APTIAN AMMONITE-BASED AGE FOR THE PABELLON FORMATION, ATACAMA REGION, NORTHERN CHILE

ERNESTO PEREZ d'A. Servicio Nacional de Geología y Minería, Casilla 10465, Santiago, Chile
MICHAEL R. COOPER Department of Geology, University of Durban - Westville, Private Bag X54001, Durban 4000, South Africa
VLADIMIR COVACEVICH C. Servicio Nacional de Geología y Minería, Casilla 10465, Santiago, Chile

ABSTRACT

The occurrence of the ammonite *Parahoplites* gr. *nutfieldiensis* (J. Sowerby) in the upper part of the Pabellón Formation indicates an early late Aptian minimum age for this unit. This modifies the late Barremian age, based on different paleontological data, previously assigned to it and allows to postulate the same age for the end of the Lower Cretaceous marine sedimentary cycle in the Andean Basin of Chile and Argentina.

Key words: Stratigraphy, Pabellón Formation, Ammonoidea, Parahoplites, Cretaceous, Aptian, Chile.

RESUMEN

El hallazgo del ammonite *Parahoplites* gr. *nutfieldiensis* (J. Sowerby) en los estratos superiores de la Formación Pabellón, Región de Atacama, indica una edad mínima aptiana superior temprana para esta unidad. Lo anterior modifica la edad barremiana superior, sugerida previamente sobre la base de otros antecedentes paleontológicos, permitiendo, además, postular esa edad para el término del ciclo sedimentario marino del Cretácico Inferior, en Chile y Argentina.

Palabras claves: Estratigrafía, Formación Pabellón, Ammonoidea, Parahoplites, Cretácico, Aptiano, Chile.

INTRODUCTION

During a detailed study of the Pabellón Formation for the project 'Phosphate Potential of Northern Chile' one of the authors (E.P.) found an ammonite fragment (field sample CH-45A, 1965) which has a significant bearing on the age of the uppermost strata of that unit. The specimen comes from Molle Alto (27°50'S; 70°19'W), Atacama Region, Northern Chile (Fig. 1) belonging to the upper part of the Pabellón Formation (Biese *in* Hoffstetter *et al.*, 1957) and is associated with a molluscan fauna which includes *Paulckella nepos* (Paulcke), *P. covacevichi* Pérez and Reyes, *Steinmannella* gr. *transitoria* (Steinmann), *Chlamys* cf. *discors* Phillipi, *Idonearca* sp. and *Ptychomya* sp. as well as indeterminate bryozoans, serpulids and gastropods (see Pérez and Reyes, 1989).

The previous estimate for the minimum age of the Pabellón Formation was late Barremian to Aptian (Tavera, 1956) based on corals and bivalves, and late Barremian (Corvalán, 1974) based on the presence of *Agria blumenbachi* Studer (= *Agriopleura blumenbachi)* which would be characteristic of that stage in Europe.

The ammonite fragment reported here corresponds to *Parahoplites* gr. *nutfieldiensis* (J. Sowerby) and is the first one recovered from these strata, indicating an early late Aptian age, thus extending the age range of the formation.

The upper strata of the Pabellón Formation consist of a sequence of shallow water sedimentary rocks which represent the regressive stage at the end of the Early Cretaceous marine sedimentary cycle in the Andean Basin of Chile and Argentina. Although the age of this event varies throughout the basin (Riccardi, 1987), an early late Aptian age, as this new ammonite ocurrence indicates, represents the youngest and more precise of those assigned to similar regressive facies in the basin.

