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On the taxonomic identity of *Diadesmis confervaceoides* Lange-Bert. *et* U. Rumrich (Bacillariophyceae)

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Abstract – *Diadesmis confervaceoides* was separated from *D. confervacea* based on differences in both the fine structure of the proximal external ends of the raphe (which have central pores) and the shape of the central area, as well as the absence of linking spines on the junction of the valve face and mantle. Based on observations of individuals of *D. confervacea* that grow in Rodriguez Stream (Buenos Aires Province, Argentina), and having compared them with observations carried out by other authors both in natural populations and clonal cultures, it is proposed that *D. confervaceoides* be considered as a synonym of *D. confervacea*. This proposal is a consequence of the polymorphism of frustules integrated in different positions of cell chains, a phenomenon that has been overlooked until recently.

***Diadesmis confervacea* / diatoms / freshwater microalgae / polymorphism / taxonomy**

Résumé – **Identité taxonomique de *Diadesmis confervaceoides* Lange-Bert. *et* U. Rumrich (Bacillariophyceae)**. *Diadesmis confervaceoides* a été séparé de *D. confervacea* sur la base de différences dans la structure fine des terminaisons proximales externes du raphé (qui ont des pores centraux) et la forme du nodule central et aussi bien que sur l'absence d'épines de liaison sur la jonction valve – manteau. Les observations de spécimens de *D. confervacea* vivant dans le Rodriguez Stream (Buenos Aires, Argentine), comparées à celles d'autres auteurs dans les populations naturelles et des cultures clonales, conduisent à proposer *D. confervaceoides* comme synonyme de *D. confervacea*. Cette proposition est une conséquence de la polymorphie des frustules intégrés dans différentes positions des chaînes cellulaires, un phénomène qui a été negligé jusqu'à une période récente.

***Diadesmis confervacea* / diatomées / microalgues d'eau douce / polymorphisme / taxonomie**

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INTRODUCTION

Recently, Rumrich *et al*. (2000) described *Diadesmis confervaceoides* Lange-Bertalot *et* Rumrich based on material from Cauquenes River, Chile. This species was separated from *D. confervacea,* primarily by the shape of the central area and the proximal raphe fissures. The occurrence of both species in the same sample allowed a comparative study of the two taxa. The valves of *D. confervaceoides* lack marginal spines, have a rhomboidal central area and proximal raphe fissures that are small circular pores while, according to Rumrich *et al*. (*op. cit.*), the central area of *D. confervacea* is wide and the raphe fissures have a "stirrup" shape.

Based on observations of Kützing's type material, Schoeman & Archibald (1980) described *Diadesmis confervacea* as having elliptical to lanceolate valves, with rounded to rostrate apices; raphe branches straight and filiform with central pores fairly distinct, round and separated by a prominent central nodule; axial area linear to linear-lanceolate, widening gradually or more or less abruptly into a lanceolate to rhombic-lanceolate central area of variable size. Scanning Electron Microscopy (SEM) observation by these authors revealed the presence of linking spines along the margin of the valve face and central pores like circular depressions often closed by a "silica plug".

An unusual growth of *Diadesmis confervacea* Kützing occurred in the austral summer of 1998 in Rodriguez Stream (Buenos Aires Province, Argentina), when long chains of up to 400 cells were observed. The specimens had valves with features of both taxa (*D. confervaceoides* and *D. confervacea*) along with intermediate forms, suggesting that *D. confervaceoides* is not a valid species.

MATERIAL AND METHODS

The studied sample was collected in January 1998 in Rodríguez stream, Buenos Aires Province, Argentina (34°54'15''S – 58°03'47''W). Available environmental data are: conductivity 1247 μS cm^{-1}; BOD 26 mg l^{-1}; dissolved oxygen 4.5 mg l^{-1}; pH 7.1; NH_4^+ 9.639 mg l^{-1}; water temperature 22.3°C.

