

金綱善恭[†]・山岸高旺：デスマジッド類の接合胞子 1*

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Zygosporae of Desmid 1

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In the present paper, zygosporae of 37 species of 14 desmid genera, *Actinotaenium*, *Arthrodesmus*, *Bambusina*, *Closterium*, *Desmidium*, *Euastrum*, *Groenbladia*, *Ichthyocercus*, *Micrasterias*, *Netrium*, *Onyconema*, *Pleurotaenium*, *Spondylosium* and *Staurastrum*, were reported with figures. The samples examined in this study were collected from the various localities in Cambodia, Thailand and Japan by Y. Kanetuna. Some other samples were collected from Brazil by former Prof. E. Saito, Sensyu University and from Florida, U. S. A. by Dr. A. M. Scott.

Key Index Words: desmid, zygospore.

緑藻類ジグネマ目 Zyglenatales のメソタエニウム科 Mesotaeniaceae とデスマジウ科 (チリモ科) Desmidiaceae の多くは単細胞性で、細胞や葉緑体の形状もよく似たものが多い。そのために 2 科をまとめて、古くからデスマジッド Desmid とよんでいる。デスマジッドには細胞の中央に細いくびれがあつて、形が鼓に似たものが多いことから、わが国では鼓藻類 (ツヅミモ類) ともよんでいる (中国では Desmidiaceae が鼓藻科)。また、デスマジッドには細胞の周縁に特異な形の切れ込みや突起があつて形の美しいものが多いが、ドイツ語では Zieralgen, zierlichsten Algen (飾り藻) ともよんでいる。

わが国ではミズゴケ類が密生する高地湿原の腐植質性・酸性の池沼に多くのデスマジッドが生育している。英国やドイツ、北欧などでは平地にも、そのようなミズゴケ湿原が多いといわれているが、それらの国々では古くからデスマジッドの観察・研究が進められていて、非常に多くの報告が発表されている (Prescott 1984)。

このデスマジッド分類の識別形質とされているのは、細胞の形や葉緑体の性状などの形態形質であるが、類似種が多く、しかも、個体変異が多いために、形態形質だけでは識別が難しい藻種がある。そのために、形態形質に接合様式や接合胞子などの生殖形質を加えて、分類を考えることが必要であろうとされている (山岸ら 1974)。

しかし、デスマジッドは、古くから形態形質を中心とする分類が主流であったために、研究の歴史が古い割りに、接合胞子などの生殖形質の記録は少ない。従って、より多くの種の接合形質や接合胞子などの情報の蓄積が望まれている。また、従来、デスマジッド類の接合胞子の形状は、時々の観察者によって適当に記載され、同じ形質でも異なる用語が用いられていることが多い。しかし、分類の識別形質として取り上げるためには明

確に内容を規定した共通の用語で表記する必要がある。ここでは統一して、次のような術語を用いることを考えた (括弧内に該当例の図版番号を示した)。

接合胞子の形: ①球形 globose (pl. 1, f. 4) ②楕円形 ellipsoid (pl. 2, f. 9) ③広楕円形 broad ellipsoid (pl. 1, f. 2) ④偏正方形 compressed quadrate (pl. 5, f. 16) ⑤十文字形 cruciform (pl. 2, f. 12) ⑥偏矩形 compressed rectangular

接合胞子膜の模様: ①平滑 smooth ②細点模様 punctate (pl. 5, f. 16) ③小孔模様 scrobiculate (pl. 5, f. 13) ④尖頭短刺状突起 short sharp spine (pl. 1, f. 11) ⑤鈍頭短刺状突起 short blunt spine (pl. 3, f. 8) ⑥尖頭長刺状突起 long sharp spine (pl. 3, f. 6) ⑦鈍頭長刺状突起 long blunt spine (pl. 1, f. 6) ⑧分岐頭長刺状突起 long furcate spine (pl. 4, f. 14) ⑨乳頭状突起 papillate protuberance (pl. 3, f. 15) ⑩低乳頭状突起 flat papillate protuberance (pl. 5, f. 8) ⑪分岐乳頭状突起 furcate papillate protuberance ⑫低円錐状突起 flat conical protuberance

