

State of knowledge of the Corallinales (Rhodophyta) of Tierra del Fuego and the Antarctic Peninsula*

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SUMMARY: Corallinales (Rhodophyta) in Tierra del Fuego are abundant, with 9 genera, 17 species and 1 subspecies. *Pseudolithophyllum* with 1 species (*P. fuegianum*), which represents 35.8% of the coralline algae, is dominant. The genera *Parahydrolithon* with 4 species (*P. consociatum*, *P. discoideum*, *P. falklandicum*, *P. subantarcticum*) and 20%, *Lithothamnion* with 3 species (*Lt. heterocladum*, *Lt. rugosum*, *Lt. granuliferum*) and 17.5%, and *Synarthrophyton* with 3 species (*S. neglectum*, *S. patena*, *S. schmitzii*) and 12% share are abundant. *Clathromorphum* with 4 species (*Cl. annulatum*, *Cl. lemoineanum*, *Cl. obtectulum*, *Cl. variabile*) and a share of 5.8%, and *Mesophyllum* with 1 species (*M. fuegianum*) and a share of 4.9% are frequent. The remaining three genera, *Bossiella* with 1 subspecies (*B. orbigniana ssp. orbigniana*), *Corallina* with 2 species (*C. elongata*, *C. officinalis*) (1.1%), and *Titanoderna* with 1 species (*T. conspectum*) (1%) are scarce. *C. officinalis* is a cosmopolitan, and the other geniculate corallines are found in both hemispheres, whereas the crustose coralline occur only in the southern hemisphere. The characteristic vertical distribution of the species in the intertidal and subtidal zone of Tierra del Fuego is given. The Corallinales in the Antarctic Region are poorly known and need further investigation.

Key words: Corallinales (Rhodophyta), Tierra del Fuego, Antarctic Peninsula.

RESUMEN: ESTADO DE CONOCIMIENTO DE LAS CORALLINALES (RHODOPHYTA) DE TIERRA DEL FUEGO Y PENÍNSULA ANTÁRTICA. – En Tierra del Fuego las Corallinales (Rhodophyta) son abundantes y están representadas por 9 géneros con 17 especies y 1 subespecie. *Pseudolithophyllum* con 1 única especie (*P. fuegianum*) es dominante y representa el 35,8% de las algas calcáreas. *Parahydrolithon* con 4 especies (*P. consociatum*, *P. discoideum*, *P. falklandicum*, *P. subantarcticum*) (20%), *Lithothamnion* con 3 especies (*Lt. heterocladum*, *Lt. rugosum*, *Lt. granuliferum*) (17,5%) y *Synarthrophyton* con 3 especies (*S. neglectum*, *S. patena*, *S. schmitzii*) (12%) son abundantes. *Clathromorphum* con 4 especies (*Cl. annulatum*, *Cl. lemoineanum*, *Cl. obtectulum*, *Cl. variabile*) (5,8%) y *Mesophyllum* con 1 especie (*M. fuegianum*) (4,9%) son frecuentes. *Bossiella* con 1 subespecie (*B. orbigniana ssp. orbigniana*), *Corallina* con 2 especies (*C. elongata*, *C. officinalis*) (1%) y *Titanoderna* con 1 especie (*T. conspectum*) (1%) son escasas. *C. officinalis* es cosmopolita, las otras especies geniculadas crecen en ambos hemisferios, y las incrustantes son exclusivas del hemisferio austral. Se señala la distribución vertical de las especies en las zonas intermareal y submareal. Los trabajos de las Corallinales de la región Antártica son escasos, no pudiéndose precisar la biodiversidad de este grupo algal.

Palabras clave: Corallinales (Rhodophyta), Tierra del Fuego, Península Antártica.

INTRODUCTION

The coralline red algae (Rhodophyta, Corallinales) are one of the abundant seaweed groups in Tierra del Fuego, Argentina and represent a prin-

cipal component of the Fuegian marine ecosystems (Mendoza and Cabioch, 1986; Mendoza *et al.*, 1996).

Coralline species have a restricted vertical distribution, and some are considered as indicators of distinct ecological zones in the intertidal and subtidal. Some species exhibit a marked and restricted geo-

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graphic distribution related to the water temperature. Some species occur exclusively in the Subantarctic regions.

