

Rebut el 2 de maig de 2008. Acceptat el 16 d'agost de 2009



## Some comments on the protoconch of *Chondrula (Mastus) gymnesica* Quintana, 2007 (Gastropoda: Enidae)

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**Abstract.**—Some comments on the protoconch of *Chondrula (Mastus) gymnesica* Quintana, 2007 (Gastropoda: Enidae). In this work, photographs of the embryony whorls of *Chondrula (Mastus) gymnesica* Quintana, 2007 and *Chondrula (Mastus) pupa* (Linnaeus, 1758) (obtained by means of electron microscopy) are compared with the reconstruction of the embryony whorls of *Balearena gymnesica* Altaba, 2007. These micrographs show that the protoconch of *Ch. (M.) gymnesica* is smooth and with no trace of ornamentation, i.e. completely different from the reconstruction published by Altaba (2007); in the latter, slightly deep grooves perpendicular to the suture line and developed on the initial portion of the protoconch, as well as a series of pits arranged in spiral rows, occupying the inferior moiety of the protoconch, can be distinguished. The similarities between the protoconch and teleoconch of *Ch. (M.) gymnesica* and *Ch. (M.) pupa* indicate that there is no need to include the Balearic taxon into a new genus, so that *Balearena* Altaba, 2007 would be a junior subjective synonym of *Mastus* Beck, 1837. The presence of a slightly-marked, vertical fold on the columella (in fact, a very variable feature of low diagnostic value) neither strengthens this idea. For these reasons (and on the basis of the principle of priority of the International Code of Zoological Nomenclature), we consider *Balearena gymnesica* as a subjective junior synonym of *Ch. (M.) gymnesica*. The smooth protoconch of *Ch. (M.) gymnesica* further contradicts the biogeographical scenario hypothesized per Altaba (2007), according to which *Ch. (M.) gymnesica* would fill a "morphological gap" between the genera *Mastus*, *Napaeus* and *Mauronapaeus*.

**Key words.**—Enidae, Balearic Island, Plio-Pleistocene, Embryony whorls, Synonymous species.

**Resum.**—Alguns comentaris sobre la protoconquilla de *Chondrula (Mastus) gymnesica* Quintana, 2007 (Gastropoda: Enidae). En aquest treball es comparen les fotografies de les voltes embrionàries de *Chondrula (Mastus) gymnesica* Quintana, 2007 i *Chondrula (Mastus) pupa* (Linnaeus, 1758) (obtingudes mitjançant microscòpia electrònica) amb la reconstrucció de les voltes embrionàries de *Balearena gymnesica* Altaba, 2007. Aquestes micrografies mostren que la protoconquilla de *Ch. (M.) gymnesica* és llisa i sense cap tipus d'ornamentació, és a dir, completament diferent de la reconstrucció publicada per Altaba (2007), en la qual apareixen solcs poc profunds perpendiculars a la línia de sutura desenvolupats en la porció inicial de la protoconquilla i una sèrie de puntejades ordenades en línies paral·leles que ocupen la meitat inferior de la protoconquilla. Les similituds existents entre la protoconquilla i la teleoconquilla de *Ch. (M.) gymnesica* i *Ch. (M.) pupa* indiquen que no cal incloure el tàxon balear en un gènere nou, i que per tant *Balearena* Altaba, 2007 és un sinònim subjectiu posterior de *Mastus* Beck, 1837. La presència d'un plec vertical poc marcat en la columel·la (en realitat, un caràcter molt variable i d'escàs valor diagnòstic) tampoc recolza aquesta idea. Per aquests motius (i en base al principi de prioritat del Codi Internacional de Nomenclatura Zoològica) considerem *Balearena gymnesica* un sinònim subjectiu posterior de *Ch. (M.) gymnesica*. Així mateix, la protoconquilla llisa de *Ch. (M.) gymnesica* contradiu l'escenari biogeogràfic hipotetitzat per Altaba (2007), segons el qual *Ch. (M.) gymnesica* ompliria un "buit morfològic" entre els gèneres *Mastus*, *Napaeus* i *Mauronapaeus*.

