

## A Newly Recorded *Pediastrum* Species in Taiwan

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(Manuscript received 18 March 1995; accepted 26 April 1995)

**ABSTRACT:** A new record of *Pediastrum*, *P. asymmetricum* Yamagishi et Hegewald, is reported in Taiwan. It is characterized by its asymmetric marginal cells and global cell wall ornaments, features which other *Pediastrum* species do not share in common. It was found in five water reservoirs situated in the north and southwest of Taiwan, coexistent with *P. simplex* Meyen. The results of water quality analysis point out that this species grows in eutrophic or mesotrophic waters. The physicochemical environment in which it occurs is discussed in the present paper.

**KEYWORDS:** Distribution, morphology, new record, *Pediastrum asymmetricum*, Taiwan.

### INTRODUCTION

*Pediastrum* is one of the most cosmopolitically distributed green algae. A revision of the taxa of this genus from all over the world has been done by Parra Barrientos (1979). In Taiwan, it is quite common in aquatic environments such as ponds, lakes and water reservoirs. A revision of this genus has indicated that there are twelve taxa in Taiwan (Wu, 1987). Recent collection of samples from various water reservoirs in Taiwan shows that there is a new species which is morphologically similar to *P. simplex* Meyen, but which is characterized by asymmetric marginal cells and global cell wall ornaments that are somewhat different from *P. simplex*. A similar species of *Pediastrum* has been recently found in a pond in Japan and was identified as a new species (Hegewald and Yamagishi, 1994). In this paper, the new species is described and compared with that reported by previous authors. In addition, the water quality at the localities where this species was found is discussed.

### MATERIALS AND METHODS

The plankton samples were collected from water reservoirs and fixed with Lugol's solution. For morphological observation under a scanning electron microscope (SEM),

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the samples were fixed with 2.5% glutaraldehyde and subsequently refixed in osmium oxide. They were then dehydrated through an acetone series followed by critical point drying, as described previously (Wu, 1987), and observed under a SEM (Zeiss DSM-950, Oberkochen, Germany).

The water quality of the water reservoirs was analyzed according to the standard methods for the examination of water and wastewater (APHA et al, 1992). The equations given by Carlson (1977) were adopted for the calculation of the trophic state index (TSI) of the aquatic environment.

The voucher specimens with collection number WU79-BS-3, WU80-YH-2, WU80-MD-2, WU81-ZY-1, WU82-LT-1 were deposited in the Institute of Botany, Academia Sinica, Taipei, Taiwan.

## RESULTS AND DISCUSSION

### Description of morphology (Plate 1)

Coenobia 4-16-celled, perforated when young and non-perforated when matured, 15-50  $\mu\text{m}$  in diameter; inner cells 6-15 x 3-8  $\mu\text{m}$ , one inner cell in 8-celled coenobia and four in 16-celled coenobia; marginal cells 12-20 x 4-12  $\mu\text{m}$ , irregular in shape, with one long processus which is usually closed to an adjacent one to form a pair; cell wall global reticulate with granula or tubercle on network.

It is noteworthy that the wall ornamentation of the present specimens somewhat resembles that of *P. simplex* var. *simplex* Meyen (see Wu, 1987), as mentioned by Hegewald and Yamagishi (1994). However, the characteristics of processus in the coenobia, the dimensions of the cells and coenobia and the wall ornamentation of the present specimens are more similar to that described by both authors for the holotype of *P. asymmetricum* Yamagishi et Hegewald. The present specimens were therefore identified as *P. asymmetricum*.

### Distribution of *P. asymmetricum* in Taiwan

A general investigation of phytoplankton in 18 water reservoirs on Taiwan was conducted during 1989-1993. *P. asymmetricum* was found in five of them (Table 1), all situated in the western part of Taiwan (Fig. 1). Presumably, this species is more widely distributed in Taiwan.

### Coexistence with other *Pediastrum* species

In the 18 water reservoirs investigated, various species of *Pediastrum*, such as *P. asymmetricum*, *P. boryanum* (Turp.) Menegh., *P. duplex* Meyen, *P. simplex* and *P. tetras* (Ehr.) Ralfs were found. In all of the dams where *P. asymmetricum* was found, it coexisted with *P. simplex*. The latter usually occurred as a dominant species, while the

