在茎部空个虫上。在由草苔虫向茎苔虫演化的进程中，分枝个虫的某些附根或许也饰变为泡状体，因而出现了象海南茎苔虫(新种)那样泡状体，主要集中在分枝部分的奇特现象，这反映了该种的原始性。随着进一步演化，分枝部分的附根完全消失，群体附着的功能完全由茎部空个虫分出的附根来承担，因而茎苔虫属的其他种类，凡有泡状体者，都只限于茎部。然而，这一推测是否正确，还有待进一步研究。

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ON SPECIES OF FAMILY BICELLARIELLIDAE (BRYOZOA) FROM THE CHINESE SEAS*

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ABSTRACT

The present paper deals with 8 genera and 31 species of the family Bicellariellidae Levinsen 1909 collected from the Chinese seas. One genus and nine species are new to science, and sixteen species are recorded for the time from our seas. The type specimens of these new species are all deposited in the Institute of Oceanology, Academia Sinica (Qingdao). The genera and species described in this paper are as follows (those marked with an asterisk are recorded for the time from China).

I. *Beania* Johnston, 1840

- (1) *Beania discordermiae* (Ortmann, 1890)*
- (2) *B. spinigera* MacGillivray, 1859*
- (3) *B. aspinosa* sp. nov.
- (4) *B. petiolata* Harmer, 1926*
- (5) *B. regularis* Thornely, 1907*
- (6) *B. hirtissima* (Heller, 1867)*
- (7) *B. intermedia* (Hincks, 1881)*
- (8) *B. mirabilis* Johnston, 1840

II. *Bugulella* Gray, 1879

- (9) *Bugulella sinica* sp. nov.

III. *Falsibugulella* gen. nov.

- (10) *Falsibugulella sinica* sp. nov.

IV. *Bicellariella* Levinsen, 1909

- (11) *Bicellariella sinica* sp. nov.
- (12) *B. gracilis* (Busk, 1852)*

V. *Bugula* Oken, 1815

- (13) *Bugula neritina* (Linnaeus, 1875)
- (14) *B. robusta* MacGillivray, 1869*
- (15) *B. dentata* Lamouroux, 1816
- (16) *B. vectifera* Harmer, 1926*
- (17) *B. orientalis* sp. nov.
- (18) *B. scaphoides* Kirkpatrick, 1890

* Contribution No. 746 from the Institute of Oceanology, Academia Sinica.

- (19) *B. subglobosa* Harmer, 1926*
- (20) *B. californica* Robertson, 1905
- (21) *B. pacifica* Robertson, 1905*
- (22) *B. aspinosa* sp. nov.
- (23) *B. intermedia* sp. nov.
- (24) *B. pugeti* Robertson, 1905*
- (25) *B. flabellata* (J. V. Thompson, 1847)*
- (26) *B. calathus* Norman, 1868*
- VI. *Dendrobeatia* Levinsen, 1909
- (27) *Dendrobeatia sinica* sp. nov.
- (28) *D. longispinosa* (Robertson, 1905)*
- VII. *Halophila* Gray, 1843
- (29) *Halophila longicauda* (Harmer, 1926)*
- VIII. *Caulibugula* Verrill, 1900
- (30) *Caulibugula mortenseni* (Marcus, 1925)*
- (31) *C. hainanica* sp. nov.

Diagnoses of new genus and new species

1. *Falsibugulella* gen. and sp. nov.

Falsibugulella gen. n. sp. nov.

Colonies erect, not articulated, supported by the rotlets. Branches composed of a single row of zooids. Zooids elongated, in flated distally, tubular proximally, forked basally. Frontal membranes small, oval and with many fine spines. Opercula, avicularia, and vibracula absent. Ovicells hyperstomial, sessile. Colonies formed by means of ultimate distal budding or lateral distal budding of a zooid.

Type species: *Falsibugulella sinica* sp. nov.

Remarks This new genera is similar to *Bugulella* Verrill 1879 in the shape of its zooids which have an expanded distal portion and a tubular proximal portion, but different from the latter genus in having no articulations between the parent zooids and the daughter ones and having no avicularia. It bears a resemblance to *Bugula* Oken 1815 in the forking of the proximal end of the dorsal surface of a zooid, but is different from that genus in having many fine spines around the frontal membranes. Therefore, this new genus has a position between *Bugulella* and *Bugula*.