**Paraules clau.**—Enidae, Illes Balears, Plio-Plistocè, Voltes embrionàries, Espècies sinònimes.

**Resumen.**—Algunos comentarios sobre la protoconcha de *Chondrula (Mastus) gymnesica* Quintana, 2007 (Gastropoda: Enidae). En este trabajo se comparan las fotografías de las vueltas embrionarias de *Chondrula (Mastus) gymnesica* Quintana, 2007 y *Chondrula (Mastus) pupa* (Linnaeus, 1758) (obtenidas mediante microscopía electrónica) con la reconstrucción de las vueltas embrionarias de *Balearena gymnesica* Altaba, 2007. Estas micrografías muestran que la protoconcha de *Ch. (M.) gymnesica* es lisa y sin ningún tipo de ornamentación, es decir, completamente diferente de la reconstrucción publicada por Altaba (2007), en la cual aparecen surcos poco profundos perpendiculares a la línea de sutura desarrollados en la porción inicial de la protoconcha y una serie de punteaduras ordenadas en líneas paralelas que ocupan la mitad inferior de la protoconcha. Las similitudes existentes entre la protoconcha y la teleoconcha de *Ch. (M.) gymnesica* y *Ch. (M.) pupa* indican que no es necesario incluir el taxón balear en un género nuevo, y que por lo tanto *Balearena* Altaba, 2007 es un sinónimo subjetivo posterior de *Mastus* Beck, 1837. La presencia de un pliegue vertical poco marcado en la columela (en realidad, un carácter muy variable y de escaso valor diagnóstico) tampoco refuerza esta idea. Por estos motivos (y en base al principio de prioridad del Código Internacional de Nomenclatura Zoológica), consideramos *Balearena gymnesica* como un sinónimo subjetivo posterior de *Ch. (M.) gymnesica*. Asimismo, la protoconcha lisa de *Ch. (M.) gymnesica* contradice el escenario biogeográfico hipotetizado por Altaba (2007), según el cual *Ch. (M.) gymnesica* llenaría un “vacío morfológico” entre los géneros *Mastus*, *Napaeus* y *Mauronapaeus*.  
**Palabras clave.**—Enidae, Islas Baleares, Plio-Pleistoceno, Vueltas embrionarias, Especies sinónimas.

## INTRODUCTION

*Chondrula (Mastus) gymnesica* Quintana, 2007 (described by Quintana, 2006) is a fossil enid, currently extinct and endemic from Majorca, Minorca and Cabrera, and ranging from the Pliocene to the late Pleistocene (Cuerda & Muntaner, 1952; Cuerda, 1959; 1975; 1993; Cuerda *et al.*, 1982; Mercadal, 1959; Mercadal *et al.*, 1970; Gasull, 1965; Seguí *et al.*, 1998; Quintana, 1995). This species had been previously identified as *Chondrula (Mastus) pupa* (Linnaeus, 1758) by Cuerda (1959). Nevertheless, the former taxon can be distinguished from the latter by its more acute apex, the narrower diameter and a shorter aperture relative to total shell length (Quintana, 2006).

Altaba (2007a) erected a new genus and species, *Balearena gymnesica* Altaba, 2007, for the same taxon, which we consider to be a junior subjective synonym of *Ch. (Mastus) gymnesica* Quintana, 2007. At the species level, this synonymy is justified by the Principle of Priority of the International Code of Zoological Nomenclature (ICZN, 1999: Article 23.1): although Altaba (2007b) has argued that the number of the *Bolletí de la Societat d'Història Natural de les Balears* where Quintana (2006) appeared was not published until 2007 (see Quintana *et al.*, 2007, for further discussion), Altaba's (2007a) description of the new taxon was not published until late 2007 (September the 26th, as stated on the paper), thus surely later than Quintana's description. Leaving nomenclatural issues aside, in this paper we argue that *Balearena* Altaba, 2007 is a junior

subjective synonym of *Chondrula* Beck, 1837, on the basis of several mistakes in the reconstruction of the protoconch (Altaba, 2007a: p. 46, Fig. 2) and in the interpretation of a hardly marked vertical fold in the columella, on which Altaba's description highly relies.

