

**Juveniles of the pteropod *Hyalocylis striata*
(Gastropoda, Pteropoda)**

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The juvenile and protoconch of *Hyalocylis striata* are described and compared to juvenile shells previously considered identical to or synonymous with this species. The development of Cavoliniidae is briefly described.

Key words: Gastropoda, Opisthobranchia, Cavoliniidae, *Hyalocylis*, protoconch, juvenile.

INTRODUCTION

Hyalocylis is the only pteropod genus in which the juvenile stages have never been accurately described. The ideas published by Van der Spoel (1967) and Richter (1976) describing the juvenile part of *H. striata* are shown to be incorrect. One juvenile specimen collected by the second author in the waters off Lizard Island, northern Australia, proved that this species possesses a normal embryonic shell like all other cavoliniid pteropods. To allow identification of this species in microplankton and sediment samples, the juvenile is described in this paper and comparisons are made with morphologically related species in order to clarify the taxonomic problems that arose in the past.

DISCUSSION

Hyalocylis striata is commonly found in the warm waters (40°N-30°S) in all oceans. Until now only adult shells with the protoconch broken off were collected, the one exception being the juvenile pictured by Pelseneer (1888). The shedding of the protoconch is a normal phenomenon in Cavoliniidae, occurring in *Hyalocylis*, *Cuvierina*, *Diacria*, *Cavolinia* and *Diacavolinia* (Van der Spoel, 1967, 1987). Some authors (e.g. Wells, 1974) had the idea that the absence of the protoconch was an artifact due to damage during collection; however, Van der Spoel (1967) has described the shedding of the protoconch as a normal biological phenomenon. The development of Cavoliniidae runs through the 12 life stages given in table I. The essential point in this development is that the animal actively sheds protoconchs I and II in specific life stages.

The “*Creseis chierchiaie*-like” organism described by Menzies (1958) was considered by Richter (1976) not to represent a gastropod, but this author did not give full arguments for this opinion. Histological study of two specimens from the North Atlantic Ocean showed that the animal was obliquely fixed to the embryonic shell by six

