Review of Palaeobotany and Palynology 221 (2015) 52–58

Contents lists available at ScienceDirect

Review of Palaeobotany and Palynology

journal homepage: www.elsevier.com/locate/revpalbo

First record of *Palaeostomocystis subtilitheca* in Holocene marine sediments from the Beagle Channel, southern Tierra del Fuego, Argentina

María Soledad Candel *

Centro Austral de Investigaciones Científicas (CADIC-CONICET), Bernardo Houssay 200, 9410 Ushuaia, Tierra del Fuego, Argentina

ARTICLE INFO

Article history:
Received 15 September 2014
Received in revised form 9 June 2015
Accepted 10 June 2015
Available online 17 June 2015

Keywords:
Acritarch
Marine environment
Holocene
Beagle Channel
Southern Hemisphere

ABSTRACT

This study documents the occurrence of *Palaeostomocystis subtilitheca* in Holocene sediments from the Beagle Channel area, southern Argentina, and represents the first record of this acritarch in high latitudes of the Southern Hemisphere. *P. subtilitheca* is considered as an indicator for polar to subpolar environments with high planktonic productivity and nutrient-rich waters and can probably be associated with low-salinity stratified waters. The Beagle Channel presents environmental characteristics similar to those reported by other authors in Central West Greenland and the Faroe Islands, characterized by high concentrations of nutrients in the surface waters. The Beagle Channel constitutes a favourable environment for the development of this species in subpolar regions of the Southern Hemisphere.

1. Introduction

The term Acritarcha represents an informal category which comprises all the unicellular microfossils of polyphyletic origin and whose biological affinity is unknown. The group includes organic-walled vesicles with variable morphologies and/or ornamentations and excystment openings represented by a split, an irregular rupture, or a circular pylome (Martin, 1993). The acritarchs are commonly associated with marine environments and have been recorded from the Paleoproterozoic to Recent (Schrank, 2003; Huntley et al., 2006). However, Quaternary acritarchs are rare, although many of them are possibly associated with dinoflagellate cysts (dinocysts) or spores of algae (Mudie and Harland, 1996). Few contributions have documented the occurrence of acritarchs in Quaternary sediments along the Argentine coast and continental shelf (Grill and Guerstein, 1995; Grill and Quattrocchio, 1996; Gómez et al., 2005; Borel and Gómez, 2006; Borel, 2007, 2009). In Isla Grande de Tierra del Fuego, studies of marine organic-walled palynomorphs (dinocysts and acritarchs) were carried out in the area of the Beagle Channel by Borromei and Quattrocchio (2001, 2007), Grill et al. (2002), Candel (2010), Candel and Borromei (2013), Candel et al. (2009, 2011, 2012, 2013), and Rabassa et al. (2009).

The aim of this paper is to document the occurrence of *Palaeostomocystis subtilitheca* in modern and middle to late Holocene marine sediments from the Beagle Channel area, Tierra del Fuego. This study constitutes the first record of this species in high latitudes of the Southern Hemisphere and southern South America.

2. Study area

The Beagle Channel is an ancient tectonic valley that connects the extreme south of the Atlantic and Pacific oceans at latitude 54° 53′ S between longitude 66° 30′ and 70° W (Fig. 1). During the Last Glacial Maximum (ca. 25 ka BP, Rabassa et al., 2011), this valley was occupied by a large outlet glacier from the Darwin Cordillera, the Beagle Glacier. After ice-melt (ca. 8200 ^{14}C yr BP), the valley was occupied by lakes, peat bogs, and rivers. During the Holocene transgression around 7900 ^{14}C yr BP, the valley was submerged by the sea and the whole area turned into a fjord (Rabassa et al., 1986). The fjords are estuarine features caused by the marine flooding of ancient glacial valleys and are characterized by a salinity and/or temperature stratification of the water column. Furthermore, fjords are deep with steep slopes and generally rocky. One of the most remarkable morphological characteristics is the presence of one or more glacial "sills." These sills are defined as an elevation which can be a rocky remnant (threshold) or moraine deposits and the inner basin defined by them has the better known dynamic within the fjords (Syvitski and Shaw, 1995). The ideal model of a stratified fjord requires the presence of an outflowing freshwater layer and a compensating seawater layer entering into the estuary. This two-layer model ("fjord type") is typical of the summer or spring–autumn seasons; the fjord waters in winter are usually not stratified. The Beagle Channel presents an estuarine stratification;

* Tel.: +54 2901 422310x115; fax: +54 2901 430644.
E-mail address: soledadcandel@cadic-conicet.gob.ar.

