

## 六放海绵一新种——中间单根海绵\*

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**提要** 1978年在冲绳海槽获得一块海绵碎片, 后来在同一水域又获得许多不完整的标本及碎片。经鉴别表明, 这些标本系单根海绵的新种——中间单根海绵。本文对其骨针作了详细的观察和描述, 并对许多微型小骨针作了扫描电镜的观察。

1978年, 中国科学院海洋研究所在冲绳海槽的调查中, 从一些海绵混合肉体中, 辨认出一组单根海绵的骨针, 骨针的构造和组合与已经发表过的三种单根海绵不同。

1981年, 在同一水域所做的调查中, 又获得18个不完整的单根海绵, 其中有10个标本是海绵的顶部一段, 还有11个与肉体分离的中轴骨针。从这些标本, 可以确认它们是单根海绵一新种——中间单根海绵(图版 I)。

迄今已发表的单根海绵有三个种:

春氏单根海绵 *M. chuni* Schulze, 1904;

华贵单根海绵 *M. dives* Schulze, 1904;

灌木单根海绵 *M. fruticosa* (Schulze)。

关于灌木单根海绵, Schulze 原先把它作为未定种 *Hyalonema* sp.。1893年, 他将 *Hyalonema* sp. 订为 *H. fruticosa*。1904年, 他又将 *Hyalonema fruticosa* 修订为 *Monorhaphis fruticosa* (Schulze), 此即为灌木单根海绵的合法拉丁文名称。然而, Schulze 对 *M. fruticosa* 虽经多次修订, 但却始终未附有详细的描述、定义或简标, 这不符合命名法规中“可用的标准”的规定, 因此, 本文新种不予同其比较。

中间单根海绵(新种) *Monorhaphis intermedia* sp. nov.

(图1—3, 图版 I—II)

**正模** IOAS S83-60; 标本采集于  $127^{\circ}45' E, 28^{\circ}05' N$  海域的水深 900m 处; 采集日期为 1981年 8月 3日。正模是从模式组 18个标本中选出的(图版 I: a)。

**副模** IOAS S83-61; 17个不完整的海绵体(碎块)(图版 I) 和 11个分离的骨针, 其中有 7个是基须。

### 描 述

所有标本都是幼小海绵体上半部近顶端的一段, 最长一个为 24.5cm。构造较完整的

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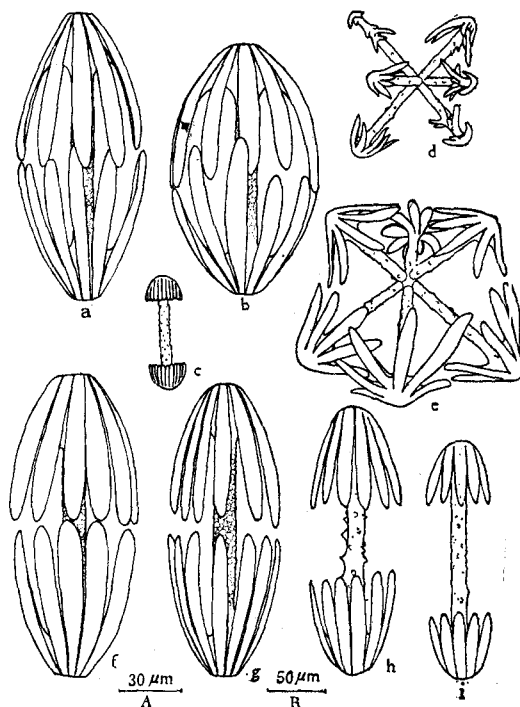


图1 中间单根海绵的骨针

a, b. 交错型双盘骨针, 比例尺 B; c. 小双盘骨针, 比例尺 A; d, e. 六盘骨针, 比例尺 A; f, g. 对称型双盘骨针, 比例尺 B; h. 对称型双盘骨针, 比例尺 A; i. 同上, 比例尺 B。