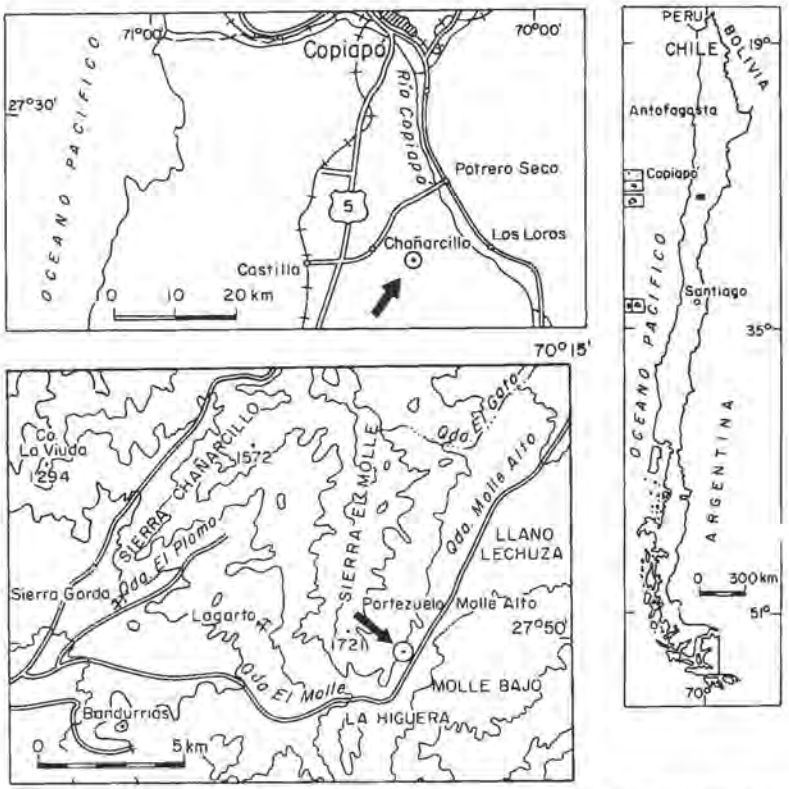

FIG. 1. Maps showing the locality where *Parahoplites* gr. *nutfieldiensis* (J. Sowerby) was found (Molle Alto) sited about 50 km south of Copiapó city, Atacama Region, northern Chile.

De: Hoja Copiapó (2700-6900), Carta Regular, escala 1:250.000, U.T.M., Instituto Geográfico Militar, Chile. Equidistancia de curvas de nivel: 200 m

SYSTEMATIC PALEONTOLOGY

Family Parahoplitidae Spath, 1922
Subfamily Parahoplitinae Spath, 1922
Genus *Parahoplites* Anthula, 1899

Type species: *Parahoplites melchioris* Anthula, 1899, by original designation.

Discussion. *Parahoplites* is common to the upper Aptian of the Caucasus, Mangyshlak, Turkmenia, northwest Germany, France, England, Madagascar and Zululand, where it is most abundant in the *Parahoplites nutfieldiensis* Zone of the low upper Aptian. This genus has also been mentioned for the upper Aptian of México (Burckhardt, 1925) and Colombia (Etayo-Serna, 1979), Aptian (Lisson, 1908) and lower Albian (Benavides-Cáceres, 1956) of Perú, South America, and Aptian (Anderson, 1938) of California and Oregon, U.S.A.

Parahoplites species seem to be strongly dimorphic, with large macroconchs represented by *P. nutfieldiensis* (J. Sowerby), *P. maximus* Sinzow, *P. sjoegreni* Anthula, *P. waageni* (Anthula), *P. irregularis* Casey and *P. cunningtoni* Casey. Microconch species are smaller and more coarsely ribbed, and include the type species *P. melchioris* Anthula, *P. schmidti* Sinzow, *P. multicostatus* Sinzow, and *P. treffryanus* Karsten.

Parahoplites gr. nutfieldiensis (J. Sowerby, 1815)

Fig. 2 a-c

Material. The fragmocone of a single silicified specimen, with a shell diameter of *ca.* 160 mm and an umbilical diameter of *ca.* 47 mm (Du/Dt = 29%). The fossil preserves two incomplete contiguous portions of the whorls and the adjacent ventral region of a probable adult shell. It is not distorted, but the upper