http://dx.doi.org/10.1016/j.revpalbo.2015.06.001
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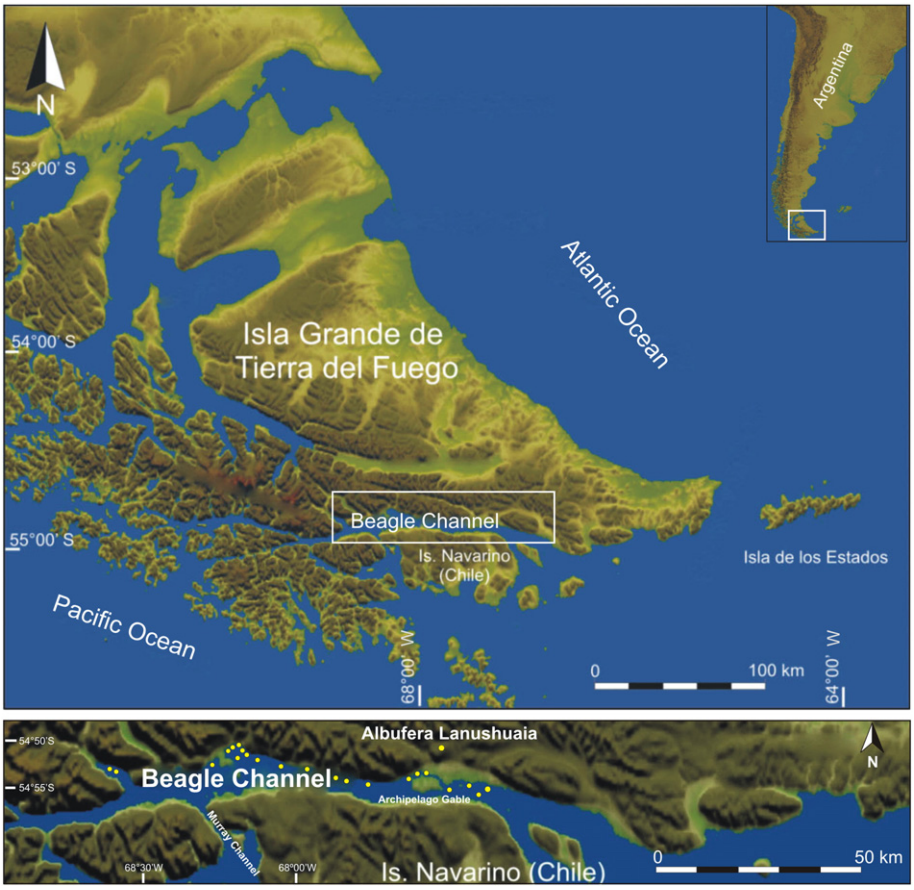

Fig. 1. Location map of the study area and sampling sites.

Table 1
Sampling site number, location, and sediment type of fossil and modern sediments from the Beagle Channel where *Palaeostomocystis subtilitheca* was recorded (modified from Candel et al., 2012).

		Locality name	Sample number	Laboratory number	Latitude	Longitude	Lithological description
Fossil profile		Albufera	AL91	1947	54°52′04.4″S	67°60′44.9″W	Clays with mollusc shells
		Lanushuaia (AL)	AL55	2584	54°52′04.4″S	67°60′44.9″W	Sandy-silt with mollusc shells
		(5800-5500 ^{14}C yr BP)	AL54	2585	54°52′04.4″S	67°60′44.9″W	Clays with vegetal remains and mollusc shells
Modern sediments	Central sector	Punta Remolino (PR)	FCB11	3167	54°51′23″S	68°03′21″W	Clay with mollusc shells
			FCB22	3862	54°51′37″S	67°56′02″W	Silt with mollusc shells
			FCB10	3166	54°52′16″S	67°51′36″W	Clay with mollusc shells
			FCB21	3172	54°52′11″S	67°49′13″W	Silty-clay with mollusc shells
		Punta Parana (PP)	FCB3	2347-3	54°52′45″S	67°45′30″W	Sandy-silt with mollusc shells
	Eastern sector	Isla Gable (IG)	FCB2	2347-2	54°52′15″S	67°33′00″W	Clay with mollusc shells
			FCB4b	3165	54°52′32″S	67°33′18″W	Clay with mollusc shells
			FCB1	2349-1	54°51′30″S	67°30′30″W	Silty-clay
		Exterior Isla Gable (EIG)	FCB16	3171	54°53′53″S	67°22′32″W	Clay with mollusc shells
			FCB14	3170	54°53′52″S	67°17′24″W	Silt with mollusc shells
			FCB12	3168	54°55′20″S	67°13′53″W	Fine grained to medium grained sand
			FCB13	3169	54°54′20″S	67°12′32″W	Clay

the waters of the channel are influenced by a strong freshwater discharge from precipitation and glaciers through the rivers during summer. The water column is strongly thermohaline stratified with water mixing at 12 m depth mainly during the summer season (Isla et al., 1999).

The narrowing (sill) of Archipelago Gable, Murray Channel, and the northwestern and southwestern Beagle Channel branches not only modify morphologically the fjord dynamics restricting water exchanges but also limit the relative effects of the eastern- and western-flowing tidal currents, and the gravity waves originating from the west

Plate I. *Palaeostomocystis subtilitheca* from surface sediments of the Beagle Channel, Tierra del Fuego. Scale bar: 10 μm. Sample number followed by England Finder coordinates. The black arrows indicate the concentric rings surrounding the pylome area. The white arrows indicate the deformation? of the pylome/operculum. 1–2, FCB3165: V25, 1: apical view, high focus; 2: apical view, low focus. 3–4, FCB3166: G27, 3: semilateral view, high focus; 4: semilateral view, low focus. 5, FCB3166: G25, apical view, low focus. 6–9, FCB3167: O17/2, 6: antapical view, low focus; 7: antapical view, mid focus; 8: antapical view, mid focus; 9: antapical view, high focus. 10–12, FCB3167: P47/1, 10: apical view, high focus; 11: apical view, mid focus; 12: apical view, low focus. 13–14, FCB3166: S17, 13: semilateral view, low focus; 14: semilateral view, high focus.