With regard to the systematic position of *Bugulella* in the Cheilostomatous suborder Anasca, it must be transferred from Superfamily Scruparinoidea to Superfamily Cellularinoidea and referred to Bicellariellidae, on the basis of the fact that none of its members shows the frontal budding and that they have hyperstomial ovicells and pedunculate avicularia.

Falsibugulella sinica sp. nov. (text-figs. 22—24)

Colonies are erect and not articulated. Branches are composed of a single row of zooids. Zooids are elongated, inflated distally, tubular proximally and forked basally to the dorsal surface. Frontal membranes are small in size and oval in shape, located at the distal end of a zooid, and occupying one third or more of the surface of the front; mural rims are thicker and raised. Cryptocyst wanting, gymnocysts well developed. There are 6—9 fine spines around the frontal membrane of a zooid, 2 of which are situated below the frontal membrane,

and always obliquely directed distally, 2—4 are located at its distal margin and directed outside, but sometimes curved inwards. Ovicells are hyperstomial, slightly broader than long, attached on the distal extremity of a zooid; space between ectooecium and entoecium is very narrow, the frontal surface of the entoecium is smooth and convex; the oopore is directed proximally. The rootlets are usually given off from the three points of a zooid: dorsal rootlet at the dorsal side of distal end, lateral rootlet at the lateral side of distal end, and frontal rootlet near the proximal end. The dorsal rootlets are always present, the lateral and frontal ones usually present. Sometimes an additional frontal rootlet may be found at the inferior side of the frontal membrane, and an additional lateral one at the proximal end. Polyptides are small, and tentacles are about 14.

The daughter zooids are given off from the dorsal surface of the distal end of the parent zooids and the uniserial branches are usually formed by means of the terminal budding given off from the distal extremity of the parent zooids. The mode of furcation is very particular: the two lateral terminal buddings usually sprung off from the dorsal surface, the two budding (daughter zooids) making up separately the terminal branches; sometimes, an additional terminal budding occurs between the two lateral buddings, with the result that the trifurcated uniserial branches given by a parent zooid appear. This trifurcation is not found in all the cellularinoid genera such as *Corynoporella*, *Bugulella* and *Erymophora*, etc.

2. *Beania aspinosa* sp. nov. (text-figs. 10—12)

Colony reticulated, yellowish in colour. Fenestra moderately large, equal to or slightly smaller than the length of a zooid, their width narrower than that of a zooid, sometimes more than one half of the latter. Connecting tubes six; the chitinous joints of the distal and disto-lateral ones very near the zooid, those of the proximal and latero-proximal ones farther away from it. Zooids elongated, smaller than those of *B. discordermiae* (Ortmann); their expanded distal part ovoid, occupying almost the whole surface of the zooid, extremely small proximal part being narrowly tubular in shape, expanding gradually into the distal expanded part. The latter is longioval, broader proximally than distally, its distal end obtusely round without a constriction, and its middle portion is broader proximally. Frontal membranes large, longioval, slightly broader in the middle, narrower at the distal end, laterally symmetrical. Opercula small, nearly semicircular. There are 4—5 spine-like processes on the distal edge of the orifices, and no lateral spines in the sides of the frontal membranes with the exception of a few zooids which have 1—2 vestigial spines. Avicularia are large, their attachment plane is on the same level with the base of the operculum, single for most zooids but sometimes paired (one on either side) for a few zooids. Their size is not uniform. The head greatly raised, typically subglobose, the rostrum elongated, laterally symmetrical, without a serration at sides and with a deep depression on its profile, hooked strongly at the end, and two spinules placed straightly near the middle. There are lateral and dorsal rootlets, the former sprung off from the middle between the latero-proximal connecting tubes and the proximal ones, sometimes another rootlet on the side slightly distal to the lateroproximal tubes. The dorsal rootlet given off from the dorsal middle line slightly distal to the same level as the disto-lateral tubes, but sometimes without the dorsal ones. Ovicells are not found.