According to Altaba (2007a), the ornamentation of the protoconch of this taxon would cover the “morphological gap” between *Mastus* Beck, 1837, *Napaeus* Albers, 1850 and *Mauronapaeus* Kobelt, 1899, further occupying a central geographical position between these genera (Altaba, 2007a: p. 49). In this paper, we provide a detailed description of the protoconch of *Ch. (Mastus) gymnesica* on the basis of SEM images, further comparing it with the reconstruction of the protoconch of the same taxon provided by Altaba (2007a: p. 46, Fig. 2).

## MATERIALS AND METHODS

The type locality of *Ch. (M.) gymnesica* corresponds to the site of Sa Punta des Vernis, in the northern coast of Ciutadella de Menorca. The eastern outcrop of this site has yielded several well-preserved shells, which have allowed us to perform a detailed study of the protoconch of this species.

Micrographs of the protoconch were taken by means of a scanning electron microscope (SEM) at the Servei de Microscòpia Electrònica of the Universitat Autònoma of Barcelona. The protoconch of a paratype of *Ch. (M.) gymnesica* was compared to one specimen of *Ch. (M.) pupa* from Ravanusa (Agrigento, Sicily). Both specimens are kept in the private collection of one of the authors (JQ), with the record numbers

4299 (paratype) and 3343.

The protoconch of *Ch. (M.) gymnesica* from Minorca was also compared to other specimens from Majorca and Cabrera, kept in the Societat d'Història Natural de les Balears and belonging to the Joan Cuerda Barceló collection. A hundred seventy-five specimens from different localities of Majorca (117 specimens from 31 localities) and Cabrera (58 specimens from 8 localities) were examined under the stereomicroscope. Usually, the protoconch was very well-preserved.

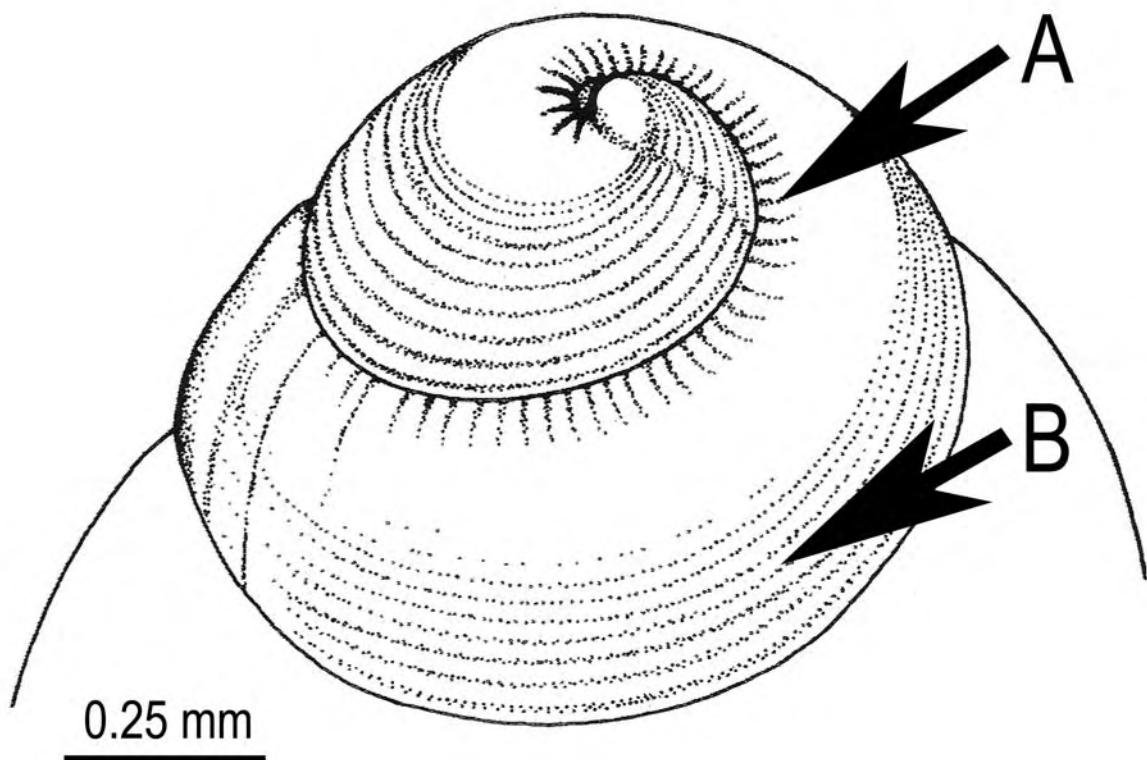
It was not possible to examine the holotype MZB 2005-1022 of the new genus and species erected by Altaba (2007a), housed at the Museu de Zoologia de Barcelona (Altaba, 2007a: p. 45), because, at the moment of submitting this work, it had not been yet deposited in this institution (F. Uribe, curator of the above-mentioned institution, pers. com. to JQ, 11/6/09 and 02/03/09).