被选为正模标本, 肉体长 16.5cm, 直径 2.5—3cm。外形和 Schulze 所示的 *M. chuni* 极相似, 即海绵体为长纺锤形, 附着在唯一的强大基须骨针上。骨针下半部插入海底, 上半部支撑着海绵体, 使之直立于海底。海绵体表面为六放海绵特有的疏松、不连续并且不规则的多孔体。体软易碎, 泥黄色, 这可能是在拖网采集时由于底质软泥进入海绵体所致。将海绵碎块用水冲洗后, 显出暗灰色或乳黄色。

海绵体横截面为椭圆形, 基须并不穿过体中央, 而位于椭圆长径的一侧, 一纵行壁龛状凹陷的出水口, 就开在靠近基须一侧。出水口表面覆以筛状网, 在长达 16.5cm 的模式标本中, 有 7 个出水口。

**骨骼** 除出水口的网状筛板外, 单根海绵没有其它特殊的骨骼构造。

**六辐骨针** 主要有两种: (1) 6 个辐等长, 笔直, 互相垂直, 辐表面有大的棘刺, 棘刺略向外倾斜(图 3: e); (2) 6 个辐不等长, 辐直或略弯曲, 表面光滑或有不明显的细棘(图 3: b—d)。两种六辐骨针大小接近, 辐长 70—92 $\mu\text{m}$ , 直径 4—5 $\mu\text{m}$ 。六辐双盘骨针(hexacamphidisc), 或称六盘骨针(hexadisc) 构造很特异。骨针有 6 个等长的辐, 互相垂直, 辐表面有乳状棘。各辐末端有一个盘, 各盘有 8 个桉叶状齿(图 1: e), 有些骨针上的齿发生变异, 齿数有增有减(图 1: d)。经研究表明, 到目前为止, 这种骨针除在本海绵种出现外, 其它只在华贵单根海绵中出现。

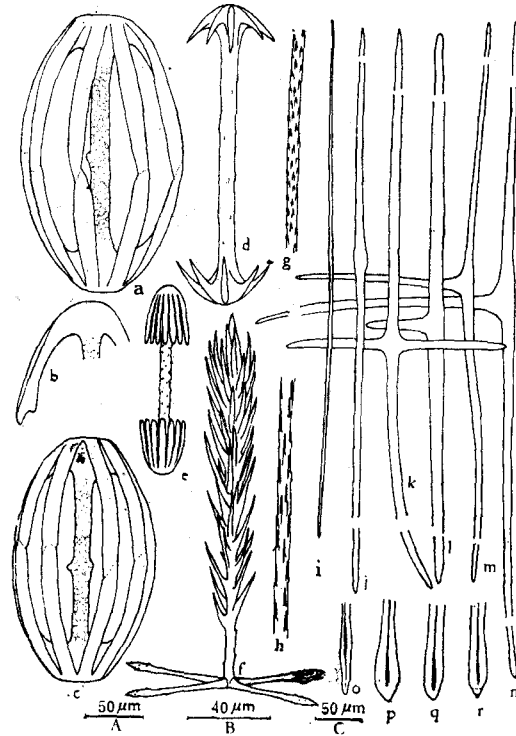


图2 中间单根海绵的骨针

a—c. 子午型双盘骨针, 比例尺 A; d. 大双盘骨针的幼形, 比例尺 A; e. 中双盘骨针, 比例尺 A; f. 羽辐骨针, 比例尺 A; g, h. 钩棘骨针的中段, 比例尺 B; i, j. 二辐骨针, 比例尺 C; k. 四辐骨针, 比例尺 C; l—n. 三辐骨针, 比例尺 C; o—r. 各种大骨针的末端, 比例尺 A。

**羽辐骨针 (pinule)** 远辐长 256—320 $\mu\text{m}$ , 约为基辐的 4 倍, 直径 5—7 $\mu\text{m}$ , 其表面的 5/6 被覆以长的侧刺(图 2:f)。基辐外端微微膨大, 然后变尖, 表面有细刺。有的羽辐骨针基辐表面平滑无刺, 末端呈梨状膨大(图版 II: g), 辐长 51—67 $\mu\text{m}$ , 直径 4—5 $\mu\text{m}$ 。有少数羽辐骨针, 在远辐的对应面生出第六个辐, 其构造与基辐相似。这种变异的骨针, 实际上变成了六辐羽辐骨针 (hexact pinule) (图版 II: h), 很少在双盘海绵亚纲中出现。