This new species is similar to *Beania discordermiae* (Ortmann). The differences between them are: the present species has no ovicells, and the profile of the avicularia is very concave, their head greatly convex, their mandible has two spinules placed near middle and with a straight spike in the end; the latter species has vestigial ovicells, 6—8 lateral spines at each

side of the frontal membrane, and the profile of the avicularia is slightly concave, the head is slightly convex, the mandible has only the terminal spike. The comparative morphology of this new species, *B. discordermiae* (Ortmann) and *B. spinigera* MacGillivray is given in table 1. It is possible perhaps that *B. aspinosa* sp. nov. and *B. spinigera* are probably derived from *B. discordermiae* (Ortmann), the first species having developed in a spineless way, the second species having developed along the multispinous direction (see table 1).

3. *Bugulella sinica* sp. nov. (text-figs. 20—21)

Colonies are erect bushy tufts. Every zooid consists of a short distal portion and an elongate proximal tube. The latter is very long, approximately 1—1½ the length of the former. Frontal membranes are almost oval, broader in the middle portion, narrower at the two ends, occupying most of the frontal surface of the distal expanded portion. Mural rims are thin, very raised. There are thin cryptocysts. Around the frontal membrane there are many spines, i.e., one shorter spines on each side of the orifice, and three lateral ones on each side of the frontal membrane, another two slender spines on its proximal end are directed distally. Except for the fertilized zooids, almost every zooid has a pedunculated subglobose avicularium at its summit; head is subglobose, rostrum and mandible are short, the latter is triangular. Ovicells well-developed, smooth, longer than broad, located on the summit of the zooids. Rootlets given off from the side of the proximal end of the expanded portion. There are two distal roset plates, one lateral roset plate, and 4—5 small pores on the lateral wall of the expanded portion.

This new species is interesting in the growth habit of its colonies. The expanded portion of a zooid is connected with the tube-like portion of its preceding one by a narrow chitinous joint. A zooid is succeeded continuously by three zooids and gives off a lateral zooid at one or another side of its expanded portion. The third of the above-mentioned continuous successors gives rise to a distal and a lateral buddings in the same way. Owing to such repeated growth, colonies appear like complicated bushy tufts. This new species is similar to *B. australis* Hayward et Cook 1979 in form of its zooids having narrow cryptocyst and general appearance of spines, but is different from the latter species by its opercula being semicircular instead of semi-elliptical, by its ovicells being smooth and without small pores, especially by its having no tubular bridge between the lateral budding of a mother zooid and preceding zooid of the mother zooid.

4. *Bicellariella sinica* sp. nov. (text-figs. 25—27)

Colony emanates from a long peduncle which consists of two rows of the alternatively arranged tubinate zooids. Around the frontal membranes of these peduncle-zooids there are 10—12 short spines. Rootlets are given off from the base of colony, the end of several rootlets expand into a grape-like structure to form a membranous attachment disc by which colony attached on the substratum.

The branches consist of two rows of alternative zooids. Every zooid is divided into three well-defined sections by two chitinous joints, the distal section expanding and being turbinate, moderately prolonged outwards. Frontal membrane is circular or ovoid, in the latter case rather narrower proximally. Ovicells typically broader than long, lying directly on the first section of a zooid, attached on the inner distal corner of that section, and the aperture faces dorsally or proximally.

The mode of bifurcation is similar to Harmer's type 4 and to that of *B. levenseni* Harmer 1926 in the fact that the axillary zooid well projects in the axil. The axillary zooid diff-

ers from the ordinary zooids in the symmetry of its frontal membrane and spines. The spines are one dorsal on its distal summit, two lateral ones symmetrically arranged at sides distal to the proximal end of the frontal membrane, and another frontal spine at the proximal end of the frontal membrane.

This new species bears a resemblance to *B. levenseni* Harmer 1926 but differs from that species in its spines being not divided into two groups of the distal and proximal ones, and its having no avicularia which are typical of the latter species.