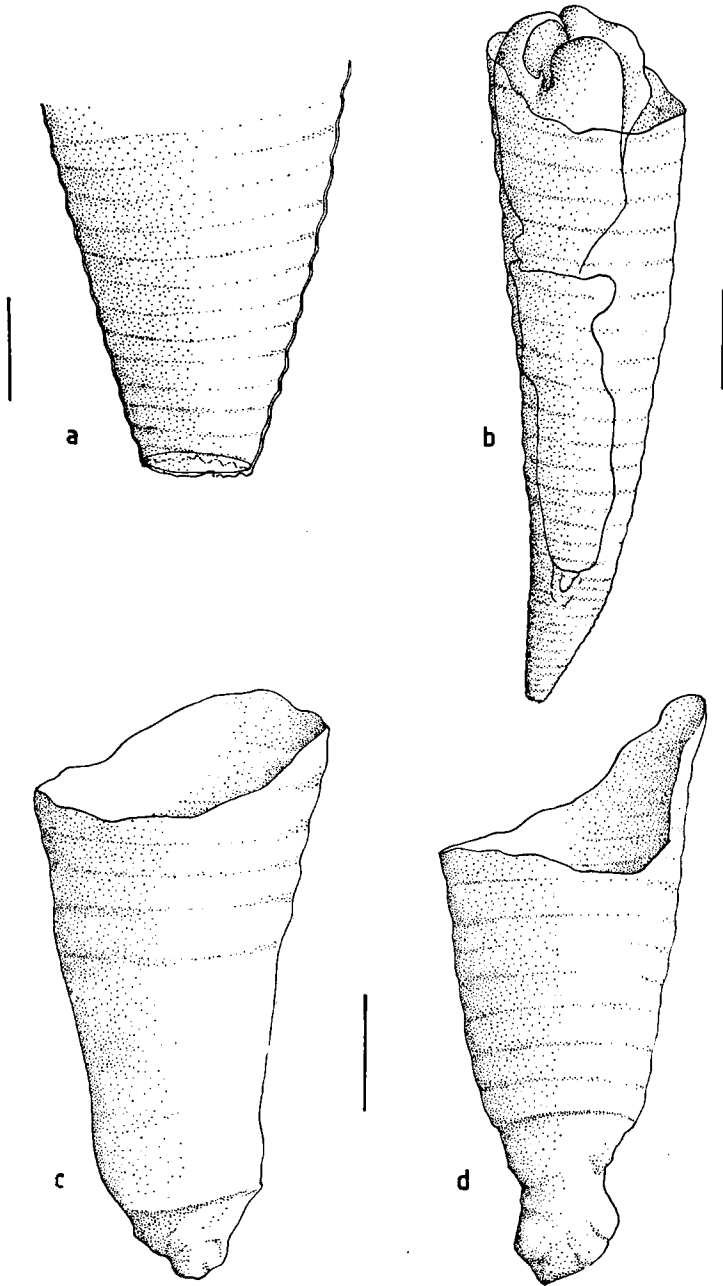
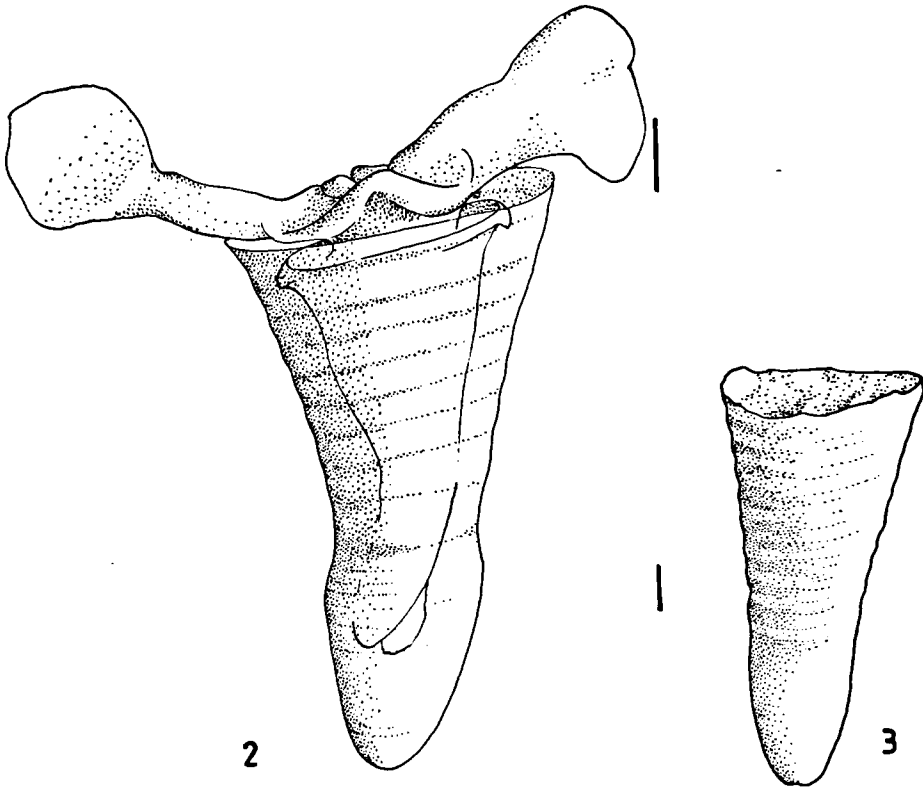


Fig. 1. *Hyalocylis striata*. a, caudal end of adult with closing membrane, Dana Exp. Sta. 3922^{IV}, 3°45'S 56°33'E, scale 0.2 mm; b, same specimen complete, scale 1 mm, c-d, adult specimens with shell repair after damage, Dana Exp. Sta. 3860^{XI}, 2°57'S 99°36'E, scale 1 mm.



Figs. 2-3, *Hyalocylis striata*. 2, juvenile, Lizard Island, 9/1/86, scale 0.1 mm; 3, fossil juvenile from Red Sea sediments, scale 0.1 mm (after Ivanova, 1985).

columellar muscle fibres, that there was a bilobed velum surrounded by a small and slender foot and that the digestive gland and stomach were present. This anatomy strongly resembles that of gastropod veliger larvae. The presence of a beak, on the shell aperture (found in some opisthobranchs but not in pteropods) shows that this animal is not an adult pteropod. The absence of eyes in the veliger and the absence of coiling in protoconchs I and II, supports the idea that it may instead be a juvenile pteropod. The distribution covering the Mediterranean, S.W. Atlantic and Indian Oceans is so wide, that it is hard to believe that these juveniles belong to a less widely distributed littoral species. To prevent further confusion, specimens of *Creseis chierchia* described by Menzies (1958) are named "beaked larvae" in this paper; whether they are juvenile pteropods or gastropod larvae remains unclear.