MATERIAL AND METHODS

Data have been obtained from work carried out in Tierra del Fuego since the end of the last century by specialists in Corallinales: Foslie (1900, 1905, 1906, 1907), Heydrich (1900), Lemoine (1913, 1920); by phycologists: Ardissonne (1888), Hariot (1895), Cotton (1915), Skottsberg (1923, 1941); and more recently by Mendoza (1976, 1988, 1990), Mendoza and Cabioch (1984, 1985, 1986, in press), Mendoza *et al.* (1996) and Cinelli *et al.* (1989).

Abundance percentage of genera is expressed by the sum of the species abundance of each genus. The abundance for each species was obtained either by counting of specimens or the cover of the encrusting thallus of the same species, which was then divided by the average thallus size. In both cases 25 cm squares were used, distributed every meter all along a transect perpendicular to the coast. The transects were done on low tide days during the summer months (November to March) in 1991, 1992, 1994 and 1995 along the Atlantic coast of Tierra del Fuego (Cabo San Pablo, Cabo Viamonte, Punta María, Caleta la Misión) and monthly in 1991, 1992, 1994 and 1995 along the Beagle Channel (Puerto Brown, Islas Bridges, Bahía Golondrina, Bahía Ensenada).

The delimitation of the intertidal and subtidal ecological levels is based on the corresponding indicator species for the coast of Tierra del Fuego. Occurrence of green algae communities (*Enteromorpha prolifera*, *Enteromorpha intestinalis* and *Blidingia minima* var. *minima*) delimits the upper intertidal zone; occurrence of the first plants of red algae (*Notogenia fastigiata*, *Sarcothalia dichotoma*, *Bostrichia intricata*), of encrusting coralline algae (*Parahydroliton falklandicum*, *Synarthrophyton neglectum*), and of brown algae (*Corycus lanceolatus*, *Adenocystis utricularis*) corresponds to the mid intertidal zone; and occurrence of the brown algae species *Lessonia nigrescens* to the lower intertidal zone. Lack of *Lessonia nigrescens* and occurrence of thalli of encrusting coralline *Pseudolithophyllum fuegianum* characterize the upper limit of the subtidal, and the occurrence of forests of brown algae *Macrocystis pyrifera* the lower subtidal zone.

RESULTS AND CONCLUSIONS

The studies of coralline algae are not very numerous in comparison with the other algae groups. The first work on coralline algae of Tierra del Fuego was carried out by Foslie (1900; 1905; 1906; 1907), Heydrich (1900) and Lemoine (1913; 1920), specialists in this algal group. Their identifications are based on the vegetative anatomy, especially the number of pores of the conceptacles. Other authors (Ardissonne, 1888; Hariot, 1895; Cotton, 1915; Skottsberg, 1923, 1941) have reported other species. However, these studies were based on the external morphology only, and attempting to identify typical species of the boreal hemisphere in Tierra del Fuego.

In these first studies on the coralline algae of Tierra del Fuego 9 genera with 41 species were reported. Later Mendoza (1976, 1988, 1990), Mendoza and Cabioch (1984, 1985, 1986, in press) and Mendoza *et al.* (1996) studied the geniculate and crustose coralline algae of Tierra del Fuego. These authors, on the base of the reproductive and morphological characteristics of the species, gave an insight into the biodiversity of coralline algae. Their results are highly different from those presented in the early works (Table 1).

The geniculate coralline algae are not common and are only represented in two genera: *Bossiella* and *Corallina*, and the crustose coralline genera *Lithophyllum*, *Epilithon*, *Melobesia*, *Neogoniolithon*, and *Phymatolithon* do not occur along the Tierra del Fuego coast.

The recent studies by Mendoza *et al.* (1996) and Mendoza and Cabioch (in press), on the basis of type material and the new collections in the last few years in Tierra del Fuego, report 9 genera with 17 species and 1 subspecies: I. *Bossiella* with 1 subspecies [*B. orbigniana* ssp. *orbigniana* (Dcne.) Silva]; II. *Corallina* with 2 species (*C. elongata* Ell. et Sol., *C. officinalis* L.); III. *Clathromorphum* with 4 species [*Cl. annulatum* (Fosl.) Mendoza, *Cl. lemoineanum* Mendoza et Cabioch, *Cl. obtectulum* (Fosl.) Adey, *Cl. variabile* (Fosl.) Mendoza]; IV. *Parahydrolithon* with 4 species [*P. consociatum* (Fosl.) Mendoza et Cabioch, *P. discoideum* (Fosl.) Mendoza et Cabioch, *P. falklandicum* (Fosl.) Mendoza et Cabioch, *P. subantarcticum* (Fosl.) Mendoza et Cabioch]; V. *Lithothamnion* with 3 species (*L. granuliferum* Fosl., *L. heterocladum* Fosl., *L. rugosum* Fosl.); VI. *Mesophyllum* with 1 species [*M. fuegianum* (Fosl.) Adey]; VII. *Synarthrophyton* with 3