## RESULTS

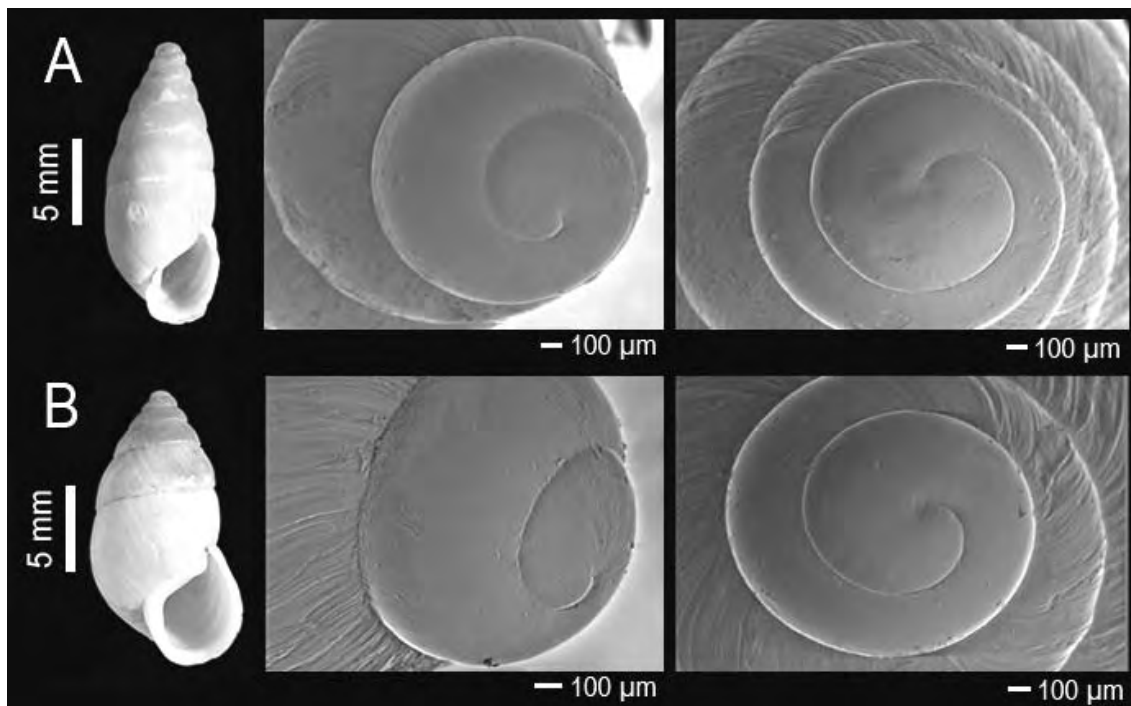
The reconstruction of the protoconch of *Ch. (M.) gymnesica* reported by Altaba (2007a) is

characterized by: (1) the presence of a series of shallow grooves perpendicular to the suture line, developed on the initial portion of the protoconch; and (2) a series of punctures arranged along spiral lines on the inferior moiety of the protoconch (Figure 1).