5. *Bugula orientalis* sp. nov. (text-figs. 41—44)

Colony is composed of a long stalk and a dichotomous branch, 20 mm high, the length of the stalk is about 15 mm. This long stalk consists of two rows of alternatively arranged zooids which are almost the same in both shape and size as the branch-zooids. The stalk-zooids are strongly calcified with the exception of the zooids distal to the stalk. At the dorsal surface of the stalk, there is a longitudinal calcareous ridge between the two zooidal rows; the dorsal surface of every stalk-zooid is also strengthened by a calcareous bar, the distal portion of which is fused with the base of the proximal fork of the succeeding zooid, and is connected with the longitudinal ridge at its inner side, whose outer lateral portion is depressed inward into a crescentic shape, extended outward proximally and turned obliquely up, and connected with the ridge. From the external side of the dorsal surface of the stalk-zooids are given off many rootlets of varying diameters which extend downward to the proximal end of the stalk; the coarser ones are expanded at their ends into oblong or elliptical structures, around which many spine-like processes are found. The distal portion of the long stalk and the dichotomous branches are very soft. The branches are composed of two rows of alternately arranged zooids. The zooidal rows face outward, resulting in the slight convexity of the central portion of the branches. Zooids are not of the same size, the axillary zooid being especially small, about half the size of the other zooids. Most of zooids are elongated, their distal ends are obliquely and outwardly extended, their outer margins are usually oblique and depressed proximally, their inner margins convexed, their sides rolled toward their surface, their distal border round, their proximal portion are tubular. Frontal membranes are narrower and elongate, middle portion broad tapering the proximal and distal ends. No spines are found. Avicularia are pedunculated, small, attached on the tubercle of the outer side of the zooidal proximal gymnocyst; their head is more or less subglobose, a little inflated, their profile is concave, their rostrum is shorter and hooked at its end, their mandible is elongated triangular and without a straight spike at its end. Most of the avicularia are lost, but the tubercles by which they are attached are visible. No ovicells are found. The mode of bifurcation follows that of Harmer's type 4. Only the axillary zooid has its frontal membrane entirely in the frontal plane, the others having these planes inclined.

Among the known species of the genus *Bugula*, it is *Bugula vectifera* Harmer 1926 that there are the calcareous bars at both branch-zooids and stalk-zooids (see Harmer 1926: 442, pl. 3, figs. 1—6). Just like *B. vectifera*, the colony of this new species consists of a long stalk and of biserial branches. It is similar to that species in its stalk having the calcareous bars, and different from that species in its branch-zooids and the distal portion of the stalk having no such bars. This new species also bears a resemblance to that species in having many rootlets given off from the outer side of the dorsal surface of every stalk-zooid, but differs from that species in its rougher rootlets which are expanded at their ends into oblong or elliptical structures around which many spinous processes occurred. The branch-zooids of

this new species are very different from those of *B. vectifera* in that their corner is round.

6. *Bugula aspinosa* sp. nov. (text-figs. 55—59)

Two colonies of this species virtually have lost their base. The colonies are soft, transparent, yellowish in colour except the part near the base, which is yellow-brown in colour. Branches consist of two rows of alternative zooids, with distal ends curved slightly towards their frontal surfaces.

Zooids are elongated, their sides are involved slightly inwards and free laterally, broader slightly distally than proximally, the distal margin ovoid and proximal end being tube-like. Frontal membranes broader, occupying more than two thirds of the surface of the front. The zooids near the base are more or less arranged back to back, their distal end sloping obliquely outwards. No spines are found. Avicularia are situated at a tubercular process on the outer side of the proximal gymnocyst of every zooid. Avicularia are of two sizes, the bigger ones are usually 3—4 times that of the smaller ones, the profile slightly concave, their head extremely convex, their rostrum is typically boat-shaped and is hooked strongly at the end, their mandible is longitriangular and has a slender straight spike. The usual avicularia are small and of the elongated type, their head less raised, their profile straight, the end of rostrum is hooked, the mandible is simple, triangular without terminal spike. Owing to the projection of the avicularia beyond the margins of the branches, the outline of the colony is serrated. Ovicells are not found. The mode of bifurcation follows that of Harmer's type 4.

This new species can easily be distinguished from the known species of the genus *Bugula* by its absence of spines and by the varying size of the avicularia. The form of the avicularia is similar to that of *Bugula dispar* Harmer 1926, but the latter species bears distal spines and its avicularia are situated at the distal position of a zooid.

7. *Bugula intermedia* sp. nov. (text-figs. 60—64)

Colony emanates from a long peduncle being 7 mm in length, of which the distal part is visibly consisting of two rows of alternative zooids, and the remaining part is entirely covered by draping rootlets grouped densely. The peduncle-zooids are of the same shape as that of the ordinary ones, but are strongly calcified, and are almost arranged back to back. Rootlets are given off from the peduncle-zooids and the ordinary zooids near the base of the peduncle where they are so repeatedly divided into many minute branches as to form a bushy tuft by which the colony attached itself on the substrum. The branches are extremely soft and long, usually rolling up along the frontal surface into concentric circles, therefore, giving the colony a flowery tuft appearance. The colony is transparent except at the base of its branches, the base and the peduncle being yellow-brown in colour. A complete colony is 25—30 mm in height.