**四辐骨针 (tetractin)** 有两种: (1) 小四辐骨针(图 3:a), 其等长的辐笔直, 互相垂直, 落在同一平面上, 末端尖, 表面有短棘刺, 辐长 64—96 $\mu\text{m}$ , 直径 3—4 $\mu\text{m}$ ; (2) 大四辐骨针(图 2:k) 的辐常不等长, 和海绵中轴线平行的辐往往很长, 达 1mm 以上, 直径 18—35 $\mu\text{m}$ , 常略弯曲。另两个较短的辐, 长 76—141 $\mu\text{m}$ , 直径常不匀称, 7—18 $\mu\text{m}$ , 辐直。所有的辐均表面无刺。

**三辐骨针 (triactin)** 数量很多, 是单根海绵具特征性的优势骨针。两个辐连成直线, 与海绵的中轴线平行, 长达 374 $\mu\text{m}$  到 6mm 以上, 直径 6—35 $\mu\text{m}$ ; 第三辐较短, 长 70—140 $\mu\text{m}$ , 直径 18—35 $\mu\text{m}$ , 垂直于其它两个辐, 整个骨针呈“T”字形, 短辐绕着基须略弯

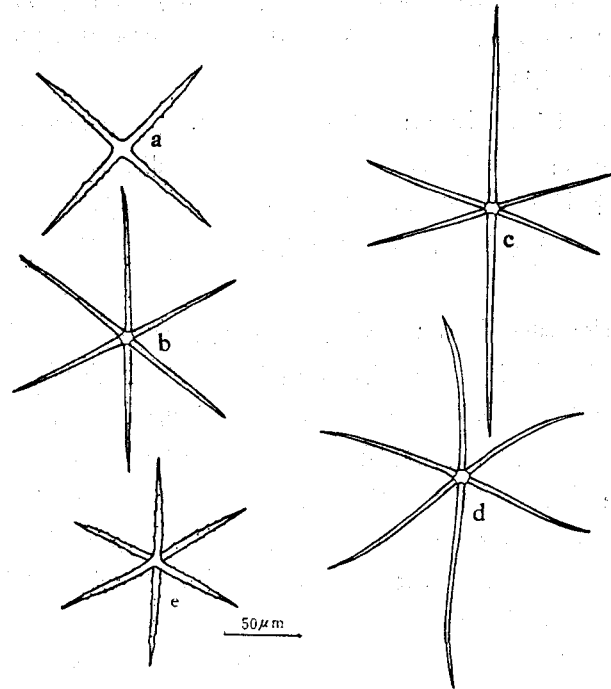


图3 中间单根海绵的骨针

a. 四辐骨针; b, c. 各种六辐骨针。

成弧形(图2:l-n)。有些三辐骨针的第三辐退化,或仅剩一个瘤突,因而常与二辐骨针相混淆。三辐骨针表面光滑,末端尖或圆(图2:o-r),辐各段的直径常不匀称(图2:l-n)。

**二辐骨针 (diactin)** 在中间单根海绵中,二辐骨针大小差异悬殊,但外形基本相同。小型的二辐骨针只有 $70\mu\text{m}$ 长,直径 $6\mu\text{m}$ 。中型二辐骨针长 $339-960\mu\text{m}$ ,直径 $16-35\mu\text{m}$ (图2:i,j)。大型二辐骨针,如基须,长达数厘米(1978年采获的基须长达 $1.68\text{m}$ ,现在已知的最大海绵骨针长达 $3\text{m}$ )。中、小型二辐骨针,其中段常膨起(图2:j);基须的最大直径不是在骨针中央,而是在骨针下端 $1/3$ 处,直径粗的一端插入海底,海绵体附着在骨针较细的一端,基须末端无锚状头。伴随骨针(comitalia)常与基须平行排列,骨针最大直径位于中央,长达 $6\text{cm}$ ,直径 $1\text{mm}$ 。