観察に用いたのは、金綱がカンボジア、タイおよび国内各地で採集した材料、元専修大学教授斎藤英三氏がブラジルで採集された材料である。なお、その他にアメリカの高名なデスマジッド類研究者 A. M. Scott 氏から贈られたフロリダ産の材料も用いた。

本稿では、それらの材料の中から観察されたものの中で、*Actinotaenium*, *Arthrodesmus*, *Bambusina*, *Closterium*, *Desmidium*, *Euastrum*, *Groenbladia*, *Ichthyocercus*, *Micrasterias*, *Netrium*, *Onyconema*, *Pleurotaenium*, *Spondylosium* および *Staurastrum* の 14 属に含まれる 37 種の接合胞子の形状について、写真と図を添え、上記の統一した術語を用いて報告する。

これらのほとんどの藻種の接合胞子は今まで記録されていな

* 本稿は金綱善恭が生前に進めていた研究の資料、図や写真などを基にして山岸高旺が整理し、まとめたものである。

かつたものである。

1. *Actinotaenium cucurbitanum* (Bissett) Teiling var. *cucurbitanum*

(pl. 1, f. 1, 2)

Bot. Notiser 1954: 399, 1954.

Zygospor (pl. 1, f. 2. ca. x200): broad ellipsoid. Wall: smooth, thick walled. Loc.: Angkor Wat, Cambodia.

2. *Arthrodesmus apertus* Scott & Grönblad var. *apertus*

(pl. 1, f. 3, 4)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (8): 24, 1957.

Zygospor (pl. 1, f. 4. ca. x200): broad ellipsoid. Wall: smooth, thick walled. Loc.: Florida, U.S.A.

3. *Arthrodesmus gibberulus* Joshua

(pl. 1, f. 5, 6)

J. Bot. 23: 34, 1885.

Zygospor (pl. 1, f. 6. ca. x200): globose. Wall: long sharp spines. Loc.: Angkor Wat, Cambodia.

4. *Arthrodesmus maximus* Borge var. *divergens* Scott & Grönblad

(pl. 1, f. 7, 8)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (8): 26, 1957.

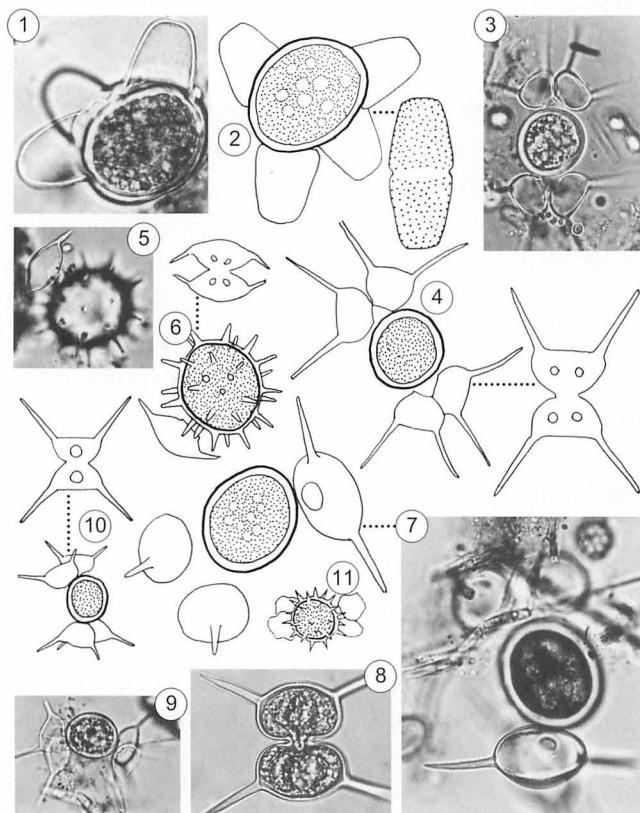


Plate 1. 1, 2. *Actinotaenium cucurbitanum* var. *cucurbitanum*. 3, 4. *Arthrodesmus apertus* var. *apertus*. 5, 6. *Arthro. gibberulus*. 7, 8. *Arthro. maximus* var. *divergens*. 9, 10. *Arthro. validus* var. *validus*. 11. *Cosmarium quadratum* var. *aplanatum*.

