

# INCIPIENT PARENTAL CARE IN *DISCUS* – A PLESIOMORPHIC STATE OF A TRULY ENDODONTID CHARACTER?

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*Abstract* *Discus rotundatus* (O. F. Müller, 1774), *D. ruderatus* (Férussac, 1821) and *D. perspectivus* (Megerle von Mühlfeld, 1818) carry some of their eggs in the umbilicus. We interpret such behaviour as an incipient parental care which has reached its perfection in some Pacific endodontids.

*Key words* Land snails, *Discus*, reproduction, behaviour.

## INTRODUCTION

The genus *Discus* is regarded either as a Palaearctic offshoot of the mainly Pacific endodontid stock, and placed in the subfamily Discinae, as opposed to the Pacific Endodontinae and some minor sub-families (Solem, 1976), or separated in the family Discidae (Nordsieck, 1986), apparently mainly on distributional grounds. During laboratory studies on three European species of *Discus* we observed a behaviour which could only be interpreted as an incipient parental care; below we describe it and discuss it in the context of more advanced and truly endodontid forms of parental care.

## MATERIAL AND METHODS

The material included live individuals of *Discus rotundatus* (O.F. Müller, 1774), *D. ruderatus* (Férussac, 1821) and *D. perspectivus* (Megerle von Mühlfeld, 1818). The exact origin of the material and the details of the laboratory culture, as well as life histories of all three species, are described in Kuźnik-Kowalska (1999, 2005, 2006).

## RESULTS AND DISCUSSION

All three species of *Discus* lay batches of 1-6 (most often 3-4) relatively large (major diameter ca. 1.5 mm), calcified eggs. Having completed egg-laying, the parent crawls over the batch, covering it with mucus (Kuźnik-Kowalska, 1999, 2005, 2006). In some cases, in all three species, one to four eggs were observed to stick in the umbilicus during the mucus-covering operation, and were subsequently carried by the parent for varied periods of time (Fig. 1, Table 1), sometimes till hatching (Figs 2, 3).

## DISCUSSION

Some Pacific members of Endodontidae are known to use their umbilicus as a brood chamber where they deposit and incubate their eggs. The situation is found in all species of the genera *Libera*, *Pseudolibera* and *Gambiodonta* and in single members of other genera: *Endodonta marsupialis* Pilsbry and Vanatta, *Taipidon semimarsupialis* Solem, *Kleokyphus callimus* Solem, *Kondoconcha othnius* Solem and *Thaumatodon euaensis* Solem (Solem, 1969, 1976). In all these genera the umbilicus is modified to serve as

Species	Instances of egg-laying	Instances of egg-carrying		Duration in most instances	Number of eggs carried	Instances of egg-carrying till hatching
		number	%			
<i>D. rotundatus</i>	86	7	c. 8	15 min-2 hrs	1-2	2
<i>D. ruderatus</i>	65	18	c. 28	30 min-4 days	1-4	3
<i>D. perspectivus</i>	54	4	c. 7	2-12 hrs	1	0

**Table 1** Instances of egg-carrying in *Discus*



Fig. 1 An egg in the umbilicus of *D. ruderatus*.

a brood chamber. Based on growth patterns, the character is believed to have evolved independently in at least five lineages (Solem, 1976). Besides discussion on the evolution and structure of the brood chamber, Solem's 1976 monograph contains the following statement (p. 29) 'the increased whorl count [...] of brood-chamber taxa probably reflects the fact that brood-chamber is an improvement upon a functioning system. Endodontids obviously survive very well by laying eggs inside a "normal" umbilicus', albeit no reference is given and no examples are mentioned.

Seeing only the condition found in brood-chamber forming endodontids, it is difficult to imagine how the evolution of such behaviour could start. It is quite conceivable that the situation found in *Discus* is the initial, plesiomorphic state of the character that has reached its perfect development in the Pacific members of the family. Once in existence, this kind of parental care would probably be strongly favoured by selection, as a means of egg-protection against predation and desiccation, and especially in view of egg and sibling cannibalism which is common at least in *Discus* (Kuz'nik-Kowalska, 1999, 2005, 2006).



Fig. 2 A hatchling in the umbilicus of *D. ruderatus*.

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