**勾棘骨针 (uncinate)** 骨针细长如发,常作蛇形弯曲。棘刺紧贴在骨针表面,长 $1-2\text{mm}$ ,直径 $5-8\mu\text{m}$ (图2:g,h)。

**双盘骨针 (amphidisc)** 在中间单根海绵中,其外形很独特,可作为种级鉴定的依据。根据骨针的大小和特异性,可分为大、中、小三类。

1. 大双盘骨针:骨针外形、长度和宽度变化幅度很大。此外,骨针两端的盘齿也很长,往往达到骨针长度的一半左右。按盘齿的变异情况,大双盘骨针又可分为三种。

(1) 对称型 (symmetrical form):与常见的双盘骨针一样,其主杆两端的盘齿相对称,即齿的数目、大小对等,形状相似。盘齿常延伸到赤道线上,但双方彼此从不愈合。两端

各有 10—12 个盘齿,齿鸭嘴状或按叶状。盘宽 64—89 $\mu\text{m}$ 。齿长 77—89 $\mu\text{m}$ ;齿宽 13—18 $\mu\text{m}$ 。骨针长 160—211 $\mu\text{m}$ 。主杆直径 11—13 $\mu\text{m}$ ,表面覆以棘刺或瘤状突。骨针数量较多(图 1:f—i;图版 II:i)。

(2) 子午型 (meridional form): 构造很特殊,两端各具盘齿 8—10 个,均向赤道线伸展,最后两者愈合(图 2: a—c),状如封闭的笼子, Schulze 称之为柠檬形双盘骨针。齿宽 18—22 $\mu\text{m}$ 。骨针长 253—335 $\mu\text{m}$ ,宽 150—214 $\mu\text{m}$ 。主杆直径 15—22 $\mu\text{m}$ ,表面有麻疹状突起,中央有 1—5 个不等的瘤突。此类型在春氏单根海绵中也有少数出现,分布在海绵体或水管系的表面。

(3) 交错型 (alternated form): 骨针两端的盘齿长短不一,在赤道线附近互相交错(图 1:a, b),但不愈合。盘宽 108—203 $\mu\text{m}$ 。齿长常超过骨针的 1/2,为 80—154 $\mu\text{m}$ ,多数为 90—110 $\mu\text{m}$ 。骨针长 192—275 $\mu\text{m}$ ,多数在 200—220 $\mu\text{m}$  之间。主杆直径 12—22 $\mu\text{m}$ ,表面有乳突状小棘。这种骨针也在春氏单根海绵和某些拂子介中出现。

2. 中双盘骨针: 骨针外形完全正常,无任何变异现象。两端各有 12 个盘齿,其长度约为骨针全长的 1/4。盘宽 25—33 $\mu\text{m}$ 。齿扁平,长 25—44 $\mu\text{m}$ 。骨针长 90—151 $\mu\text{m}$ 。主杆直径 6—8 $\mu\text{m}$ ,表面有棘刺(图 2:e;图版 II:a, d, f)。Schulze 在他的工作中将中双盘骨针并入大双盘骨针内。此种骨针数量较多。

3. 小双盘骨针: 盘顶较扁,两端各有 18—20 个盘齿,齿鸭嘴状。盘宽 12—16 $\mu\text{m}$ 。齿长 9—12 $\mu\text{m}$ 。骨针长 35—48 $\mu\text{m}$ 。主杆直径 3—4 $\mu\text{m}$ ,表面有棘刺(图 1:c;图版 II:b, c, e)。

## 讨 论

中间单根海绵同华贵单根海绵,春氏单根海绵特征比较如下。

### 1. 与华贵单根海绵的比较

- (1) 两者的六盘骨针几乎完全相同,这种骨针极少在其它海绵中出现;
- (2) 两者的大双盘骨针相似。

以上两个特征为春氏单根海绵所不具备。

### 2. 与春氏单根海绵的比较

(1) 两者的子午型双盘骨针相近似,但春氏单根海绵的主杆光滑,有显著的中央乳突,而中间单根海绵的主杆却有麻疹状的瘤突,有或无中央乳突,骨针两端盘齿的愈合不很牢固,略施以压力,随即从愈合的部位断裂(图 2:b)。