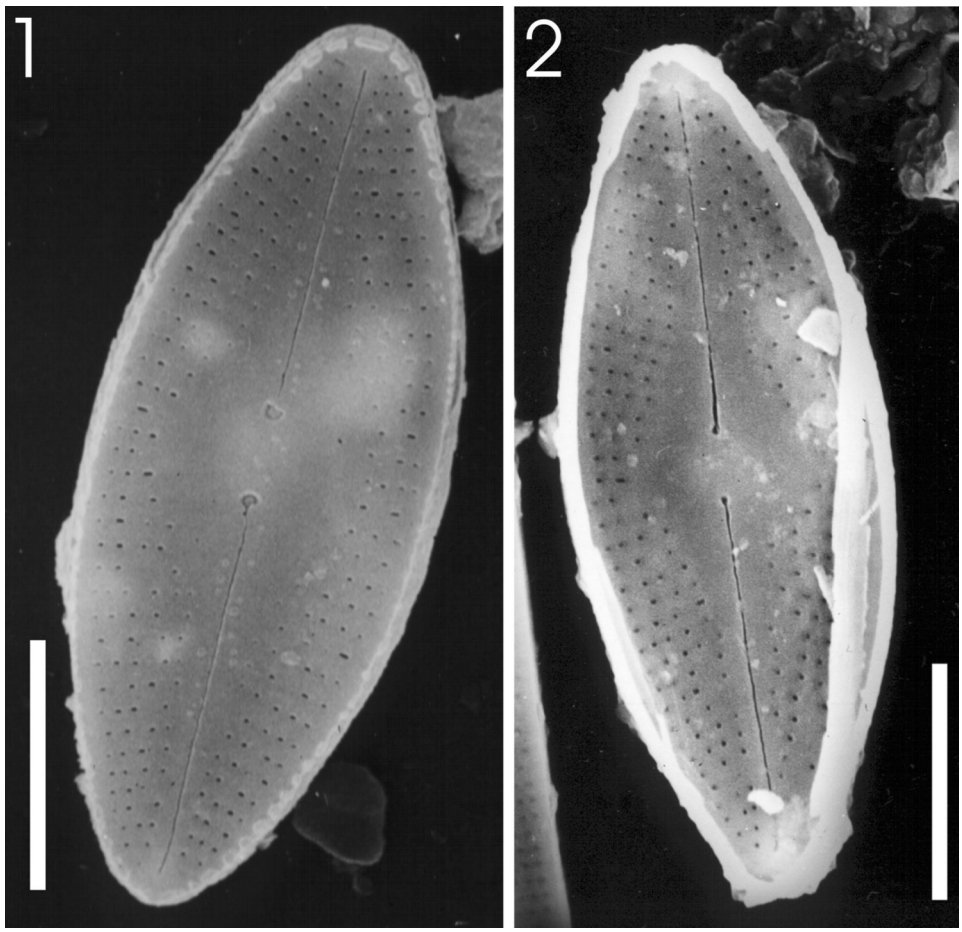
Organic content was eliminated following the standard method of Battarbee (1986), oxidising with Hydrogen peroxide and heat. Permanent slides were mounted in Naphrax® and deposited in Nora I. Maidana's personal collection (slides RVE 2 98 a-c).

A Carl Zeiss 54974 microscope, a Leica Quantimet 520 image analyser and a video camera Sanyo VC 2512 were used for the observations and measurements. The central area width was measured in 50 randomly selected valves.

SEM observations were made with a Phillips XL 30, 20 Kv from the Service of Electron Microscopy of the Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina.

