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Stratigraphical distribution of the Ordovician conodont *Erraticodon* Dzik in Argentina

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ABSTRACT

Three different species of the Ordovician genus *Erraticodon* Dzik are described and illustrated. *Erraticodon patu* Cooper is reported from the Lower–Midde Ordovician strata of the Acoite and Alto del Cóndor formations. *E.* cf. *Erraticodon balticus* and *Erraticodon hexianensis* from Middle Ordovician carbonate deposits of the San Juan Formation are analyzed and compared to specimens of these species from Australia, China, Newfoundland, and Baltica. *E. patu* and *E. hexianensis* are recorded for first time in the San Juan Formation of Precordillera. The elements of *E.* cf. *E. balticus* resemble closely *E. balticus* Dzik but lack the important denticle on the posterior process of the S elements. An evaluation of the stratigraphic occurrences of these species relative to those of key Lower and Middle Ordovician conodont species such as *Trapezognathus diprion* Lindström, *Oepikodus intermedius* Serpagli, *Baltoniodus triangularis* (Lindström), *Baltoniodus navis* Lindström, *Yangtzeplacognathus crassus* (Chen and Zhang) and *Eoplacognathus pseudoplanus* (Viira) indicates they value for biostratigraphic correlation.

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1. Introduction

Hyaline conodonts of the genus *Erraticodon* belong to the Family Chirognathidae Branson and Mehl (1944), within the Order Prioniodinida Sweet (1988). The genus *Erraticodon* has been recorded in Floian to Darriwilian strata of Australia, Baltica, Midcontinent USA, South-Central China and Argentina (Zhen et al., 2003; Stouge, 1984; Zhang, 1998; Rasmussen, 2001; Albanesi, 1998; Lehnert, 1995; Mestre, 2010; Carlorosi, 2012). Therefore, it is present in several biogeographical conodont provinces. Zhen et al. (2003) analyzed the global distribution of *Erraticodon* and concluded that *Erraticodon patu* (then regarded as an exclusively Australian conodont) is the oldest species of the group, but also suggested that some specimens assigned to *E. patu* require further study. *Erraticodon* is interpreted to have had thrived in shallow and warm sea waters with sandy sea floors, because it is abundant in sandy beds with disarticulated macrofauna (Sweet, 1981; Stouge, 1984; Albanesi et al., 2005; Carlorosi, 2012).

Elements of the genus *Erraticodon* are not common in Ordovician conodont faunas of Argentina. They have been mentioned by Lehnert (1995), Albanesi (1998), Albanesi and Vaccari (1994), Sarmiento (1990), Mestre (2010), among others. Carlorosi (2012) described and illustrated *E. patu* Cooper from Floian-Dapingian strata in the Andean Basin (Eastern Cordillera).

The purpose of this paper is to report and illustrate the species of the genus *Erraticodon* that occur in several Ordovician formations of Argentina. Previous records are evaluated and reviewed following the taxonomic concepts of Zhen et al. (2003), Zhen et al. (2007) and Zhen and Pickett (2008).

2. Geological settings and previous investigations

The material examined in this study is derived from two different geological provinces in Argentina, the Andean Basin and the Precordillera, where Lower and Middle Ordovician strata are classical outcrops. Conodonts were collected from the following sections: Chamarra Creek (Los Colorados, Jujuy), Talacasto Creek (Sierra de Talacasto, San Juan), La Chilca (La Chilca Hill, San Juan) and Del Aluvión Creek (Viejo Hill, San Juan) (Fig. 1).

2.1. Andean Basin

The Lower Paleozoic Central Andean Basin covers a large area in southern Perú and the Eastern Cordillera and Subandean areas of Bolivia and Argentina. It is represented lithologically by a highly fossiliferous succession of strata of sandstone and shale, which has been considered as the most prominent Ordovician sequence