The branch consists of two rows of alternative zooids. The latter is prolonged, slightly broader distally than proximally, their middle portion being broadest, their outer margin slightly depressed, their distal end sloping outwards, their inner and outer distal margins are obtusely round, their distal border is round and slightly lifted towards the frontal surface, their inner margin raised slightly and rolled inward to become free. Frontal membranes elliptical, attenuated toward the proximal end, occupying more than two thirds of the surface of the front. A pedunculated avicularium is placed on the tubercle of the proximal gymnocyst of a zooid. The stalks are variable in length, one third to one half the length of an avicularium. Sometimes it is at the distal end of a branch where a long stalked avicularium

is found, which is larger in size and wider in diameter, whose stalk has the same length as an avicularium and is a small ball in shape, and has a wider base (it connecting a zooid) and a narrower end (it connecting the avicularium itself). The usual avicularia are of the elongate type, their heads less raised and are at the same level as the rostrum, the profile is straight, the rostrum is hooked at its end, the mandible is longitriangular. This elongated avicularium is sometimes replaced by a large one whose size is three times that of the ordinary avicularia. The head of this large avicularium is inflated but less raised, the rostrum being extremely short and hooked at its end, mandible triangular with slender straight spike at the end. No ovicells are found.

One peculiar feature of this new species is its movable long stalked avicularia. In regard to this peculiarity, the present species bears a resemblance to those of the genus *Camptoplites*. However the proximal fork of a zooid characteristic of buguloid species is also found in this new species, and as compared with *Camptoplites* the stalks of the avicularia are extremely short. It is perhaps possible that this new species seems to present an intermediate form between *Bugula* and *Camptoplites*.

8. *Dendrobeatia sinica* sp. nov. (text-figs. 75—78)

Colonies are yellowish or orange-yellow in colour, recumbent, instead of erect, flabellate or irregular in form, composed of multiserial zooids, attached on rocks by means of dorsal rootlets. Each zooid consists of a proximal tubular portion and a distal expanded portion. Most of the tubular portion of a zooid is covered by the distal end of the expanded portion of the preceding zooid. The expanded portion is boat-shaped. A frontal membrane occupies most of the frontal surface of the expanded portion. Orifices and opercula are semicircular, and opercula have a proximal border which is slightly curved inwards and arched outer margin which is thickened. Distal and lateral spines are robust. The distal spines are directed toward the distal ends. There are two distal spines on a fertilized zooids, two or four on an unfertilized ones. As a rule, there are five outer lateral spines, three or four inner ones. All the lateral spines are perpendicular to zooidal surfaces at their base and curved inwards and covered above the frontal membranes. There is a large calcareous area on the dorsal surface of the expanded portion of each zooid, the area occupying most of the dorsal surface of the expanded portion of the each zooid. It is on the area where there are two lateral roset plates and a large distal one, proximal lateral roset plate being larger than distal one. There are two kinds of stalked avicularia. The avicularia located at central zooids are smaller and attached on large cylindrical tubercles of proximal tubular portion. Marginal avicularia are larger, and attached on lateral tubercles of the proximal ends of the expanded portion. Both the central avicularia and the marginal avicularia are subglobose. Their rostra and mandibles are triangular, and have a strongly hooked end. Ovicells are of hyperstomial type, subglobose, larger wide than long, their frontal surfaces are convex and marked with many radiate lines. From the distal dorsal surface of the expanded portion of each zooid a slender rootlet is given off, by these dorsal rootlets colonies are attached on substrata.

This new species is similar to *D. murrayana* (Johnston, 1847) in general appearance of zooids, but different from the latter species by 1) its colony being recumbent instead of erect; 2) its ovicells which are larger wide than long instead of larger long than wide; 3) its rostra and mandibles being strongly hooked; 4) its dorsal calcareous area being very large, and 5) its rootlets which are given off from each zooid instead of only proximal zooids.