RESULTS AND DISCUSSION

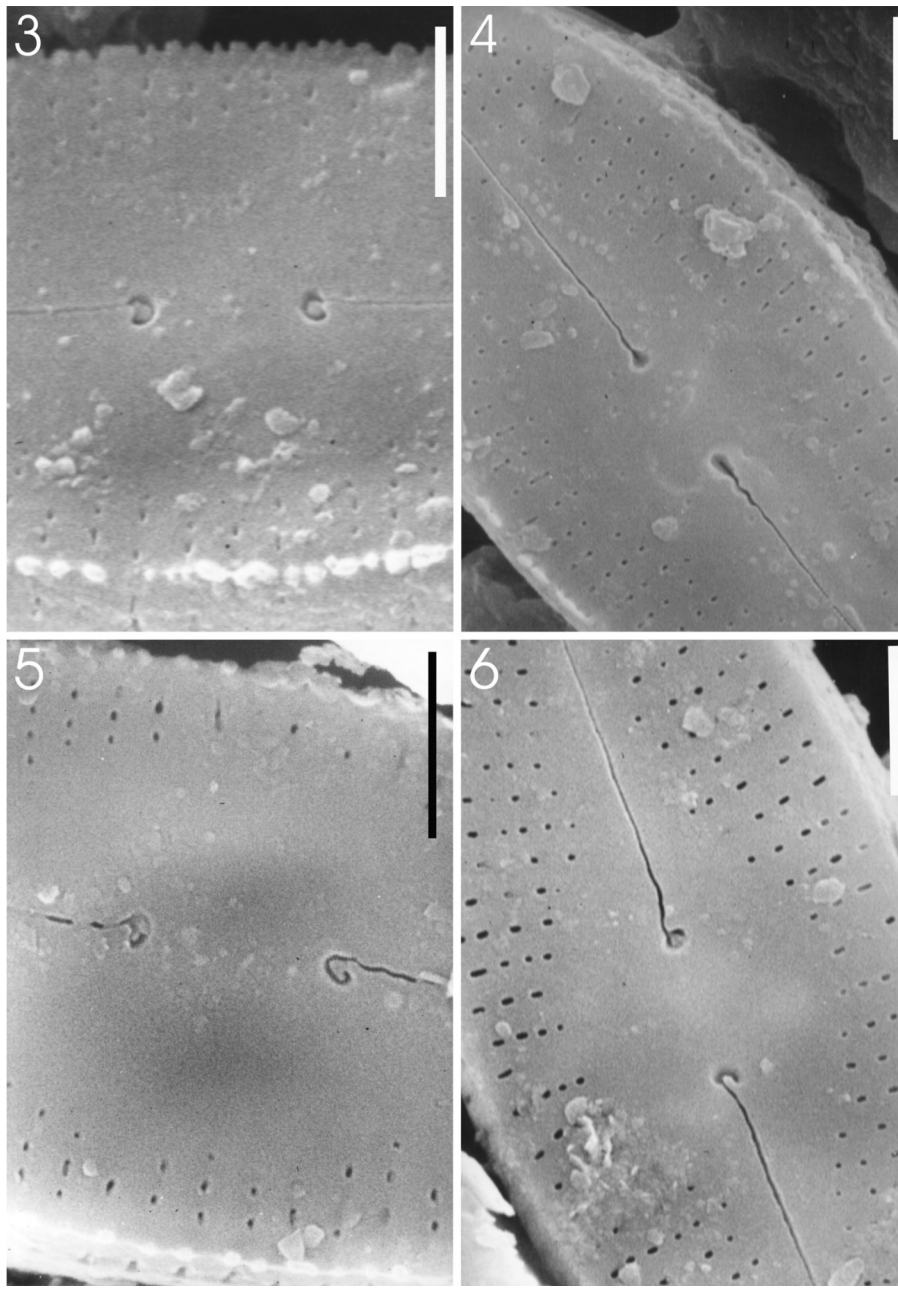
More than 90% of the valves observed from Rodriguez stream had marginal linking spines and stirrup shaped raphe fissures, typical of *D. confervacea* (Figs 1, 3). However, some valves (less than 5 %) agree with the description of



Figs 1-2. SEM. External view of *Diadesmis confervacea*. Arroyo Rodríguez, Buenos Aires Province, Argentina. **1.** Valve with marginal linking spines and stirrup shape raphe fissures. **2.** Valve without marginal linking spines, with small and circular central pores and rhombic central area. Scale bar equals 5 μm.

D. confervaceoides in lacking marginal linking spines and having small and circular central pores (Fig. 2). Moreover, several valves also presented combinations of the diagnostic features of both species: valves with marginal linking spines and circular central pores (Fig. 4), valves with marginal linking spines with one central stirrup shape fissure and the other one hook-like (Fig. 5); and valves without marginal linking spines with one central stirrup shape fissure and the other one hook-like (Fig. 6).

The cells of *D. confervacea* form chains joined by mucilage excreted through the raphe and the chain integrity is maintained by overlapping of marginal linking spines (Rosowski, 1980, as teeth). Therefore, those cells lacking marginal linking spines would act as separation valves.



Figs 3-6. SEM. External views of the central area of valves of *Diadesmis confervacea*. Arroyo Rodríguez, Buenos Aires Province, Argentina. **3.** Valve with marginal linking spines and proximal stirrup-shape raphe fissures. **4.** Valve with marginal linking spines and circular central pores. **5.** Valve with marginal linking spines and one central stirrup shape fissure and the other one hooked. **6.** Marginal spines absent and one central stirrup shape fissure and the other one hooked. Scale bar equals 2 µm.

