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DIACAVOLINIA NOV. GEN. SEPARATED FROM CAVOLINIA

(PTEROPODA, GASTROPODA)

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ABSTRACT

Diacavolinia is described to comprise *Cavolinia longirostris*, a species which throws off the protoconchs-I and -II while the species of *Cavolinia* keep the protoconch in the adult stage. Phylogeny of the Cavoliniidae is discussed.

RESULTS

The genus *Cavolinia* Abildgaard, 1791 (emend. Philippi, 1853) consists of species with dorsoventrally compressed shells, modified aperture lips, inflated ventral side, with a shell aperture divided into three sections by two aperture closing structures, linking the dorsal and ventral shell sides. All species except *Cavolinia longirostris* (ms. Lesueur, De Blainville, 1821) possess protoconchs-I and -II in the adult stage. In *Cavolinia globulosa* (Gray, 1850) (cf. Van der Spoel, 1976). The protoconch-I may, however, be passively lost in some adults.

A separation between *C. longirostris* and the other species of this genus has never been proposed though this difference points to an essentially different ontogeny in the two groups. *C. globulosa* passively loses its protoconch-I but shows no other modifications in structure or growth.

In *C. longirostris* the protoconch-I and -II are actively thrown off when the shell is nearly full-grown and the opening in the teloconch resulting from this loss is closed by a bending of dorsal and ventral shell sides, which after their bending grow together (Van der Spoel, 1976; Richter, 1982). Active shedding of the protoconch is also found in *Diacria* Gray, 1847, *Cuvierina* Boas, 1886 and *Hyalocyllis* Fol, 1875 but in these genera a special membrane is formed to close the opening in the teloconch which is left after loss of the protoconch, and there is no bending of the teloconch sides. The mechanism in these three genera thus essentially differs from that in *C. longirostris*.

As *C. longirostris* thus differs from both *Cavolinia* and *Diacria*, *Diacavolinia* nov.gen. is proposed to comprise this species. This name points to resemblance to *Cavolinia* s.str. and *Diacria*.

The new taxonomy for the group is shown below.

***Cavolinia* s.str.**

- C. tridentata* (Niebuhr, 1775) with 9 formae;
C. uncinata (Rang, 1829) with 2 subspecies and 5 formae;
C. gibbosa (d'Orbigny, 1836) with 3 formae;
C. globulosa (Gray, 1850);
C. inflexa (Lesueur, 1813) with 3 formae.

***Diacavolinia* nov.gen.**

- D. longirostris* (De Blainville, 1821) with 6 formae.

Considering *Diacavolinia* a separate genus also influences the concept of diversity in *D. longirostris*. In this species 6 formae are described, which are frequently found sympatric and further studies may prove some of these to represent good species.

The restricted number of selected characters provided by the protoconch and the uncertainty about their polarity prevent the development of a cladogram. A tentative phylogeny of the eight genera in the family Cavoliniidae, mainly based on shell characters already determined in the juvenile stage, shows the separate development of the two types of protoconch shedding in two different lines of development. The suggestion by Richter (1976) to place the coiled *Limacina inflata* (d'Orbigny, 1836) in the Cavoliniidae on the basis of the shell structure is not followed as it is not known if shell structure in the adults can be used for phylogenetic conclusions. The shell structure of the protoconch would give more information.

The elongated protoconch-I found in *Creseis* Rang, 1828 and *Styliola* Gray, 1850 is considered primitive, the more derived genera have a rounded protoconch-I. These two primitive genera can be separated on the basis of the development of a slightly twisted asymmetrical rib in the telococh of *Styliola*. In the other genera shell length is reduced in relation to shell width during growth as well as during evolution. In one line (*Hyalocylis*, *Cuvierina*, *Diacria*) this reduction is realized by the throwing off of the protoconch-I and -II and the closure of the telococh with a septum, in the other line (*Clio*, *Cavolinia*, *Diacavolinia*)

these shell parts are usually preserved throughout life and a septum is never formed. Dorsoventral flattening, enhancing better floating capacity and mobility (Van der Spoel, 1968), is realized in two lines. In the "*Diacria*" line dorsal and ventral sides are flattened and the lateral spines are developed except in *Hyalocylis* which stays primitive in this character. In the "*Cavolinia*" line either the ventral side (in *Clio* Linnaeus, 1767) or the dorsal side (in *Cavolinia* and *Diacavolinia*) is flattened.

Usually in these genera the greatest shell volume is found above the middle, but in *Cuvierina* this tendency is not followed so that a dichotomy is proposed in the "*Diacria*" line. In the "*Cavolinia*" line two dichotomies developed, one giving rise to the line of *Clio* without a shell aperture closing mechanism and one separating *Cavolinia* and *Diacavolinia* on the basis of the shedding of protoconchs.

Most genera are showing little diversity. In *Diacria* two lines of development can be traced, one represented by *D. trispinosa*-like species with large lateral spines, and one represented by *D. quadridentata*-like species with secondary reduction of lateral spines. In *Clio* three lines are proposed: one represented by species showing schizogamy [*C. pyramidata* and *C. andreae* (Pafort & Van der Spoel, 1986)], one represented by predominantly deep-sea species with reduced lateral spines and well-developed transversal striation, and one line of the remaining more primitive species. In *Cavolinia* a splitting into four phylogenetic lines is seen. *C. inflexa* (Lesueur, 1813) can be separated as primitive, it shows no reduction of the caudal shell part. In *C. globulosa* (Gray, 1850) the protoconch-I is passively lost, no closure is executed but a special callus is formed on the protoconch-II and telococh (Van der Spoel, 1976) indicative of a separate phylogenetic line. *C. gibbosa* (d'Orbigny, 1836) constitutes a separate line as shell length reduction is more pronounced by bending of the caudal spine, than in the remaining species.

DIAGNOSIS OF THE GENERA

***Diacavolinia* nov.gen.**

Type-species [by monotypy]: *Cavolinia longirostris*

(De Blainville, 1812)= *Hyalaea longirostris* (ms Lesueur) De Blainville, 1821 (non Sowerby, 1878).

Description: Shell dorsoventrally depressed, with lateral spines. In adults protoconchs-I and -II are thrown off and the opening left is closed by bending and growing together of dorsal and ventral shell sides. Shell aperture with closing structure linking dorsal and ventral sides (6 formae).

Cavolinia

For synonymy see Van der Spoel (1967).

Type-species: *Cavolinia tridentata* (ms. Forskål) (Niebuhr, 1775) = *Monoculus telemus* Linnaeus, 1758= *Anomia tridentata* (ms. Forskål) Niebuhr, 1775.

Description: Shell dorsoventrally depressed, with lateral spines. In adults always protoconch-II and, usually protoconch-I present, but never repair of

opening in caudal shell when protoconch is broken off (5 species).

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