9. *Caulibugula hainanica* sp. nov. (text-figs. 84—91)

Colony consists of a jointed stem and fan-like branches, more than 30 mm in height. The branches are very long, about half the length of a colony, are of a fresh reddish-brown colour, and the stem is yellowish with the exception of its distal portion which is brownish. The stem is composed of a single row of zooids. The stem-zooids proximal to the stem are much elongated, shortening and increasing gradually in width toward to its distal end, and its distal stem-zooids are shorter and wider and are almost of the same shape as the branch-zooids. Both the proximal stem-zooids and the distal ones are involved toward their frontal surface in their lateral margins and at their frontal surface have a much prolonged frontal membrane extending almost to their proximal end. The proximal end of every stem-zooid is connected with the distal end of its preceding one by a conical structure which is convex frontally but flat dorsally, and forked proximally. The lateral margins of the dorsal surface in every stem-zooid are strengthened by a lateral calcareous thickening. Distally the two lateral calcareous thickenings are united and fused with the base of the proximal fork of the conical structure of the succeeding zooid, and proximally either of them is connected separately with a lateral calcareous thickening of the preceding stem-zooid.

It is worthy of emphasizing that as far as the stem is concerned, the nearer the stem-zooids are to its proximal end, the longer they are, forming stick-like elongations which are similar to the prolonged kenozooids of other caulibuguloids. But the nearer they are to the distal end of the stem, the shorter and wider they become. They are different from normal kenozooids but similar in shape to the branch-zooids. The stem-zooids distal to the stem have a polypide. Of the three specimens, one is a fragment of a stem, composed of six zooids, the four distal to it have a polypide each, the others have no polypide. The other two specimens are colonies consisting of a stem (its base being lost) and fan-like branches, only the distal two zooids of the stem have a polypide each.

The first zooid of the proximal end of the fan-like branches is of the same basic shape as the branch-zooids. It is on the dorsal surface of the first zooid that the two daughter zooids arranged alternately are given off, the sixth alternative zooid taking part in the bifurcation of the branches. The mode of bifurcation follows that of Harmer's type 4. The branch-zooids are elongated, are of *Bugula*-type. They are sloped slightly outward. Their outer distal corner is projected outward into an angular shape, their inner distal corner is round, their lateral margins are involved toward the frontal surface and free. Frontal membranes are wide, occupying more than three fourths of the front. Avicularia are small and attached on a columell-like process of the outer side of the proximal gymnocyst; their head is inflated and very convex; their rostrum is very short and hooked strongly at its end; their mandible is elongate triangular without a straight spike at its termination. No ovicells are found.

The rootlets are delicate and long, and given off from the proximal zooids of the stem. It is on the dorsal surface of the branches that a longitudinal calcareous ridge between the two zooidal rows is found. At the outer side of every zooid there is a calcareous thickening. After extending to the proximal end of a zooid, this lateral calcareous thickening is sloped toward the anterior and connected with the longitudinal calcareous ridge; at the distal end of the zooid the calcareous thickening is extended to the centre of the dorsal surface of a branch along the distal border of the zooid and is fused with the ridge.

It is on the proximal end and the middle portion of the fan-like branches (near their first and second bifurcations) that one or two vesicles are found in each of the zooids. Most of the vesicles are attached on the outer side of the dorsal surface of the zooids, a few on

the inner side of their frontal surface. The vesicles are pyriform, have a stalk being short and bigger in diameter and papilla-shaped process at the end opposite to the stalk. No vesicles are found at the stem, but the marked attachment scars left after they are lost are visible on the dorsal surface of some stem-zooids.

This new species bears a resemblance to *Caulibugula mortenseni* Marcus 1925 in the outline of its colony and in the shape of its zooids and vesicles. In this new species the outer distal corner of its branch-zooids is angular, on the dorsal surface of the zooids the calcareous thickenings occur, the vesicles are found on both the branch-zooids and the stem-zooids, and the stalk of the vesicles is short and bigger in diameter. But in *C. mortenseni* the outer distal corner of its zooids is round, the dorsal surface of the zooids has no calcareous thickenings, the vesicles are limited to the stem, the stalks of the vesicles are elongated and do not have the papilla-like processes which are very conspicuous in *Caulibugula hainanica* sp. nov.

