



## ORIGINAL ARTICLE /ARTÍCULO ORIGINAL

### A NOMENCLATURAL AND CULTURAL NOTE ON *CHLORELLA PERUVIANA* G. CHACÓN AND OTHER SPECIES OF THE GENUS *CHLORELLA* BEIJ. (CHLORELLACEAE, CHLORELLALES)

### UNA NOTA NOMENCLATURAL Y CULTURAL SOBRE *CHLORELLA PERUVIANA* G. CHACÓN Y OTRAS SPECIES DEL GÉNERO *CHLORELLA* BEIJ. (CHLORELLACEAE, CHLORELLALES)

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## ABSTRACT

On the course of our investigations on the culture of *Chlorella peruviana* G. Chacón, it became apparent that some nomenclatural changes were necessary within the genus. Here, we present those changes: transfer of *C. pyrenoidosa* H. Chick to *Auxenochlorella* as *A. pyrenoidosa* (H. Chick) Molinari & Calvo-Pérez *comb. nov.*; the replacement name *C. gloriae* Molinari *nom. nov.* for *C. salina* Butcher; and the lectotypification of *C. peruviana* G. Chacón. Finally, the liquid medium Calderón for marine algae is validated for this last species.

**Keywords:** algae nomenclature, *Chlorella*, *Chlorella peruviana*, Peru

## RESUMEN

En el transcurso de investigaciones fisiológicas con *Chlorella peruviana* G. Chacón, se hizo evidente la necesidad de cambios nomenclaturales en el género. Presentamos dichos cambios a continuación, a saber: la transferencia de *C. pyrenoidosa* H. Chick a *Auxenochlorella* como *A. pyrenoidosa* (H. Chick) Molinari & Calvo-Pérez *comb. nov.*; el nombre de remplazo *C. gloriae* Molinari *nom. nov.* para *C. salina* Butcher, y la lectotipificación de *C. peruviana* G. Chacón. Finalmente, el medio líquido Calderón para algas marinas es validado para el cultivo de esta última especie.

**Palabras clave:** *Chlorella*, *Chlorella peruviana*, nomenclatura de algas, Perú.

## INTRODUCTION

While testing culture media for hypersaline algae collected at the Chilca lagoons in 2012, a single species of *Chlorella* dominated overwhelmingly the habitat.

After unsuccessful research, we stumbled upon a hard-to-find article (Chacón-Roldán 1980a) describing the medicinal properties of the same lagoon we were working with. There, a new species of *Chlorella* was identified, but no formal description was made. This clue

led us to the actual description of the alga, by the same author, as *Chlorella peruviana* G. Chacón, in the same year (Chacón-Roldán 1980b).

Once we had the identity, we contacted the author, who provided us with specimens of some *Chlorellae*, now deposited in the MOL herbarium. With the new material, we proceeded to understand some of the species used by Chacón Roldán (*id.*) in her description of the new species. We focused in *Chlorella pyrenoidosa* H. Chick, 1903), a fresh-water species with a heterotrophic metabolism, a trait that located it in the subgenus *Auxenochlorella* of Shihira & Krauss, 1965); and *Chlorella salina* Butcher, 1952), a poorly known species whose name is a later homonym of *C. salina* (Chick 1903, Kufferath 1919, Butcher 1952, Shira & Krauss 1965).

## MATERIALS AND METHODS

Samples were taken from the “Milagrosa” salty lagoon, in Chilca, on October 25, 2012. In addition, measurements of temperature, pH, salinity and oxygen were taken. For the culture, we used a modified medium for marine algae published originally by Serpa & Calderón (2005).

The medium was distributed in transparent plastic recipients of 2,5 L of capacity. Then, all the recipients were inoculated with 1 mL of the lagoon's water. The recipients were put under “cages” of wood frames and sides of plastic net, in order to diminish the solar radiation to a half. The evaluation of the culture was made two weeks after the inoculation at the Vegetal Physiology lab of La Molina University.