TABLE 1. – Former and present inventory of coralline algae in Tierra del Fuego. Species on the left were reported in prior studies, bold indicated species do not occur in Tierra del Fuego; species on the right are present identifications of those species that occur in Tierra del Fuego (Mendoza *et al.*, 1996; Mendoza and Cabioch, in press).

I.	AMPHIROA	
1	<i>Amphiroa crassa</i> Lamour.	
2	<i>Amphiroa tasmanica</i> Sonder	
II.	BOSSIELLA	
1	<i>Bossella orbigniana</i> (Dcne.) Silva	<i>Bossella orbigniana</i> (Dcne.) Silva ssp. <i>orbigniana orbigniana</i>
III.	CORALLINA	
1	<i>Corallina armata</i> Hook f. et Harv.	
2	<i>Corallina chilensis</i> Decne	
3	<i>Corallina frondescens</i> Kutz	
4	<i>Corallina officinalis</i> L.	<i>Corallina officinalis</i>
5	<i>Corallina pilulifera</i> Post. et Rupr.	
IV.	EPILITHON	
1	<i>Epilithon vallentinae</i> Lemoine	
V.	LITHOPHYLLUM	
1	<i>Lithophyllum aequabile</i> Fosl.	<i>Clathromorphum obtectulum</i>
2	<i>Lithophyllum amplexifrons</i> (Harv.) Heydr.	
3	<i>Lithophyllum conspectum</i> Fosl.	<i>Titanoderma conspectum</i>
4	<i>Lithophyllum decipens</i> (Fosl.) Fosl.	
5	<i>Lithophyllum discoidea</i> (Fosl.) Levr.	<i>Parahydrolithon discoideum</i>
6	<i>Lithophyllum decussatum</i> (Ell. et Sol.) Phil.	
7	<i>Lithophyllum falklandicum</i> Fosl.	<i>Parahydrolithon falklandicum</i>
8	<i>Lithophyllum fuegianum</i> Heydr.	<i>Pseudolithophyllum fuegianum</i>
9	<i>Lithophyllum hapalidioides</i> (Crouan) Hariot	
10	<i>Lithophyllum postulatatum</i> (Lamour.) Fosl.	
11	<i>Lithophyllum racemus</i> (Lamark.) Fosl.	
12	<i>Lithophyllum subantarcticum</i> Fosl.	<i>Parahydrolithon subantarcticum</i>
VI.	LITHOTHAMNION	
1	<i>Lithothamnion antarcticum</i> (Hook f. et Harv.) Fosl.	<i>Synarthrophyton patena</i>
2	<i>Lithothamnion fuegianum</i> Fosl.	<i>Mesophyllum fuegianum</i>
3	<i>Lithothamnion glaciale</i> Kjellm.	
4	<i>Lithothamnion granuliferum</i> Fosl.	<i>Lithothamnion granuliferum</i>
5	<i>Lithothamnion heterocladum</i> Fosl.	<i>Lithothamnion heterocladum</i>
6	<i>Lithothamnion kerguelenum</i> (Dickie) Fosl.	
7	<i>Lithothamnion lenormandii</i> (Aresch.) Fosl.	
8	<i>Lithothamnion lichenoides</i> (Ell. et Sol.) Heydr.	
9	<i>Lithothamnion margini</i> Lemoine et Rosenv.	<i>Parahydrolithon subantarcticum</i>
10	<i>Lithothamnion mülleri</i> Lenorm. ex Rosanoff	
11	<i>Lithothamnion neglectum</i> Fosl.	<i>Synarthrophyton neglectum</i>
12	<i>Lithothamnion patena</i> (Hook. f. et Harv.) Heydr.	<i>Synarthrophyton patena</i>
13	<i>Lithothamnion rugosum</i> Fosl.	<i>Lithothamnion rugosum</i>
14	<i>Lithothamnion schmitzii</i> (Hariot) Heydr.	<i>Synarthrophyton schmitzii</i>
15	<i>Lithothamnion variabile</i> Fosl.	<i>Clathromorphum variabile</i>
VII.	MELOBESIA	
1	<i>Melobesia farinosa</i> Lamour.	
VIII.	NEOGONIOLITHON	
1	<i>Neogoniolithon mamillare</i> (Harv.) Setch. et Mason.	
IX.	PHYMATHOLITHON	
1	<i>Phymatholithon polynorphum</i> (L.) Fosl.	