On the contrary, the SEM images reported in this paper (Figure 2A) indicate that the protoconch *Ch. (M.) gymnesica* is smooth, showing neither grooves nor punctures. This lack of ornamentation in the specimen examined under SEM cannot be due to the erosion, because there is no type of striation or erosive mark on the surface. It can be neither attributed to the growth of a stratum of carbonate of calcium of secondary origin, because the suture line appears well-defined and without any type of crystallization. On the basis of observations performed under the stereomicroscope, this lack of ornamentation further characterizes the protoconch of all the other specimens from Minorca, Majorca and Cabrera. To this regard, *Ch. (M.) gymnesica* does not differ from *Ch. (M.) pupa*, which also displays a smooth protoconch (Figure 2B).



**Figure 1.** Reconstruction by Altaba (2007a) of the protoconch of *Ch. (M.) gymnesica*. A: shallow grooves perpendicular to the suture line; B: punctures arranged along spiral lines. Original art reproduced from Altaba (2007a), with permission of the copyright owner, Magnolia Press.



**Figure 2.** Micrographs of the protoconch of: (A) A paratype of *Ch. (M.) gymnesica* Quintana, 2007 (JQ collection, record No. 4299), from the type locality; (B) A specimen of *Ch. (M.) pupa* (Linnaeus, 1758) (JQ collection, record No. 3343) from Ravanusa (Agrigento, Sicily).

## DISCUSSION AND CONCLUSIONS

The protoconch of *Ch. (M.) gymnesica* from Minorca, Majorca and Cabrera does not show any kind of ornamentation. Accordingly, this species cannot be distinguished from *Ch. (M.) pupa* on the basis of the protoconch. Similarly, the supposed vertical fold of *Ch. (M.) gymnesica* is very variable—as it can be appreciated in Altaba's (2007a: Fig. 3, p. 47)—, and thus cannot be used as a diagnostic feature. As such, there are no conchological criteria justifying the inclusion of the Balearic enid into a new genus, as argued by Altaba (2007a), whose reconstruction of the protoconch of *Ch. (M.) gymnesica* significantly differs from the protoconch of the same species depicted in this paper.

The relationship established by Altaba (2007a) between the ornamentation of the embryonic whorls and the geographical distribution of three enid genera and *Ch. (M.) gymnesica* is of dubious significance, because the subfamily Eninae Woodward, 1903 includes up to 19 subgenera (Schileyko, 1998): two endemic from the Canary Islands, four from North Africa, and 13 distributed throughout the Mediterranean. A study trying to decipher phylogenetic relationships on the basis of protoconch ornamentation should not merely include three enine genera selected *ad hoc*.

Surprisingly, however, Altaba (2007a) does not figure the protoconch of either of the two species of *Mauronapaeus* on which he bases some of his observations, and which are not even identified at the species level.

According to Altaba (2007a), there seems to be a direct relationship between the morphology of the shell of several particular genera and their geographical distributions, so that each taxon fits into its corresponding place. In this sense, the terrestrial molluscs from the Balearic archipelago are fitted into this biogeographic scheme, so that *Ch. (M.) gymnesica* would constitute a species of “biogeographical bond” between the Macaronesic enids from North of Africa and Europe. The smooth protoconch of *Ch. (M.) gymnesica* dismantles all these biogeographic assumptions.

## ACKNOWLEDGMENTS

We are especially grateful to Onofre Castell Ordinas, from the Servei de Microscòpia Electrònica of the Universitat Autònoma de Barcelona, who kindly took the micrographs that appear in this work. We also thank Eloisa Leon Moll, from Ciutadella de Menorca, for translating the manuscript into English, and the anonymous referees for revising the original version of the manuscript.