(2) 两者的交错型双盘骨针构造基本相似,但春氏单根海绵的主杆表面光滑,有中央乳突,而中间单根海绵主杆却长有麻疹状瘤突,无中央乳突。

华贵单根海绵不具备以上两个特征。

## 结 论

中间单根海绵兼备春氏与华贵两种单根海绵的主要特征,它是处于两个种之间的一个种,因而得名。

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## MONORHAPHIS INTERMEDIA—A NEW SPECIES OF HEXACTINELLIDA\*

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### ABSTRACT

A giant basalia spicule with a length of 1.68 m and two badly mutilated specimens of *Monorhaphis* were obtained in the collection made by the Institute of Oceanology, Academia Sinica in the Okinawa Trough during 1978. In the cotton-like fragment which is possibly mixed with other sponge fragment, a group of *Monorhaphis* spicules is recognized, which seems to differ from those of known species.

In the collection made from the same locality during 1981, eighteen more incomplete specimens were obtained, from which, a species is considered new, viz., *Monorhaphis intermedia*.

*Monorhaphidae* Ijima, 1926.

*Monorhaphis* Schulze, 1904.

*Monorhaphis intermedia* sp. nov. (Figs. 1—3; Pl. I—IV)

**Holotype** IOAS S83-60. An upper portion of the sponge measures: 16.5 cm long, 2.5—3 cm in diameter.

**Paratype** IOAS S83-61. Seventeen fragments of upper portion, and eleven isolated basalia and comitalia.

**Locality** 127°45'E, 28°05'N; depth: 900 m; Date: 1981. 8.3.

A typical *Monorhaphis* is an oblong and somewhat laterally compressed body, attached on a giant and gently curved basalia spicule. A series of oscula or "niche" as called by Schulze, is located on one side. Eighteen specimens obtained in 1981 are apparently young specimens, all of which have the upper portion torn off from the lower portion. The largest specimen which is chosen as holotype, measures 16.5 cm long, the diameter varies from 2.5 to 3 cm. Seven large oscula covered by sieve plates can be distinctly seen on one side.

**Spiculation** Some of the characteristic spicules of *M. intermedia* are similar to those found in *M. chuni* and in *M. dives*.

**Hexactin:** There are two kinds of hexactin with the same dimension. 1). Echinated hexactin—the rays are straight and equal in length, the spines are slightly directed obliquely, forwardly (Fig. 3:e); 2). The rays of the hexactin are sometimes unigually long, straight or some-

\* Distribution No. 1219 from Institute of Oceanology, Academia Sinica.

what bent, smooth or slightly echinated (Fig. 3:b—d). The rays of the both hexactins are 70—92  $\mu\text{m}$  in length and 4—5  $\mu\text{m}$  in diameter.

Each end of the hexacamphidisc or hexacdisc has a disc with leaf-like teeth (text-fig. 1:d, e), which varies in shape and number, these peculiar spicules are scarcely seen in other species, but they are very similar to those of *M. dives*.

The pinules with plumose-bushy pinular rays are generally 256—320  $\mu\text{m}$  in length, 5—7  $\mu\text{m}$  in diameter. Basal rays are 51—67  $\mu\text{m}$  in length, slightly swollen and with a few spines near the end (text-fig. 2:f). Sometimes the base rays vary into smooth and bulk-like end (Pl. II:g), sometimes a sixth ray grow opposite the pinular ray, hence the spicules become hexac-pinules (Pl. II:h).

Tauractins of two kinds, the smaller one with straight and nearly equal rays generally falling into one plane, echinated on the surface, 64—96  $\mu\text{m}$  in length, and 3—4  $\mu\text{m}$  in diameter (text-fig. 3:a); the larger one with smooth and unequal rays, two rays of which are parallel with the central axis of the sponge, are generally larger than the others, exceeding 1 mm in length, and 18—35  $\mu\text{m}$  in diameter, the shorter rays are generally somewhat curved (text-fig. 2:k).

The presence of numerous triactins is one of the characteristic features of *Monorhaphis*. The two rays 374  $\mu\text{m}$  to over 6 mm in length, and 6—35  $\mu\text{m}$  in diameter, fall in one axis and are parallel with the giant basalia, the spicule is smooth, the ends are obtusely pointed, frequently rounded (text-fig. 2:l—r).