species [*S. neglectum* (Fosl.) Mendoza, *S. patena* (Hook. et Harv.) Townsend, *S. schmitzii* (Hariot) Mendoza], and the 2 restant genera with only 1 species VIII. *Pseudolithophyllum* [*P. fuegianum* (Heydr.) Mendoza et Cabioch]; and IX. *Titanoderma* [*T. conspectum* (Fosl.) Woelkerling].

Mendoza and Cabioch (1986, in press) and Mendoza *et al.* (1996) reported that the coralline algae in Tierra del Fuego often occur in a high number of specimens of the same species and do not show a great specific diversity. Moreover, the crustose coralline are more abundant than the geniculate group. The genus *Pseudolithophyllum*, with only one species, is dominant and represents 35.8% of the

calcareous algae (Fig. 1). Three genera are abundant: *Parahydrolithon*, with 4 species (*P. conspectum*, *P. discoideum*, *P. falklandicum*, *P. subantarcticum*), making up 20%; *Lithothamnion*, with 3 species, with 17.5%; and *Synarthrophyton*, with 3 species, with 12%. The genera *Clathromorphum*, with 4 species, with 5.8% share, and *Mesophyllum*, consisting of a single species (4.9%), are frequent. *Bossella*, with 1 subspecies, *Corallina*, with 2 species with 1.1%, and *Titanoderma*, consisting of 1 species (1%) are scarce (For names of species cf. last paragraph).

As to the vertical distribution, Mendoza and Cabioch (1986; in press), Mendoza *et al.* (1996)

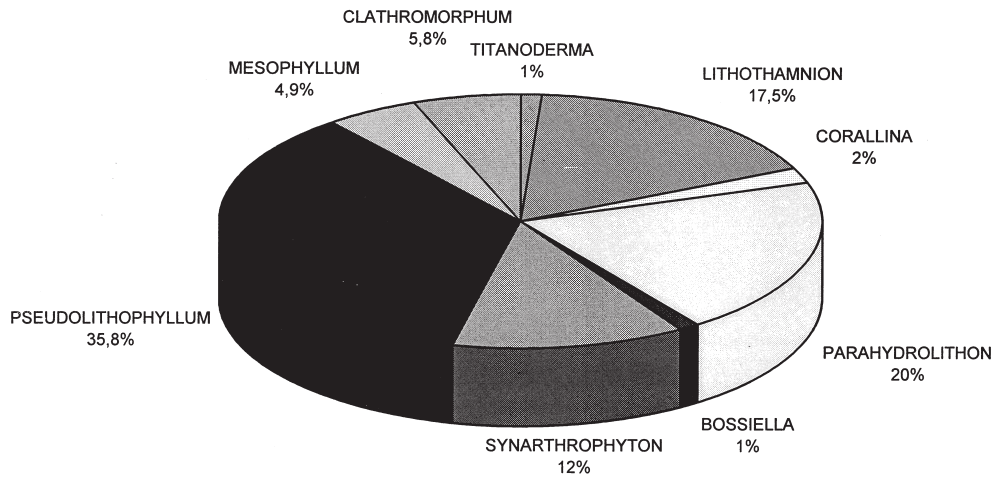


FIG. 1. – Diagrammatic representation of genera abundance of coralline algae in Tierra del Fuego, total material from various years included (see Materials and Methods) (Mendoza *et al.*, 1993, in press; Mendoza and Cabioch, in press).