Zygospor (pl. 1, f. 7. ca. x200): broad ellipsoid. Wall: smooth, thick walled. Loc.: Florida, U.S.A.

5. *Arthrodesmus validus* (West & West) Scott & Grönblad var. *validus*

(pl. 1, f. 9, 10)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (8): 29, 1967.

Zygospor (pl. 1, f. 10. ca. x300): broad ellipsoid. Wall: smooth. Loc.: Florida, U.S.A.

6. *Arthrodesmus validus* (West & West) Scott & Grönblad var. *incrassatus* Scott & Grönblad

(pl. 2, f. 1, 2)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (8): 29, 1957.

Zygospor (pl. 2, f. 1. ca. x200): globose. Wall: smooth. Loc.: Angkor Wat, Cambodia.

7. *Bambusina brebissonii* Kützing var. *brebissonii*

(pl. 2, f. 3, 4)

Phycol. germ. 140, 1845.

Zygospor (pl. 2, f. 3. ca. x300): broad ellipsoid. Wall: smooth. Loc.: Angkor Wat, Cambodia.

8. *Bambusina sphaerospora* Scott & Grönblad

(pl. 2, f. 5, 6)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (8): 50, 1957.

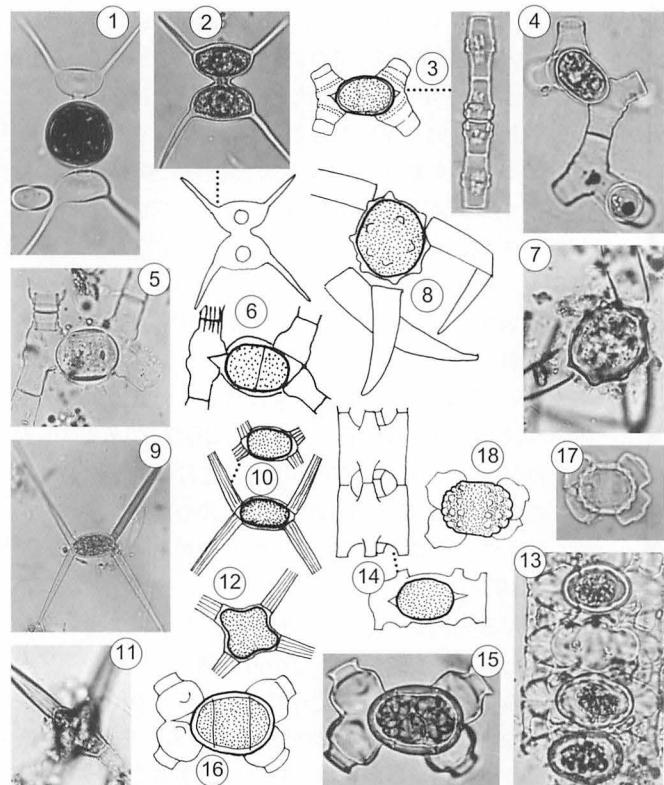


Plate 2. 1, 2. *Arthrodesmus validus* var. *incrassatus*. 3, 4. *Bambusina brebissonii* var. *brebissonii*. 5, 6. *Bambu. sphaerospora*. 7, 8. *Closterium calosporum* var. *brasiliense*. 9, 10. *Clost. kuetzingii* var. *vittatum*. 11, 12. *Clost. setaceum* var. *vittatum*. 13, 14. *Desmidium baileyi* var. *baileyi*. 15, 16. *Desm. coarctatum* var. *coarctatum*. 17, 18. *Desm. gracilipes*.