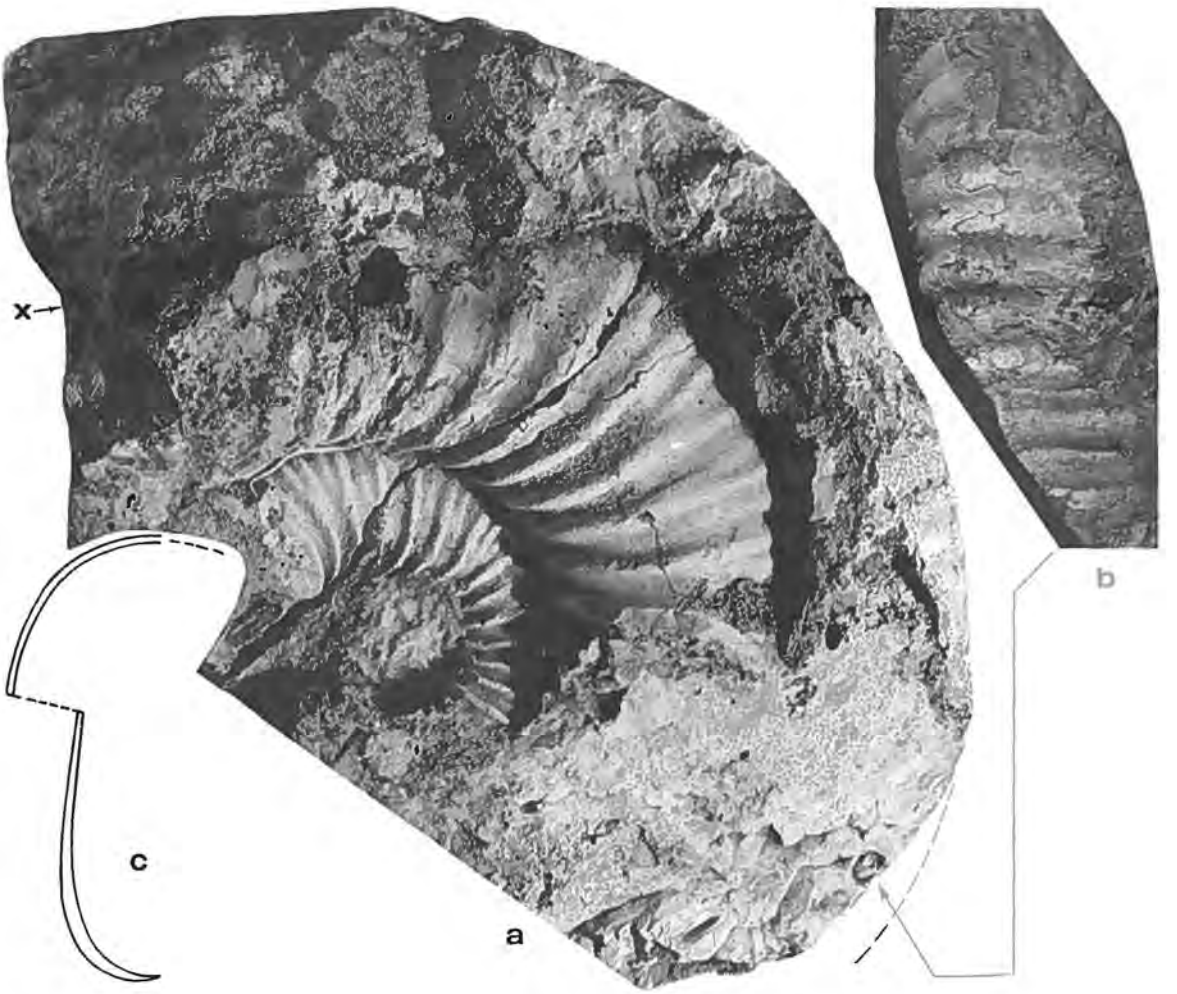

FIG. 2. *Parahoplites* gr. *nutfieldiensis* (J. Sowerby) x 1. Col. Number: SNGM F56c-6889. **a.** Lateral view; note the rursiradiate primaries, 1-2 intercalatories, and the absence of flank tubercles from the inner whorls. At **x** the last badly preserved septum is shown. **b.** Ventral area at the beginning of the last whorl. **c.** Section of the last whorl.

third of the flank was displaced through a fracture from the rest of the flank.