Diactin: There are numerous diactins, which vary greatly in dimension, the smaller ones measure 70  $\times$  6  $\mu\text{m}$ , the medium ones 339—960  $\times$  16—35  $\mu\text{m}$ , the larger stalk-like basalia are over 20 cm long (the largest basalia obtained in 1978, measure 168 cm in length and 5 mm in diameter).

The uncinates are hair-like and generally bent, 1—2 mm in length, 5—8  $\mu\text{m}$  in diameter (text-fig. 2:g, h), the short barbs lie low.

There are three kinds of amphidiscs, macra-, meso- and microamphidiscs. The macramphidiscs are of three forms:

1. Symmetrical form. This is the common form of amphidisc as seen in Amphidiscophora, both ends of the spicules are ornamented with the same ambeliform disc, the length of the teeth varies, but are never fused together, measures 160—211  $\mu\text{m}$  long, 64—89  $\mu\text{m}$  broad, each disc has twelve leaf-like teeth, which are 77—89  $\mu\text{m}$  long, 13—18  $\mu\text{m}$  broad; the axial shaft is 11—13  $\mu\text{m}$  in diameter, echinated or tuberculated at the surface (text-fig. 1:f—i, Pl. II: i).

2. Meridional form. This is the most characteristic amphidiscs, the teeth of both discs meet and are fused to gether at their equator. The spicule is 253—335  $\mu\text{m}$  long, 150—214  $\mu\text{m}$  broad at the equator, usually with 8 teeth in each disc, which is 18—22  $\mu\text{m}$  broad; the axial shaft has measles-like surface, and 1—5 turbercles around the centre (text-fig. 2:a—c). The same amphidisc is seen also in *M. chuni*.

3. Alternated form. This is another peculiar form of amphidisc, with irregular teeth at both discs, some of them are prolonged and extend beyond the equator, are nearly attached to the opposite teeth, but never fused together, and are bent inward at the end. The length of the spicules range in 192—275  $\mu\text{m}$  long, the majority, 200—220  $\mu\text{m}$  long, 108—203  $\mu\text{m}$  broad. The teeth varies in length from 80—154  $\mu\text{m}$ , the axial shaft is 12—22  $\mu\text{m}$  in diameter, and is echinated on the surface (text-fig. 1:a—b). Similar amphidisc is also seen in *M. chuni* (and some other Hyalonema species).

Mesamphidisc. This is the amphidisc usually seen in other Amphidiscophora. It differs from the symetrical macramphidisc in its dimension, and also in the length of their teeth. In