MATERIAL

The specimens described of *Hyalocylis striata* juv. are from: Lizard Island 14°40'S 145°26'E, off the western side of the island, surface plankton tows, northern Great Barrier Reef, 9/1/1986, 200 µm net, surface, night tow, 0.3 m net diameter.

The specimens of *Creseis chierchiae* are from: 23°27'S 151°35'E, channel between Heron and Wistari Reefs, southern Great Barrier Reef, 10/2/1986, surface daytime plankton tows, 500 µm, 0.3 m diameter net.

The specimens described as beaked larvae are from: Amsterdam North Atlantic Plankton Expedition 101A, Sta. 43 trawl 9, 41°44.7'N 34°25.0'W, 110-200 m, 30/9/1981 and Sta. 52 trawl 9, 24°57.6'N 29°54.2'W, 0-62 m, 18/9/1981.

Hyalocyclus striata (Rang, 1828) (figs. 1-3)

Cleodora (Creseis) striata Rang, 1828: 315, pl. 13 fig. 3.

Hyalocyclus striata; Pelseueer, 1888, pl. III fig. 3 (this diagram gives the first figure of a juvenile of this species, although the apical angle illustrated is too large); Tesch, 1913: 28, fig. 2; Richter, 1976: 145, fig. 4.

Hyalocyclus striata (in part); Van der Spoel, 1967.

The description and figure given by Richter (1976: 145, fig. 4) probably does not concern the normal embryonic shell of this species, as it is either the closing membrane (cf. Van der Spoel, 1967) or a remnant of the embryonic shell after strong decalcification. This can be concluded from the description "das beim Trocken-Präparieren regelmässig kollabierte". An artifact due to preservation fluid could also have caused this collapse (Van der Spoel, personal observation), although it was not mentioned by Richter (1976).

Clio striata Tesch, 1904, pl. 1 fig. 17, is similar to fig. 16 and represents a damaged shell, without a protoconch.

Rottman (1976: pl. 4 fig. 6) depicted *Hyalocyclus striata* with a complete protoconch, but described the specimen as *Creseis chierchiae*. The juvenile pictured by Almogilabin, 1982 (pl. I fig. 16) looks like a repaired adult shell and certainly does not give the correct shape of the protoconch. The juvenile figured by Ivanova (1985, pl. III fig. 2) is the cast of a real juvenile shell.

Description.—Shell faintly curved dorsally, the embryonic shell is thrown off in adults and a closing membrane is formed near the place of rupture. The concave closing membrane is punctuate at the surface. The embryonic portion leaves a completely circular mark at the top of the adult shell. The adult shell is transversely striated by broad, thickened bands. The distance between the successive bands increases towards the aperture. The shell is round in cross-section. The rear angle of the adult shell is 24°, while the shell length is about 8 mm. The embryonic shell (protoconch I) is separated from protoconch II by a shallow and vague incision, below which it bulges outward. The overall shape of protoconch I is oval with a rounded anterior end.

Creseis chierchiae (Boas, 1886) (fig. 4)

Cleodora chierchiae Boas, 1886:62, 202, pl. 3 fig. 39ter; pl. IV figs. 43 bis-ter.

Creseis chierchiae; Frontier, 1963: 229 + text fig.; Richter, 1963: 268, fig. 3; Zhang, 1964: 136, fig. 11; Richter, 1976: 145, figs. 1-2; Rottman, 1976, pl. 4 fig. 6; Richter, 1979, pl I figs 8-11; Ivanova, 1985, pl. III fig. 3; Rampal, 1985, fig. 1D.

Hyalocyclus striata (in part); Van der Spoel, 1967, fig. 42.

This species was originally described from the 'Rade de Panama' 10°N 137°E. It does not concern juveniles; fig. 4 represents a full-grown male specimen.