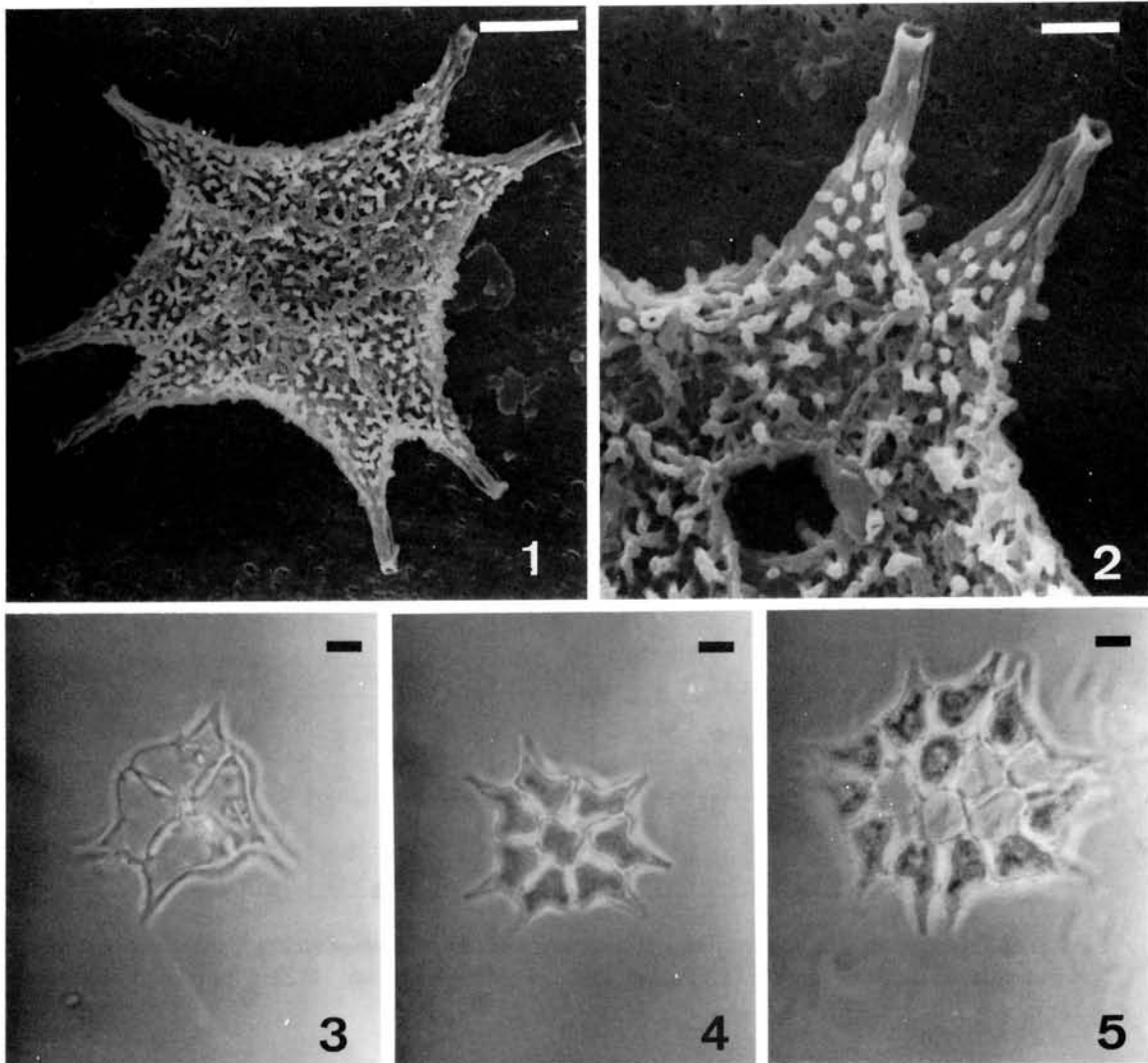


Plate 1. Morphology of *Pediastrum asymmetricum* Yamagishi et Hegewald. (1): an 8-celled coenobium under SEM, bar = 5  $\mu\text{m}$ ; (2): enlarged marginal cells under SEM, bar = 2  $\mu\text{m}$ ; (3)-(5): coenobium under light microscope with 4, 8 and 16 cells, respectively, bar = 5  $\mu\text{m}$ .

former appeared only in trace. This is unlike that reported in Japan, where *P. asymmetricum* coexisted with *P. simplex* and *P. duplex* (Hegewald and Yamagishi, 1994).

#### Environment of *P. asymmetricum* inhabiting localities

The water quality of the dams where *P. asymmetricum* resides is summarized in Table 1. Some parameters vary to a considerable extent during the period in which the samples were taken. Generally, low value measurements were obtained in the winter, and high value measurements were obtained in the summer. The values of the trophic state index evaluated via Carlson's equations were either over 50.0 or between 40.0 and 50.0, indicating that they were in the eutrophic or mesotrophic state, respectively. Nevertheless, the present data does not indicate that this species has any special nutrition requirement.