Other authors have described the ultrastructure of valves in *D. confervacea*. Coste (1975, fig. 3) illustrated a valve which had marginal linking spines with circular pores, and a lanceolate and reduced central area. Coste & Verrel (1978, pl. 1, fig. 3) illustrated a valve without marginal linking spines with circular pores, and with the central area wide and lanceolate.

Rosowski (1980) analysed a clonal culture of this species (clon UN93). The specimen shown in fig. 2 has a valve without marginal linking spines with circular pores whereas the specimen in fig. 4 corresponds to a valve with marginal linking spines and "stirrup" shape fissures.

A great variability in the width of the central area (2.72-4.73 µm; mean 3.819 ± 0.412 µm, Fig. 7) was also observed in our sample. This agrees with the illustrations of *D. confervaceoides* provided by Rumrich *et al*. (2000; pl 81, figs 1-7) and those of *D. confervacea* illustrated by Schoemann & Archibald (1980, figs 1-26) and Coste & Verrel (1978; pl. 1, figs 2, 3; pl. 2, fig. 3).

The observed variability in the shape of the raphe central fissures and in the central area width would not allow differentiating between these two species.

Morphological features from both clonal cultures and natural populations suggest that the diagnostic features of *D. confervaceoides* correspond to different expressions of *D. confervacea*, hence it is a highly polymorphic species. Polymorphism has also been observed in other members of the genus, i. e. *D. gallica* (W. Smith) Van Heurck (= *Navicula gallica)* (Granetti, 1977; 1978). We suggest that *D. confervaceoides* cannot be considered a valid species and should be regarded as a synonym of *D. confervacea*.

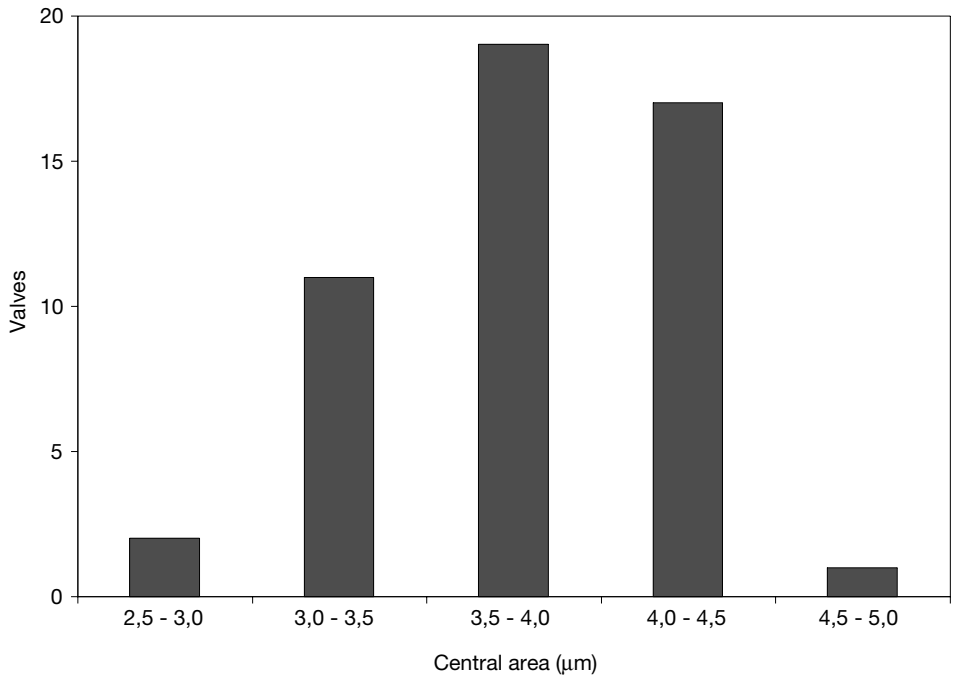


Fig. 7. Variability of central area width in *Diadesmis confervacea* from Arroyo Rodríguez, Argentina.

It is likely that the shape and size of the raphe fissures in this species are closely related to chain formation and the presence of valves without marginal linking spines enables cell separation preventing mechanical ruptures. The situation in *D. confervaceoides* demonstrates that the presence or absence of marginal linking spines alone cannot serve as a criterion to distinguish between two similar taxa in this genus. The phenomenon of potentially developing or non-developing linking spines was already shown by Lange-Bertalot (1980) in the case of *Navicula (Diadesmis) perpusilla*.

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