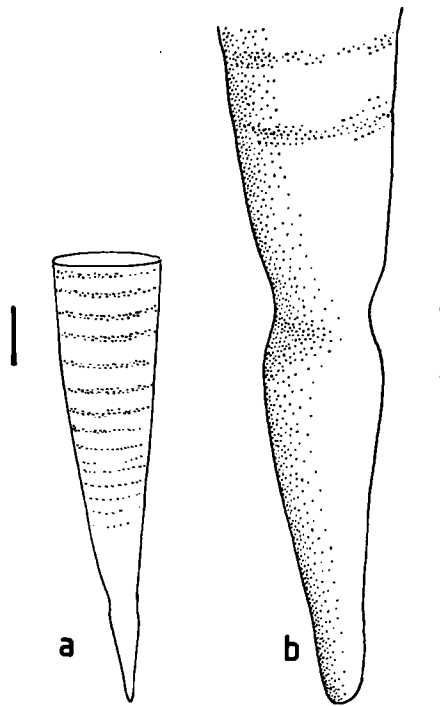


Fig. 4. *Creseis chierchiae*, adult male specimen; a, protoconch, scale 0.1 mm; b, complete shell, Heron Island, 10/2/86, scale 0.2 mm.

Description.—Shell straight, but clearly growing broader towards the aperture. Aperture oval without a beak. Shell usually transversely striated, the striae becoming more prominent towards the aperture. The embryonic shell with anteriorly convex and posteriorly concave sides, has a blunt anterior end. A clear incision separates the embryonic and adult shell. Shell length 1.4-1.6 mm, width c. 0.2 mm, embryonic shell 0.4-0.5 mm in length. The soft parts contain gonads with mature sperm so that the specimens are normal full-grown individuals.

Beaked larva (fig.5)

Creseis chierchiae; Menzies, 1958: 386, fig. 2D.

Creseis chierchiae (in part); McGowan, 1960: 161; Chen, 1962: pl. XIV fig. 21; Magaldi, 1977, fig. 20.

Chen (1962) depicted this species s.n. *C. chierchiae* and probably did not distinguish between real *C. chierchiae* specimens and the present species. Frontier (1963) described this species as resembling the *C. acicula* given by Tokioka (1955) and representing a yet undescribed new species. Richter (1976) stated that this species does not belong to *Creseis* and that it may not belong to the Gastropoda but no further reasons were given for this statement. Frontier (1963) considered this species, figured by Menzies

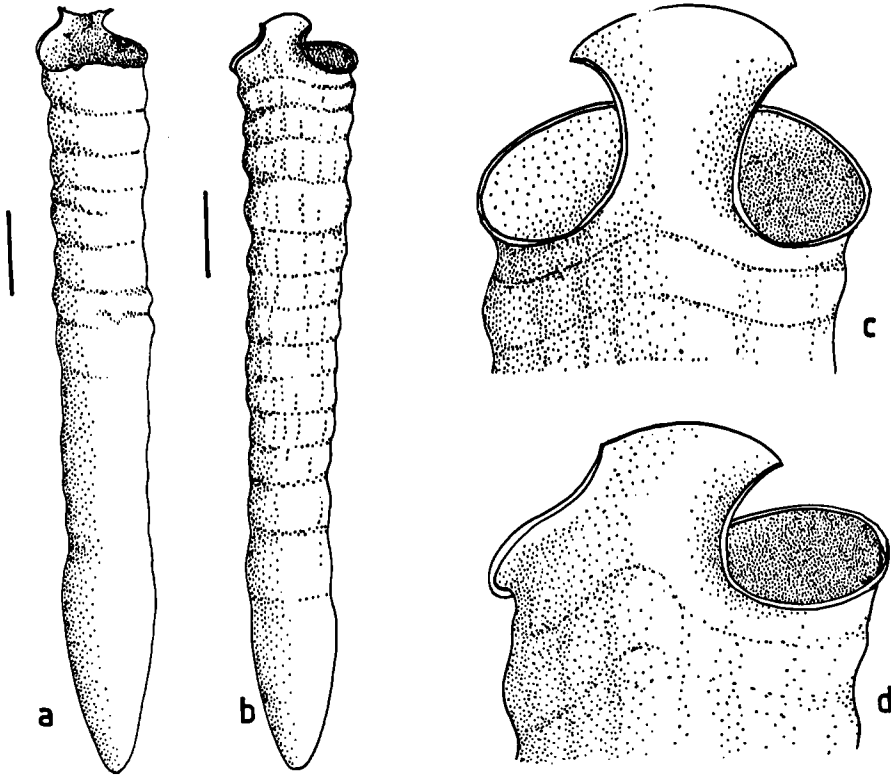


Fig. 5. "Beaked larva" of Menzies. a, 101A Sta.43 trawl 9; b, 101A Sta.52 trawl 9, scales 0.1 mm, c-d, aperture of same specimen, more enlarged.