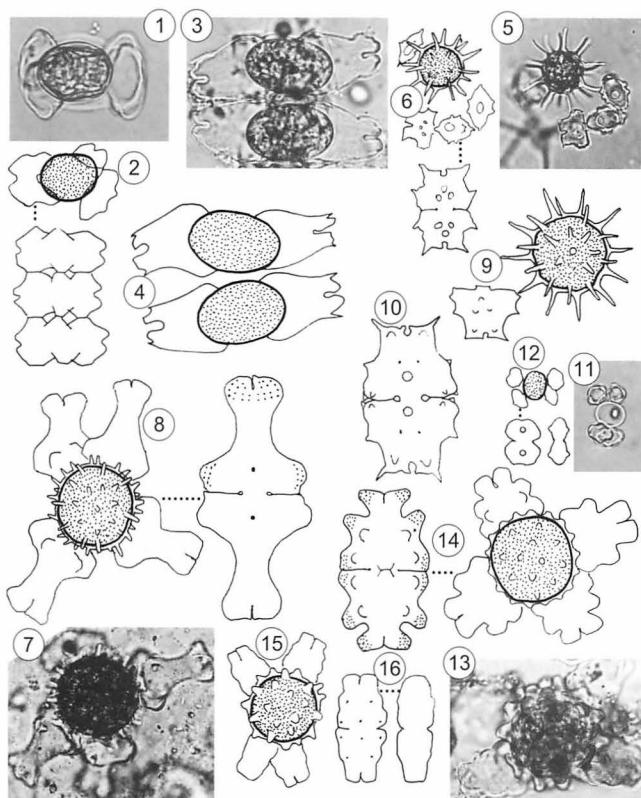


Plate 3. 1, 2. *Desmidium pseudostreponema* var. *pseudostreponema*. 3, 4. *Desm. swartzii* var. *swartzii*. 5, 6. *Euastrum acanthophorum*. 7, 8. *Euast. longicolle* var. *capitatum*. 9, 10. *Euast. occulatum* var. *prescottii*. 11, 12. *Euast. prominens*. 13, 14. *Eust. pseudojeneri* var. *glabrum*. 15, 16. *Euast. sinuosum* var. *prescottii*.

Zygospore (pl. 2, f. 6. ca. x300): broad ellipsoid. Wall: smooth, with a transverse cleft at the middle. Loc.: Florida, U. S. A.

9. *Closterium calosporum* Wittrock var. *brasiliense* Börgesen

(pl. 2, f. 7, 8)

Vidensk. Medd. Dansk. Naturhist. Foren. 1890: 934, 1890.

Zygospore (pl. 2, f. 8. ca. x300): broad ellipsoid. Wall: papillate protuberances, about 6-8 are visible around the periphery. Loc.: Rio de Janeiro, Brazil.

10. *Closterium kuetzingii* Brébisson var. *vittatum* Nordstedt

(pl. 2, f. 9, 10)

K. Svens. Vet.-Akad. Handl. 22: 70, 1888.

Zygospore (pl. 2, f. 10. ca. x300): ellipsoid, with narrowly rounded ends. Wall: smooth. Loc.: Sarawak, Kotabaru, Malaysia.

11. *Closterium setaceum* Ehrenberg var. *vittatum* Grönblad

(pl. 2, f. 11, 12)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (6): 10, 1945.

Zygospore (pl. 2, f. 12. ca. x300): cruciform, with concave sides and rounded corners. Wall: smooth. Loc.: Angkor Wat, Cambodia.