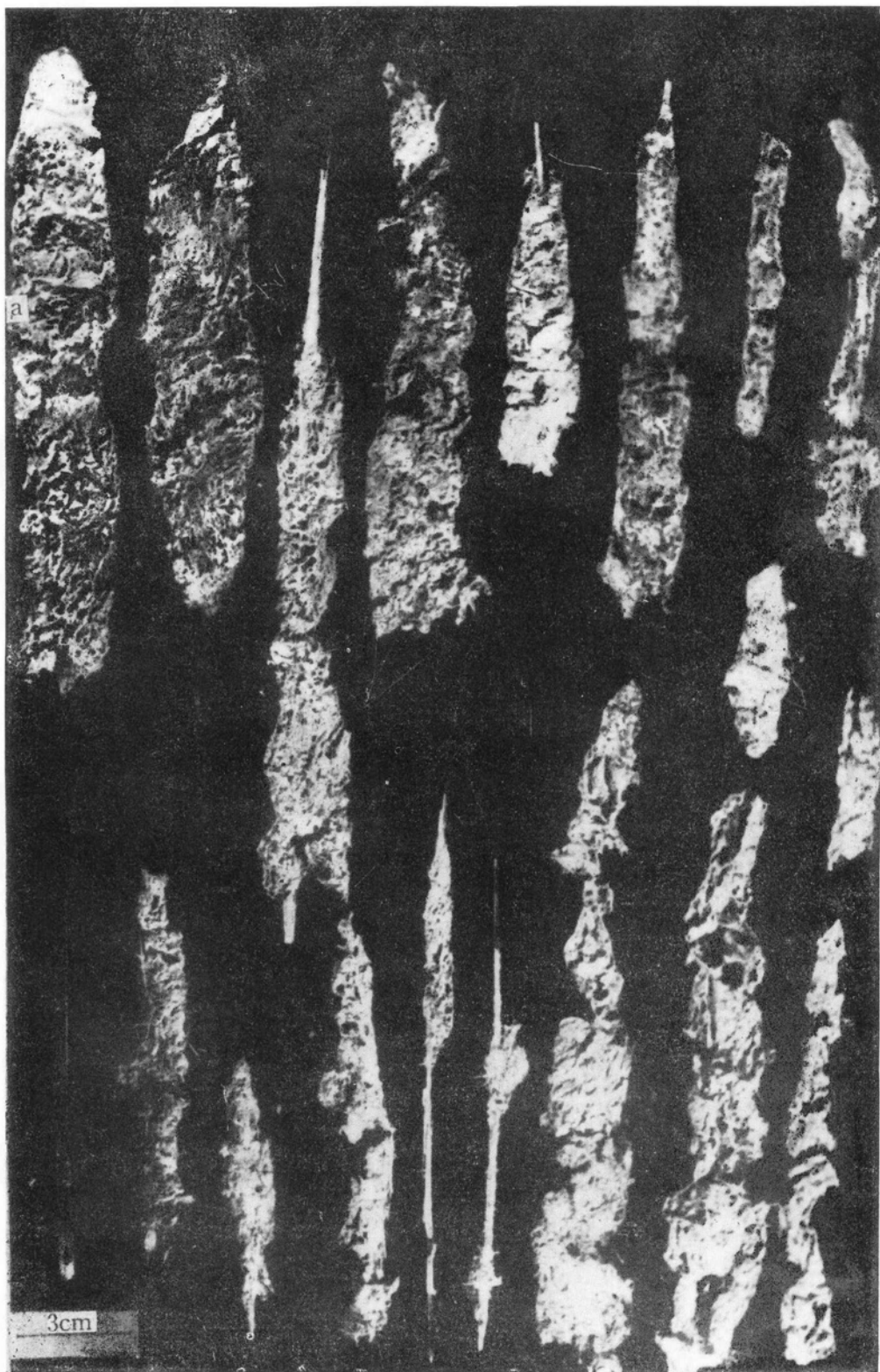
the macramphidisc, the length of the teeth is about  $1/2$  the length of the spicule, while in the mesamphidisc, it is  $1/4$  the length of the spicule. The mesamphidisc measures  $90-151 \mu\text{m}$  long, with 12 teeth vary from  $25-44 \mu\text{m}$  in length, the axial shaft is  $6-8 \mu\text{m}$  in diameter (text-fig. 2: e; Pl. II: a, d, f). Similar mesamphidisc is also found in *M. dives*.

The micramphidisc with 18—20 teeth on each ambelliform disc, is  $35-48 \mu\text{m}$  long,  $12-16 \mu\text{m}$  broad. The teeth are  $9-12 \mu\text{m}$  in length, and the axial shaft  $3-4 \mu\text{m}$  in diameter, is minutely echinated (text-fig. 1: c; Pl. II: b, c, e).