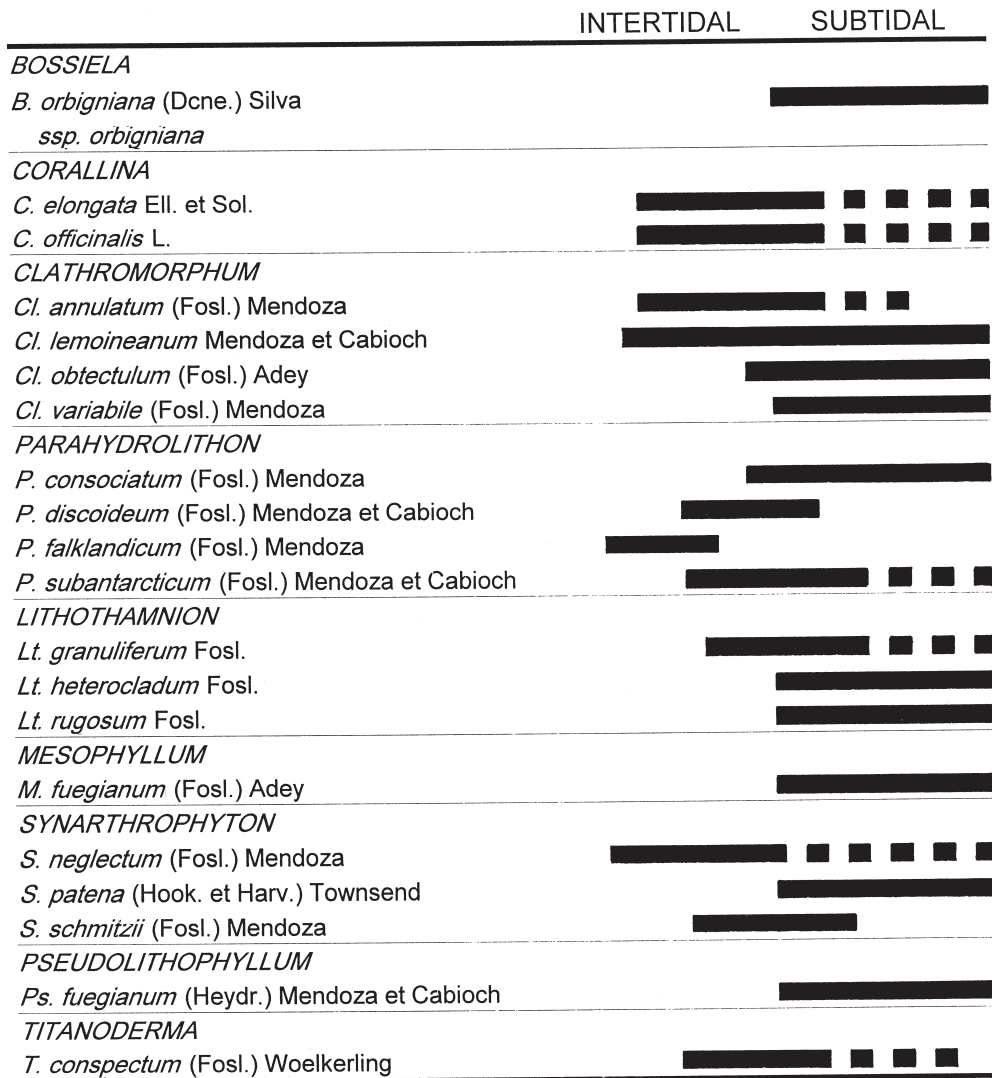


FIG. 2. – Vertical distribution of coralline algae in Tierra del Fuego, (Mendoza *et al.*, 1993; 1996; Mendoza and Cabioch, in press) (see Materials and Methods).

TABLE 2. – Former and present inventory of coralline algae at the Antarctic Peninsula. Species on the left were reported in prior studies followed by the author who cited them in brackets, bold indicated species do not occur in the Antarctic Peninsula; species on the right are present identifications of those species (Mendoza *et al.* 1996; Mendoza and Cabioch, in press); ? shows problems in the taxonomic identification of the material which does not allow us to confirm the species (see Mendoza and Cabioch, 1984).