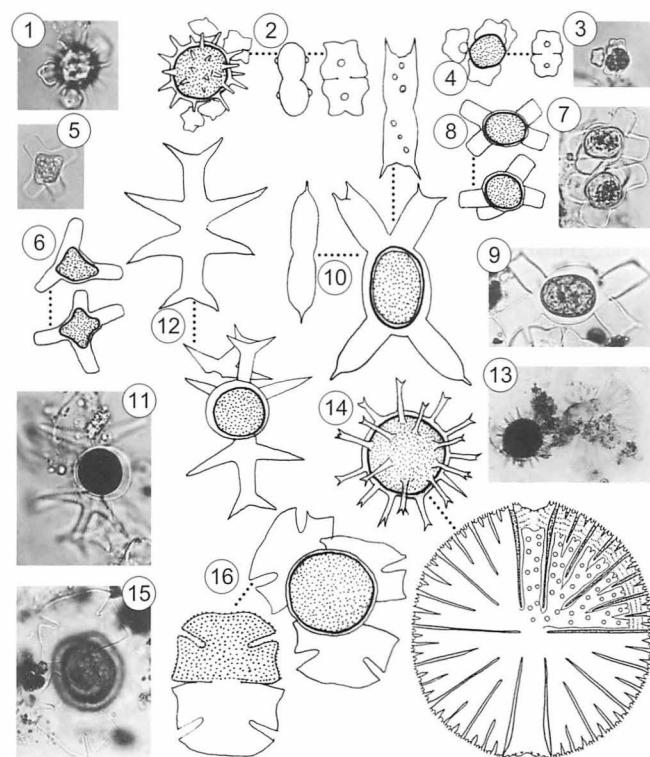


Plate 4. 1, 2. *Euastrum sublobatum* var. *kriegeri* f. *tuberculatum*. 3, 4. *Euastr. sublobatum* var. *notatum*. 5, 6. *Groenbladia neglecta* var. *elongata*. 7, 8. *Groen. neglecta* var. *neglecta*. 9, 10. *Ichthyocercus angolensis*. 11, 12. *Micrasterias arcuata* var. *expansa*. 13, 14. *Micra. radiosa* var. *radiosa*. 15, 16. *Micra. suboblonga* var. ?

12. *Desmidium baileyi* (Ralfs) Nordstedt var. *baileyi* (pl. 2, f. 13, 14)

Acta Univ. Lund. 16: 4, 1880.

Zygospore (pl. 2, f. 14. ca. x400): broad ellipsoid. Wall: smooth. Loc.: unknown, Japan.

13. *Desmidium coarctatum* Nordstedt var. *coarctatum*

(Pl. 2, f. 15, 16)

Bot. Notiser 1887: 15, 1887.

Zygospore (pl. 2, f. 16. ca. x350): broad ellipsoid. Wall: smooth, with two median parallel clefts. Loc.: unknown, Japan.

14. *Desmidium gracilipes* (Nordstedt) Lagerheim (pl. 2, f. 17, 18)

Oefv. Kongl. Vet.-Akd. Förhandl. 42: 228, 1886.

Zygospore (pl. 2, f. 18. ca. x250): broad ellipsoid to rectangular, with rounded shorter sides. Wall: smooth, but with many flat papillate protuberances at both sides only. Loc.: Angkor Wat, Cambodia.

15. *Desmidium pseudostreponema* West & West var. *pseudostreponema*

(pl. 3, f. 1, 2)

Trans. Linn. Soc. London Bot. ser. 2, 6 (3): 193, 1902.

Zygospore (pl. 3, f. 2. ca. x300): broad ellipsoid, formed within the female gametangial cell, anisogamous. Wall: smooth. Loc.: Lake

Boraphet, Thailand.

16. *Desmidium swartzii* (Agardh) Agardh var. *swartzii* ex Ralfs

(pl. 3, f. 3, 4)

Brit. Desm. 61, 1848.

Zygospor (pl. 3, f. 4. ca. x300): broad ellipsoid. Wall: smooth.
Loc.: Tomakomai, Japan.

17. *Euastrum acanthophorum* Turner

(pl. 3, f. 5, 6)

Sven. Vet.-Akad. Handl. 25: 82, 1892.

Zygospor (pl. 3, f. 6. ca. x250): globose. Wall: long sharp spines.
Loc.: Angkor Wat, Cambodia.

18. *Euastrum longicolle* Nordstedt var. *capitatum* West & West

(pl. 3, f. 7, 8)

Trans. Linn. Soc. London Bot. ser. 2, 6: 148, 1902.

Zygospor (pl. 3, f. 8. ca. x300): globose. Wall: short blunt spines.
Loc.: Angkor Wat, Cambodia.

19. *Euastrum oculatum* Börgesen var. *prescottii* Förster

(pl. 3, f. 9, 10)

Nova Hedwigia 23: 539, 1972.