The specimen, F56c-6889, is kept in the paleontological collections of the Servicio Nacional de Geología y Minería, Santiago, Chile.

Description. The relatively evolute shell of this ammonite gives the impression of having had a slightly compressed, subquadrate whorl section. The umbilicus is wide and moderately deep, with a steep umbilical wall and well-rounded umbilical shoulder. On the outer whorl the flank is broad and flat, with maximum width close to the umbilical shoulder. On the inner whorl, at a diameter of approximately 65-70 mm, the flanks are slightly convex with maximum width close to midflank.

Ornament comprises strong primary ribs, which begin at the umbilical seam and are rursiradiate to the umbilical shoulder, where they form weak umbilical bullae. On the inner whorl there are 14 strong and high primaries per half whorl which are rursiradiate in the umbilical slope and then rectiradiate to slightly rursiradiate across the flank. They are commonly separated by one, rarely two, intercalatories which arise low on the flank; the last two or three single intercalated ribs join clearly the corresponding primary. On the outer whorl the ribbing weakens at mid-

flank, a feature which tends to emphasize the umbilical bu lae. A fragment of the venter suggests that the latter was somewhat flattened, with subrounded ventrclateral shoulders, and was crossed transversely by the ribbing. Across the venter the ribs are equally spaced with a uniform relief and slightly broader than the interspaces. The suture line is very badly preserved and displayed only at the end of the specimen.

Discussion. Within the Lower Greensand of southern England there is a closely allied group of species centered around *Parahoplites nutfieldiensis* (J. Sowerby) (*cf.* Casey, 1965, p. 404, Pl. 67, Fig. 5, Pl. 68, Figs. 2-4, Pl. 69, Fig. 4, Pl. 70, Fig. 3, Text-Figs. 147, 149, 150). This includes *P. maximum* Sinzow (Casey, 1965, p. 408, 410, 411, Pl. 68, Fig. 5, Pl. 69, Figs. 1-2), *P. irregularis* Casey (1965, p. 410, Pl. 67, Fig. 2, Pl. 68, Fig. 1), and *P. cunningtoni* Casey (1965, p. 411, Pl. 67, Fig. 1, Pl. 70, Fig. 1, Text-Figs. 149c, 150b). According to Casey (1965, p. 409), *P. maximus* is connected to *P. nutfieldiensis* by transitions but is "... more coarsely ribbed at all stages, with earlier loss of forward sinus of ventral ribbing and with first lateral lobe of more pronounced symmetry". *Parahoplites irregularis* was diagnosed as "... like *P. nutfieldiensis* but with narrower umbilicus and closer, more irregular costation, having secondary ribs commonly in threes" (p. 411), while *P. cunningtoni* Casey was said to be "... similar to *P. nutfieldiensis* but with narrower umbilicus..." (p. 411). Given the range of variation now kown to exist in ammonite species (Kennedy and Cobban, 1976), these differences probably would not withstand population analysis and it seems likely that but a single species is involved. Kemper (1971) treats *cunningtoni* as a subspecies of *P. nutfieldiensis.* The Chilean fragment can easily be accommodated within the intraspecific variation of such broadly interpreted species.

Parahoplites waageni (Anthula, 1899, p. 106, Pl. 9, Fig. 1) closely resembles the described ammonite fragment but is more inflated, with convex flanks and a rounded venter. *Parahoplites sjoegreni* Anthula (1899, p. 116, Pl. 11, Fig. 3) differs from the Chilean fragment in having convex flanks, an evenly rounded venter, and prorsiradiate flank ribs.

The compressed form of the present individual, together with the absence of lateral tuberculation on the inner whorls distinguishes it from *Cheloniceras* macroconchs, e.g. *C. laticostatum* (Sinzow) (Kemper, 1964, p. 50, Pl. 10, Fig. 1) and *C. seminodosum* (Sinzow) (Kemper, 1964, p. 48, Pl. 6, Fig. 2), and also from large specimens of *Hypacanthoplites*. The ribs of the latter genus are also generally prorsiradiate.

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