Additionally, we practiced a culture of *C. pyrenoidosa* in the same medium, without salt, thus providing a fresh-water environment. Two recipients with the same characteristics

previously stated were inoculated with 1 g of lyophilised microalgae. The same treatment was followed. However, the potassium nitrate, used as a nitrogen source, was replaced by powdered peptones in one of the recipients, in order to test the ability of this species to grow in autotrophic and heterotrophic media.

For the taxonomical treatment, a nomenclatural survey was made. Most of the data is available through AlgaeBase (Guiry & Guiry 2015).

## RESULTS AND DISCUSSIONS

The culture was completely successful, with high cellular density; proving that the Calderón medium can be used for the extensive culture of hyper-saline species for scientific and commercial purposes provided it is saturated with common salt (NaCl). It was designed as a fresh water-algae culture medium (Calderón pers. comm.) and was subsequently modified by Serpa & Calderón (2005) for the culture of a marine algae. Here we modified it in order to create a highly saline environment that can support halophytic microalgae. Here we propose some changes that we consider are necessary and will reflect better the natural history of the family Chlorellaceae.

*Auxenochlorella pyrenoidosa* (H. Chick)  
Molinari & Calvo-Pérez *comb. nov.*

BASIONYM: *Chlorella pyrenoidosa* H. Chick, Proceedings of the Royal Society Biological Sciences Series B 71(475): 460. 1903.

Specimen studied: “Material tomado de la MCC 18b”. *G. Chacón s. n.* (MOL!)

*Chlorella pyrenoidosa* should be placed in the genus *Auxenochlorella* (Shihira & R. W. Krauss) Kalina & Pun och., for its

physiological characteristics; that is, its inability to use inorganic nitrates as a nitrogen source. The control recipient provided with peptones was able to survive over the two-weeks period of evaluation. The control recipient, with potassium nitrate prospered for a short time, was yellow at the end of the first week, and remained so until the end of the experiment. Erected by Kalina & Pun ochárová (1987), this genus is based over the subgenus created in the monograph of Shihira & Krauss (1965), and is characterized by a partially heterotrophic metabolism dependent of organic nitrogen compounds, identical to the metabolism already found in this species (Samejima & Myers 1958) and confirmed by us in this study.

*Chlorella gloriosa* Molinari & Calvo-Pérez,  
*nom. nov.*

*Chlorella salina* Butcher. Journal of the Marine Biological Association of the United Kingdom 31: 179. 1952. *Nom. illeg. hom. Non Chlorella salina* Kuff., Annales de Biologie Lacustre, t. 9 (1919): p. 6.

LECTOTYPE of *Chlorella salina* Butcher (here designated): Journal of the Marine Biological Association of the United Kingdom 31: "Contributions to knowledge of the smaller marine algae". Plate I, figs. 11, 12, 13 and 14. 1952. (iconotype).

It has been established by Shihira & Krauss (1965) that no original material was to be located. Therefore, it is necessary to use the plates as type. Anyway, the designation of an epitype may be necessary. We choose to name it "*gloriosa*" ("related or pertaining to glory") in honour of Prof. Gloria Chacón Roldán de Popovici, who supported this research, provided key bibliography and donated crucial specimens, used for the critical comparison of the species. The epithet is an adjective, and should be treated as such.

*Chlorella peruviana* G. Chacón, 1980

LECTOTYPE of *Chlorella peruviana* Gloria Chacón (here designated): Isotype de *Chlorella peruviana* (Chacón s. n. USM 15749), maintained in a metabolically inactive state through lyophilisation made in 1970 by René Solís, director of the Health National Institute of Peru (Instituto Nacional de Salud), and checked for viability every five years. The isotype, here designated as a lectotype, is deposited in the "Augusto Weberbauer" Herbarium (MOL!) under the number MOL1669.

While making this research, one of us (EAMN) went to the USM herbarium in order to verify if the holotype was extant. This, sadly, was not the case. Fortunately, Gloria Chacón gave us some of the isotypes preserved in her personal collection. Those are currently at MOL, and are here designated as a lectotype. This is currently the only endemic species of *Chlorella* for Peru.

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