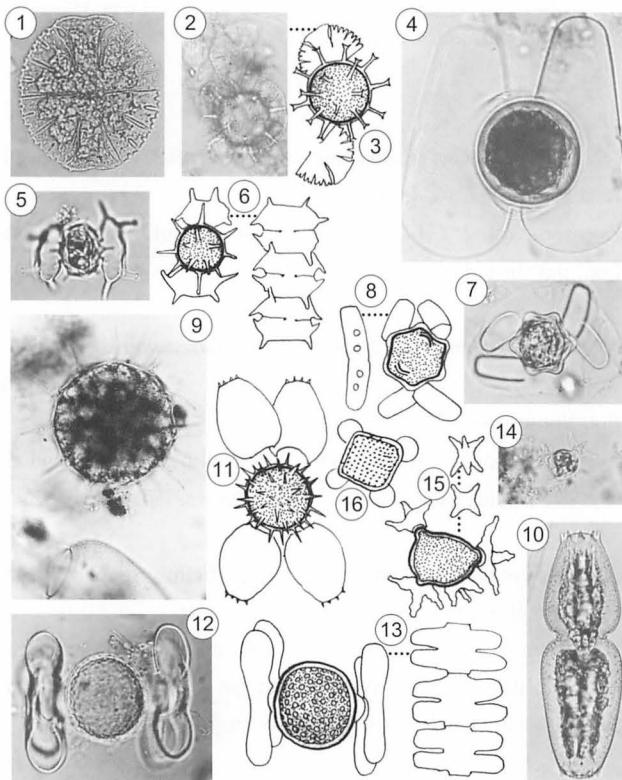


Plate 5. 1-3. *Micrasterias tetraptera* var. *taylorii*. 4. *Netrium digitus* var. *digitus*. 5, 6. *Onychonema laeve* var. *laeve*. 7, 8. *Pleurotaenium minitum*. 9-11. *Pleuro. ovatum*. 12, 13. *Spodylosium pulchrum* var. *pulchrum*. 14, 15. *Staurastrum inconspicuum* var. *inconspicuum*. 16. *Cosmarium tinctum* var. *globosiforme*.

Zygospor (pl. 3, f. 9. ca. x400): globose. Wall: long sharp spines.
Loc.: Florida, U. S. A.

20. *Euastrum prominens* Scott & Grönblad

(pl. 3, f. 11, 12)

Acta Soc. Sci. Fenn. ser.2, B, 2 (8): 14, 1957.

Zygospor (pl. 3, f. 12. ca. x250): broad ellipsoid to globose. Wall: smooth. Loc. unknown, Japan.

21. *Euastrum pseudojeneri* Scott & Prescott var. *glabrum* Kanetsuna

(pl. 3, f. 13, 14)

Phycol. Res. 50: 106, 2002.

Zygospor (pl. 3, f. 14. ca. x250): globose. Wall: papillate protuberances. Loc.: Phu Kradung, Thailand.

22. *Euastrum sinuosum* Lenormand var. *prescottii* Watanabe

(pl. 3, f. 15, 16)

In Kuroiwa (ed.), Stud. Crypt. P. N. G. 56, 1979.

Zygospor (pl. 3, f. 16. ca. x250): globose. Wall: papillate protuberances. Loc.: Woitape, New Guinea,

23. *Euastrum sublobatum* Brébisson var. *kriegeri* Grönblad f. *tuberculatum* Prescott

(pl. 4, f. 1, 2)

In Prescott et al. Synop. N. Am. Desm. 2 (2): 110, 1972.

Zygospor (pl. 4, f. 2. ca. x300): globose. Wall: long sharp spines.
Loc.: unknown, Japan.

24. *Euastrum sublobatum* Brébisson var. *notatum* Grönblad

(pl. 4, f. 3, 4)

Acta Soc. Sci. Fenn. ser.2, B, 2 (6): 14, 1945.

Zygospor (pl. 4, f. 4. ca. x400): globose to broad ellipsoid. Wall: smooth. Loc.: Florida, U. S. A.

25. *Groenbladia neglecta* (Raciborskii) Teiling var. *elongata* Scott & Grönblad

(pl. 4, f. 5, 6)

Acta Soc. Sci. Fenn. ser. 2, B, 2 (8): 48, 1957.

Zygospor (pl. 4, f. 6. ca. x200): compressed quadrata, sometime twisted, corners rounded or angled, sides slightly concave. Wall: smooth. Loc.: Siem Reap, Cambodia.

26. *Groenbladia neglecta* (Raciborskii) Teiling var. *neglecta*

(pl. 4, f. 7, 8)

Bot. Notiser 1952: 276, 1952.