### Remarks

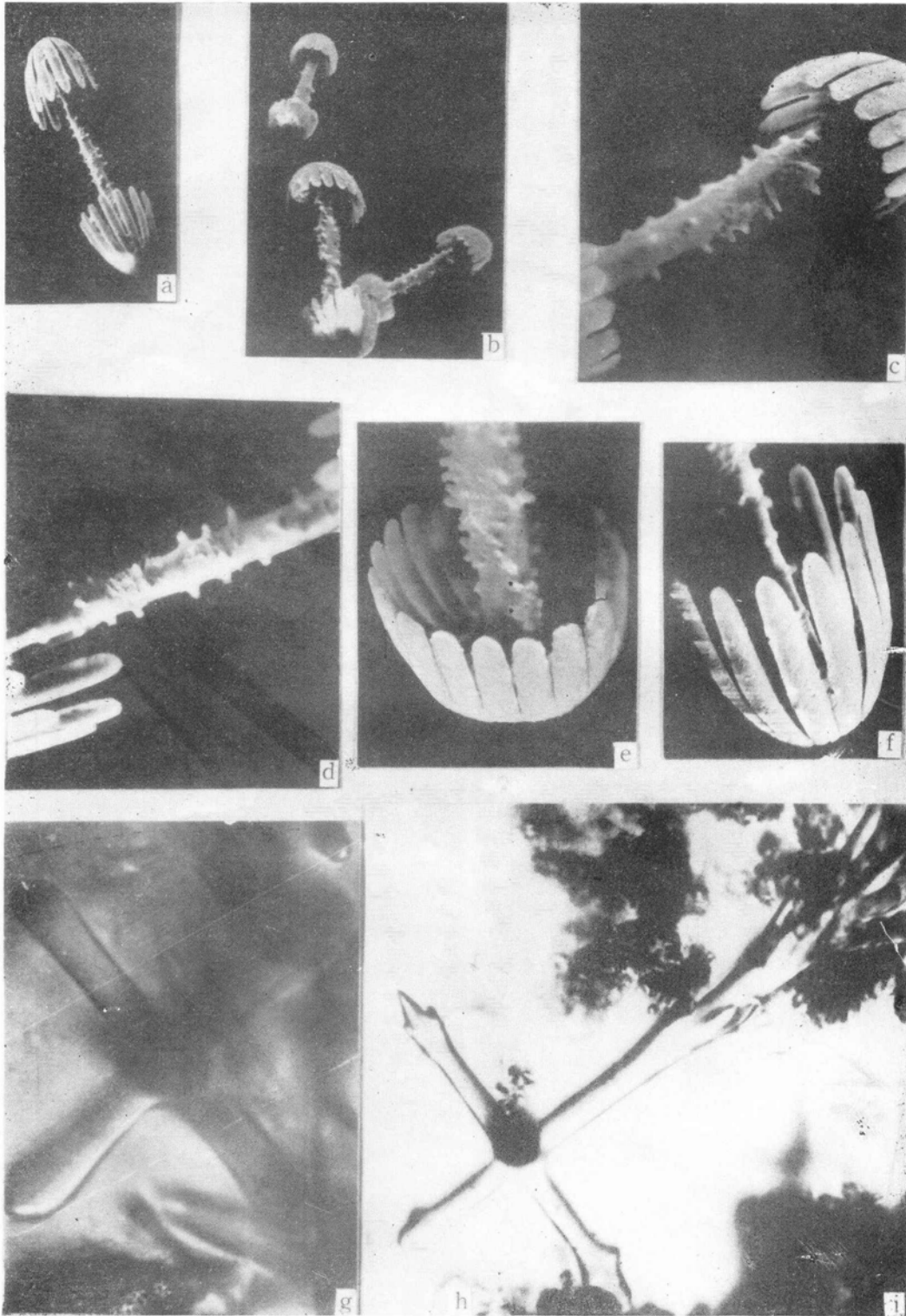
*M. intermedia* possesses both the characteristics of *M. chuni* and that of *M. dives*. It is similar to *M. dives* in having: 1. similar hexadisc, present only in a few other species, 2. similar macramphidisc. It resembles *M. chuni* in having: 1. similar meridional amphidisc, 2. similar alternated form of amphidisc. Thus *M. intermedia* is regarded as a species between *M. chuni* and *M. dives*.





中间单根海绵(新种)*Monorhaphis intermedia* sp. nov.

a. 正模标本;其余为副模。



中间单根海绵的骨针

a. 中双盘骨针, 500×; b. 小双盘骨针, 750×; c. 小双盘骨针(局部), 2500×; d. 中双盘骨针(局部), 1500×; e. 小双盘骨针(局部), 2500×; f. 中双盘骨针(局部), 1500×; g. 羽辐骨针无棘的基辐; h. 六辐羽辐骨针。

a-f. 为扫描电镜照片; g, h. 为光学显微镜照片。