(1958), as a pteropod, probably of the genus *Creseis*, but did not consider it to be *C. chierchiai*. McGowan (1960) described both 'beaked larva' and *C. chierchiai* together, but he mentioned differences between the two, especially with regards to the embryonic shell.

Description.—Shell straight with transverse ribs that are all equally developed over the entire shell length. The lateral sides of the shell are parallel so that the shell diameter is the same along the entire shell length. Aperture oval with a beak. Embryonic shell oval, not sharply separated from the teleoconch. Shell length 0.8-1.2 mm, width 0.1 mm, the relatively large embryonic shell is 0.25 mm in length. The soft parts of the preserved specimens occupy 2/3 of the shell volume. A bilobed velum is found anteriorly, 0.1 mm in length, and situated between a small footlobe. The animal is fixed obliquely to the shell by six columellar muscle fibres, each about 0.15 mm in length. The majority of the body consists of interstitial tissue indicating that the specimens are juvenile.

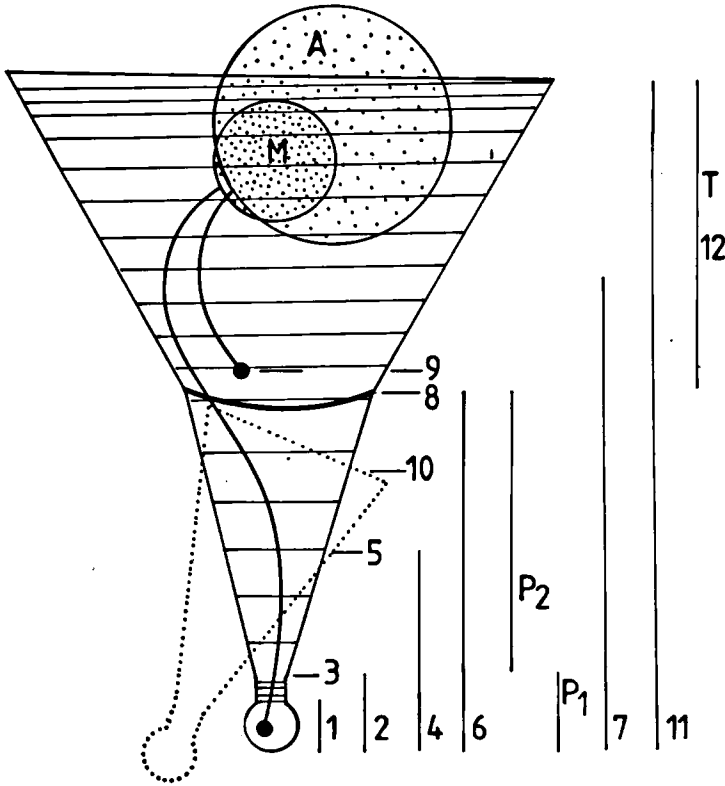


Fig. 6. Diagram of shell development in Cavoliniidae, numbers referring to the stages in table 1, A = adult soft parts, M = minute soft parts before detachment of columellar muscle, P1 = protoconch I, P2 = protoconch II, T = teleoconch.

SUMMARY

Hyalocylis striata has a normal thecosomatous protoconch, that is usually shed in the examined adults and subadults. *Creseis chierchiaie* is a valid species, adults reaching a length of 1.4 mm and cannot be juveniles of the former species. The "*Creseis chierchiaie*" described by Mensier should be called "beaked-larvae" as it is certainly not a representative of the genus *Creseis*.

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Life-stage	Development of	Description
1 egg	shell + body growth	free floating egg
2 trochophore (3)	shell + body growth metamorphosis	trochophore larva in embryonic shell
4 veliger (5)	shell + body growth metamorphosis	veliger larva in growing protoconch I
6 juvenile	body growth	juvenile in protoconch II
7 skinny or minute (8)	body growth formation of closing membrane between protoconch II and teleoconch	juvenile in protoconch II with anterior part of teleoconch
(9)	detachment of columellar muscle from embryonic shell and fixing of the columellar muscle to teleoconch near closing membrane	
(10)	shedding of the protoconch in some species this occurs after phase 8 or 9 in others	
11 adult	body growth	with full grown teleoconch and in some species with attached protoconch
12 mature	shell + body growth	with only full grown teleoconch

Table 1. Development of Cavoliniidae as shown in fig. 6.

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