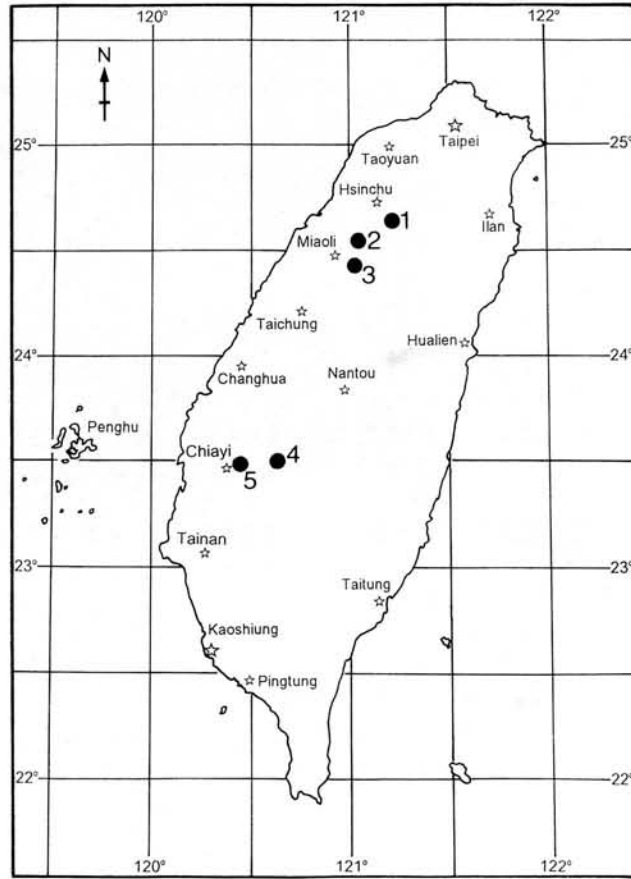


Fig. 1. Map of Taiwan showing the localities at which *Pediastrum asymmetricum* Yamagishi et Hegewald was found. 1: Baosan Dam; 2: Yunhosan Dam; 3: Mingder Dam; 4: Zenyitan Dam; 5: Langtan Dam.

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Table 1. Summary of water quality in five water reservoirs in which *P. asymmetricum* Yamagishi et Hegewald was found

	Lan-Tan Dam <sup>1</sup>	Yunhosan Dam <sup>2</sup>	Zenyitan Dam <sup>2</sup>	Baosan Dam <sup>2</sup>	Mingder Dam <sup>2</sup>
pH	7.6 - 9.3	7.7 - 8.7	8.1 - 8.7	7.9 - 8.9	7.5 - 9.3
Dissolved oxygen (mg/L)	7.6 - 9.0	6.9 - 8.8	7.2 - 9.2	8.5 - 9.4	6.2 - 10.0
Conductivity ( $\mu$ mho/cm)	329 - 365	200 - 225	350-365	112 - 205	155 - 300
Alkalinity (m mol/L)	-	1.3 - 2.0	2.3 - 2.9	1.4 - 1.9	1.4 - 2.3
Secchi depth (m)	-	1.0 - 1.8	0.7 - 1.6	1.1 - 2.0	1.1 - 1.3
BOD <sub>5</sub> (mg/L) <sup>3</sup>	0.8 - 3.0	0.7 - 3.1	0.9 - 7.7	0.6 - 4.3	1.3 - 3.0
Total organic N (mg/L)	0.45-1.00	0.03-0.12	0.15-0.66	0.05-0.12	0.04-0.10
Ammonia-N (mg/L)	0.03-0.19	0.01-0.16	0.03-0.08	0.02-0.15	0.04-0.16
Nitrate-N (mg/L)	0.08-1.00	0.03-2.33	0.02-2.20	0.23-1.69	0.90-2.48
Phosphate-P ( $\mu$ g/L)	2 - 10	6 - 44	8 - 15	3 - 43	3 - 51
Total P ( $\mu$ g/L)	20 - 72	10 - 104	46 - 65	10 - 96	9 - 87
Chlorophyll <i>a</i> ( $\mu$ g/L)	6.2-20.3	1.0-15.2	3.7-9.9	1.2-14.3	1.4-25.7
Trophic state index (TSI) <sup>4</sup>	47.9-62.9	41.1-52.5	54.9-63.1	50.2-57.9	45.1-61.7

<sup>1</sup> measured during March 1992 - May 1993.

<sup>2</sup> measured during September 1989 - July 1990.

<sup>3</sup> BOD<sub>5</sub>: Biochemical oxygen demand for an incubation of 5 days.

<sup>4</sup> TSI was calculated on the basis of the measured levels of chlorophyll *a*, total phosphate and Secchi depth. Data measured in the winter were not used for calculation.

## 一種台灣新記錄盤星藻

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(收稿日期：1995年3月18日，接受日期：1995年4月26日)

### 摘 要

在台灣中西部五個水庫中被發現有一種盤星藻，與單角盤星藻一起出現，但形態上與其有異，經鑑定係與新近才在日本一池塘發現而被命名的新種(*Pediastrum asymmetricum* Yamagishi et Hegewald)相似。此種盤星藻為台灣之新記錄，本文對其形態及所出現水域水質作分析，發現此種生長於優養化之水庫中，本文並對其生長環境作探討。

關鍵字：盤星藻，新記錄，地理分佈，形態，台灣。

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