While discussing the characters of the stalk of his *Bugula vectifera*, Harmer (1926: 442, 443) had pointed out that “*B. vectifera* is of interest as suggesting the mode of evolution of the stalk of *Caulibugula*.” “A uniserial stalk composed of zooids with calcareous bars of the kind...” of *B. vectifera* “would form a suitable starting point for the evolution of the stalk of *Caulibugula*, with its uniserial kenozoecia provided with lateral calcareous thickening.” From the characteristics of the long stalk of both *Bugula vectifera* and *Bugula orientalis* sp. nov., it may be presumed that the long stem of *Caulibugula*, with its uniserial kenozooids provided with the lateral calcareous thickening, is derived from the uniserial stalk of such buguloid ancestors as *B. vectifera* or *B. orientalis* sp. nov. This buguloid form had the uniserial stalk composed of zooids with the calcareous bars of the kind described above.

From the above-mentioned it is known that, as far as the stem of *Caulibugula hainanica* sp. nov. is concerned, the nearer the stem-zooids are to its distal end, the more they are shortened and widened. Their shape is similar to normal buguloid zooids, but the proximal stem-zooids bear a resemblance to the elongated kenozooids of the other species of *Caulibugula* in shape. Either its stem-zooids or its branch-zooids have the calcareous thickenings (they are similar to calcareous bars in function). Moreover, *Caulibugula hainanica* sp. nov. is already provided with the same colonial construction as the other caulibuguloids, consisting of a stem composed of a single row of zooids and the fan-like branches. Therefore, if the morphological characteristics of *B. vectifera* and *B. orientalis* sp. nov. have reflected the starting point of the evolution from buguloid form to caulibuguloid ones, the morphological ones of *Caulibugula hainanica* sp. nov. would have suggested this evolution progressing to a higher step where the buguloid ancestor had evolved into the caulibuguloid forms which presented the colonial construction characteristic of *Caulibugula*.

It is well-known that in the modern systematic study on Bryozoa there is an inclination of disregarding the colonial construction patterns, because of the fact that the same colonial patterns (such as retiform colonies and cellularine ones) may separately occur in distinct species or genera or even in distinct families or orders. However, in *Caulibugula*, whether those species which have the zooids of the *Bugula*-type, such as *C. mortenseni* Marcus, or those species which have the zooids of the *Bicellariella*-type, such as *C. zanzibariensis* (Waters), their colonies are composed of two parts—a stem consisting of the uniserial kenozooids and the fan-like branches arranged alternately by the two rows of zooids. The colonial construction of *Caulibugula* is obviously worthy of consideration systematically and

the peculiar stem consisting of the uniserial kenozooids may be considered to be a systematic characteristic of generic value (see Harmer 1926: 457). From the colonial constructions and the zooidal morphological characters of *B. vectifera*, *B. orientalis* sp. nov. and *Caulibugula hainanica* sp. nov., it can be presumed that *Caulibugula* is derived from *Bugula*, and *C. hainanica* sp. nov. seems to be a primitive species of *Caulibugula*.

Among the known species of *Caulibugula*, if vesicles are present, they are restricted to the stem, that is, the vesicles are attached on the kenozooids. It is, however, strange that the vesicles of *Caulibugula hainanica* sp. nov. are mostly concentrated in the middle and proximal portions of the fan-like branches. This special arrangement is hard to explain as the physiological function of the vesicles has been not yet understood up to now. It is a well-known fact that the vesicles are given off from the kenozooids which give rise to a stem, and no rootlets are found in the fan-like branches, resulting in the concentration of the vesicles to the stems. Among the species of *Bugula*, the rootlets are usually given off from the zooids located below the middle portion of the branches of a colony. It is, therefore, presumed that in the course of the evolution of the buguloid ancestors from the *Bugula*-type forms to the *Caulibugulatype* ones, some of the rootlets situated at their branches had also transformed into vesicles, resulting in the special phenomenon of the vesicles being mostly concentrated in the branch portion as shown in *Caulibugula hainanica* sp. nov., suggesting the primitive nature of this new species. With further evolution, the rootlets of the branch-zooids would completely disappear, the attachment of a colony had been wholly supported by the rootlets given off from the kenozooids of a stem. The result was that the vesicles (if present) of the other species of the genus *Caulibugula* are all deposited in the stems. This presumption, however, needs further investigations.