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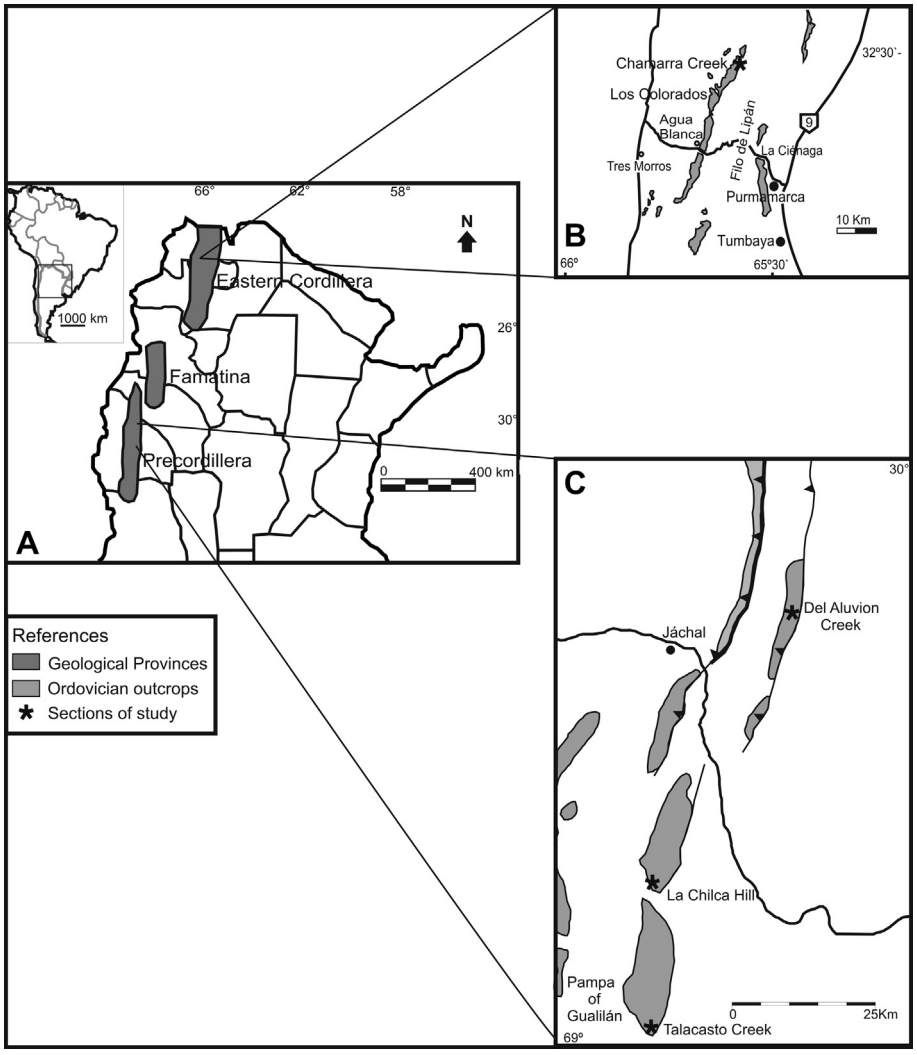

Fig. 1. Regional and location maps. A – Geological provinces of Argentina. B – Eastern Cordillera with Ordovician outcrops in grey color, study area mentioned in text. C – Precordillera with Ordovician outcrops in grey color, areas of study are mentioned in text.

worldwide, with over 10 km in thickness (Suárez Soruco, 1992; Erdtmann et al., 1995; Egenhoff, 2000) (Fig. 1).

Shallow marine sequences characterize the whole region and were deposited on a general deepening in a westward basin. This Ordovician basin is bounded by the Brazilian Shield to the east and the Pampean shield to the south–east. Lower and Upper Ordovician formations are chronostratigraphically resolved by abundant fossils, with conodonts of particular importance for correlation. During the last 20 years an important amount of data has been put together and, nowadays, a fairly acceptable general picture of the strata, fossils, and ages is available (Gagnier et al., 1996; Suárez Soruco, 2000; Aceñolaza et al., 2002; Benedetto, 2003; Egenhoff et al., 2004; Erdtmann et al., 1995). Among the different paleontological elements, conodonts have to be highlighted due to their importance in the studies of the Cambrian and Ordovician strata in South America.

2.1.1. Chamarra Creek section (Eastern Cordillera)

The entire succession is composed by the clastic Acoite and Alto del Cóndor formations. The uppermost part of the Acoite Formation is almost 300 m thick and the entire Alto del Cóndor Formation is 120 m thick. The coordinates at the base of the measured section are 23°31′56, 4″ S and 65°40′04, 3″ W (Figs. 1 and 2). Astini et al. (2004) described the basal part of the Acoite Formation as a heterolithic succession composed by alternating green shale and grey sandstone. At the top, sandstone beds are thicker than shale beds and usually contain bioclastic levels. Astini and Waisfeld (1993) defined these strata as a sandy member in the upper part of the Acoite Formation. Sampled beds have fragments of brachiopods and trilobites. The age of the upper part of this formation is restricted to the uppermost Floian by the record of the *Trapezognathus diprion* Zone (Lower Ordovician) (Carlorosi, 2012).

The Alto del Cóndor Formation is comprised of pale yellow sandstone for the lower member, and green siltstone and red sandstone for the upper member. The age is given by conodonts of the *Baltoniodus triangularis* Zone as earliest Dapingian (Middle Ordovician) (Carlorosi, 2012).

Elements of the genus *Erraticodon* were recovered from the upper beds of the Acoite Formation and the lower and upper members of the Alto del Cóndor Formation.

The following species are present in the *T. diprion* Zone: *Drepanodus arcuatus* Pander, *Drepanoistodus basiovalis* (Sergeeva), *Drepanoistodus costatus* (Abaimova), *Erraticodon patu* Cooper, *Gothodus costulatus* Lindström, *Trapezognathus diprion* (Lindström), *Baltoniodus* sp. cf. *B. triangularis* (Lindström), *Oistodus* sp., and *Triangulodus* sp.

The following species are present in the *B. triangularis* Zone: *Baltoniodus triangularis* (Lindström), *Drepanoistodus basiovalis,*

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