## LITERATURE CITED

- ALTABA, C.R. (2007a). A new genus and species of Enidae (Gastropoda: Pulmonata) from the Quaternary of the Balearic Islands (Western Mediterranean). *Zootaxa*, 1595: 43-52.
- ALTABA, C.R. (2007b). Reply to Quintana *et al.* (2007): *Darderia bellverica* Altaba, 2007 is the correct name for the Mallorcan fossil helicodontid. *Spira*, 2: 191-196.
- CUERDA, J. (1959). Presencia de *Mastus pupa*, Bruguière en el Tirreniense de las Baleares orientales. *Bol. Soc. Hist. Nat. Bal.*, 5: 45-50.
- CUERDA, J. (1975). *Los tiempos cuaternarios en Baleares*. Conselleria de Cultura, Educació i Esports del Govern Balear, Palma de Mallorca.
- CUERDA, J. (1993). Nota sobre el Cuaternari. In: Alcover, J.A., Ballesteros, E. & Fornós, J.J. (Eds.) *Història natural de l'arxipèlag de Cabrera*. CSIC-Edit. Moll. Mon. Soc. Hist. Nat. Bal., 2: 117-130.
- CUERDA, J.; ANTICH, S.; SOLER, A. (1982). La secuencia pleistocénica dunar de Son Mosón (Mallorca) y sus correlaciones faunísticas y estratigráficas. *Boll. Soc. Hist. Nat. Bal.*, 26: 13-35.
- CUERDA, J & MUNTANER, A. (1952). Nota sobre las playas cuaternarias con *Strombus* del Levante de la bahía de Palma. *Bol. Soc. Hist. Nat. Bal.*, 1: 1-8.
- GASULL, L. (1965). Algunos moluscos terrestres y de agua dulce de Baleares. *Bol. Soc. Hist. Nat. Bal.*, 11: 1-157.
- INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE (ICZN). (1999). *International Code of Zoological Nomenclature. Fourth Edition*. The International Trust for Zoological Nomenclature, London.
- MERCADAL, B. (1959). Noticia sobre la existencia de terrazas tyrenienses en la costa sur de Menorca. *Bol. Soc. Hist. Nat. Bal.*, 5: 39-44.
- MERCADAL, B.; VILLALTA, J.; OBRADOR, A.; ROSELL, J. (1970). Nueva aportación al conocimiento del cuaternario menorquín. *Acta Geol. Hisp.*, 4: 89-93.
- QUINTANA, J. (1995). Fauna malacològica associada a *Cheirogaster gymnesica* (Bate, 1914). Implicaciones biogeogràfiques. *Boll. Soc. Hist. Nat. Bal.*, 38: 95-119.
- QUINTANA, J. (2006). Reconsideració taxonòmica de *Chondrula (Mastus)* fòssil de Mallorca i Menorca (Gastropoda: Pulmonata: Enidae). *Bol. Soc. Hist. Nat. Bal.*, 49: 21-38.
- QUINTANA, J.; PONS, G.X.; VICENS, D. (2007). Algunas anotaciones críticas sobre *Oestophora cuerdaei* Quintana, Vicens et Pons, 2006 (Mollusca: Pulmonata: Helicodontidae). *Spira*, 2: 157-162.
- SCHILEYKO, A.A. (1998). Treatise on Recent Terrestrial Pulmonate Molluscs, part 2: Gastrocoptidae, Hypselostomatidae, Vertiginidae, Truncatellinidae, Pachnodidae, Enidae, Sagdidae. *Ruthenica*, Suppl. 2: 129-261.
- SEGUÍ, B.; BOVER, P.; TRIAS, M.; ALCOVER, J.A. (1998). El jaciment fòssilífer de la cova C-2 (Ciutadella de Menorca). *Endins*, 22: 81-97.