Zygospor (pl. 4, f. 8. ca. x200): globose to broad ellipsoid. Wall: smooth. Loc.: Angkor Wat, Cambodia.

27. *Ichthyocercus angolensis* West & West

(pl. 4, f. 9, 10)

J. Bot. 35: 80, 1897.

Zygospor (pl. 4, f. 10. ca. x350): broad ellipsoid. Wall: thick, smooth. Loc.: unknown, Japan. West & West (1897) illustrated a

- zygospore of this alga having bilamellate wall, outer layer thick, smooth and inner scrobiculate.
- 28. *Micrasterias arcuate* Bailey var. *expansa* (Bailey) Nordstedt** (pl. 4, f. 11, 12)
 Öfv. Kongl. Vt.-Akad. Förhandl. 1877: 22, 1978.
 Zygospore (pl. 4, f. 12. ca. x250): globose. Wall: smooth. Loc.: Florida, U. S. A.
- 29. *Micrasterias radiosua* Ralfs var. *radiosa*** (pl. 4, f. 13, 14)
 Brit. Desm. 72, 1848.
 Zygospore (pl. 4, f. 14. ca. x200): globose. Wall: long furcated spines, with bi- or trifurcated apex. Loc.: Tomakomai, Japan.
- 30. *Micrasterias suboblonga* Nordstedt var. ?** (pl. 4, f. 15, 16)
 Bot. Notiser 1887: 164, 1888.
 Zygospore (pl. 4, f. 16. ca. x200): globose. Wall: smooth, thick walled. Loc.: unknown, Thailand.
- 31. *Micrasterias tetraptera* West & West var. *taylorii* Krieger** (pl. 5, f. 1-3)
 Kryptogamenflora 13 (1, 2): 93, 1939.
 Zygospore (pl. 5, f. 3. ca. x200): globose. Wall: long furcate spines, with bifurcated apex. Loc.: Florida, U.S.A.
- 32. *Netrium digitus* (Ehrenberg) Itzigson & Rothe var. *digitus*** (pl. 5, f. 4)
 In Rabenhorst, Alg. Sachsen, no. 508, 1856.
 Zygospore (pl. 5, f. 4. ca. x250): globose. Wall: smooth. Loc.: Kagami-ike, Japan.
- 33. *Onychonema laeve* Nordstedt var. *laeve*** (pl. 5, f. 5, 6)
 Vidensk. Medd. Dansk. Naturhist. Fören. Kjöbenhavn 1869: 206, 1870.
 Zygospore (pl. 5, f. 6. ca. x200): globose. Wall: sparse long sharp spines. Loc.: Transpentanella, Brazil.
- 34. *Pleurotaenium minutum* (Ralfs) Delponte** (pl. 5, f. 7, 8)
 Mem. R. Acad. Sci. Torino, ser. 2, 28: 131, 1878.
- Zygospore (pl. 5, f. 8. ca. x300): globose. Wall: sparse flat papillate protuberances, about 6 papillae are visible around the periphery. Loc.: Phu Kradung, Thailand.
- 35. *Pleurotaenium ovatum* Nordstedt** (pl. 5, f. 9-11)
 Öfv. Kongl. Vet.-Akad, Förhandl. 1887: 18. 1887.
 Zygospore (pl. 5, f. 11. ca. x200): globose. Wall: many long sharp spines. Loc.: Lake Baraphet, Thailand.
- 36. *Spondylosium pulchrum* (Bailey) Archer var. *pulchrum*** (pl. 5, f. 12, 13)
 In Prichard, Hist. Infus. Animal. 724, 1861.
 Zygospore (pl. 5, f. 13. ca. x200): globose. Wall: bilamellate, outer layer thin, smooth and inner layer scrobiculate. Loc.: Florida, U. S. A.
- 37. *Staurastrum inconspicuum* Nordstedt var. *inconspicuum*** (pl. 5, f. 14, 15)
 Acta Univ. Lund. 9: 26, 1873.
 Zygospore (pl. 5, f. 15. ca. x400): compressed quadrat, slightly twisted, with rounded corners and swelled sides. Wall: smooth. Loc. Florida, U. S. A.

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