I LITHOPHYLLUM		
1	<i>Lithophyllum aequabile</i> Fosl.	(Foslie) <i>Clathromorphum obtectulum</i>
2	<i>Lithophyllum discoideum</i> Fosl.	(Skottsberg) ?
3	<i>Lithophyllum decipiens</i> (Fosl.) Fosl.	(Skottsberg)
4	<i>Lithophyllum subantarcticum</i> Fosl.	(Lemoine) <i>Parahydrolithon subantarcticum</i>
II LITHOTHAMNION		
1	<i>Lithothamnion antarcticum</i> (Hook. f. et Harv.)Fosl.	(Skottsberg) <i>Synarthrophyton patena</i>
2	<i>Lithothamnion lenormandii</i> (Aresch.) Fosl.	(Lemoine)
3	<i>Lithothamnion lichenoides</i> (Ell. et Sol.) Heydr.	(Skottsberg)
4	<i>Lithothamnion mangini</i> Lem. et Rosenv.	(Lemoine) <i>Parahydrolithon subantarcticum</i>
5	<i>Lithothamnion schmitzii</i> (Hariot) Heydr.	(Skottsberg) <i>Synarthrophyton schmitzii</i>

reported the coralline algae present a marked and constant vertical distribution (Fig. 2). *Synarthrophyton neglectum* and *Parahydrolithon falklandicum* are the dominant species in the mid intertidal, *P. falklandicum* is exclusive in this zone and *S. neglectum* lives also down into the subtidal zone. *Corallina elongata*, *C. officinalis*, *Clathromorphum annulatum*, *Cl. lemoineanum*, *P. discoideum*, *P. subantarcticum*, *Lt. grannuliferum*, and *Titanoderma conspectum* occur from the lower intertidal downward. *Bossiella orbigniana ssp. orbigniana*, *Clathromorphum lemoineanum*, *Cl. variable*, *Parahydrolithon consociatum*, *Lithothamnion heterocladum*, *Lt. rugosum*, *Mesophyllum fuegianum*, *S. patena*, *S. schmitzii*, *Pseudolithophyllum fuegianum* occur from the upper subtidal. In the lower subtidal zone the coalescent thalli of *P. fuegianum* cover the substrate, and *L. heterocladum* forms very long banks.

The crustose coralline algae are characteristic of the southern hemisphere (Mendoza and Cabioch, 1986; in press; Mendoza *et al.*, 1996), the geniculate *Corallina officinalis* is a cosmopolitan, and *C. elongata*, *Bossiella orbigniana ssp. orbigniana* are found in both hemispheres.

The coralline algae are better known in the Antarctic region. The first studies were made by Foslie (1906) and Lemoine (1913), specialists in this algal group. Other species were reported by Skottsberg (1923, 1941), who was not a specialist in coralline algae. In these papers, 2 genera with 9 species were reported for this region. *Lithophyllum* is represented with 4 species (*L. aequabile*, *L. discoideum*, *L. decipiens*, *L. subantarcticum*), and *Lithothamnion* with 5 species (*Lt. antarcticum*, *Lt. lenormandii*, *Lt. lichenoides*, *Lt. mangini*, *Lt. schmitzii*). However, recent studies on the Corallinales of Tierra del Fuego (Mendoza *et al.*, 1996;

Mendoza and Cabioch, in press) have allowed the taxonomic identity of the species cited for the Antarctic Peninsula to be corrected, except for *Lithophyllum discoideum* Foslie, which due to a wrong use as a synonym of *L. fuegianum* (see Mendoza and Cabioch, 1984) does not permit us to state whether it is *Parahydrolithon discoideum* (Foslie) Mendoza and Cabioch or *Pseudolithophyllum fuegianum* (Heydrich) Mendoza and Cabioch (Table 2).

Cinelli *et al.* (1989) carried out a short study of the coralline algae in the Antarctic region. In this paper, only 2 genera are given: *Clathromorphum*, with 2 species (*Cl. obtectulum*, *Cl. lemoineanum*), and *Parahydrolithon*, with 1 species (*P. subantarcticum*).

Consequently, since there is neither a detailed study, a review of the material already identified nor new, recently collected samples of coralline algae of the Antarctic Peninsula, it is not possible to specify at present the biodiversity of this algal group and compare it with that of Tierra del Fuego. However, we are aware of the abundance of coralline algae along the coasts of the Antarctic Peninsula, supported by the large amount of material collected in the First and Second "Expédition Antarctique Française" in 1903-1905 and 1908-1910, in the Herbario PC, Paris, which has unfortunately not been studied yet.

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