Studies on Olividae. XIX. Where is the suture of *Oliva* shells?

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ABSTRACT. The suture of *Oliva* shells is hardly perceptible and has no functional link with the so-called "sutural channel", for which the more descriptive name "filament channel" is proposed.

RESUME. La suture des coquilles d' *Oliva* est à peine perceptible et n' a pas d'association fonctionnelle avec le soi-disant "canal sutural", pour lequel le nom plus descriptif de "canal du filament" est proposé.

KEYWORDS: *Oliva*, shell, suture, channel, posterior filament, filament channel.

1. INTRODUCTION.

All authors agree broadly on the definition of the suture of coiled shells. This is for instance: "*the line of contact where two whorls meet*" (FRETTER & GRAHAM, 1962), or "*a continuous line marking the junction of whorls in a gastropod shell*" (ARNOLD, 1965), or "*the junction of each whorl against the other*" (ABBOTT, 1974).

The spire of all *Oliva* shells displays a wide, conspicuous spiral channel that LAMARCK (1811) called "*le canal de la spire*". In their descriptions of the general characters of the genus *Oliva*, FISCHER von WALDHEIM (1807), MONFORT (1808), LAMARCK (1811) and later DUCLOS (1844) all repeated *verbatim* the same expression: "*tours de spire séparés par un canal*".

If the whorls were "separated by a channel", then it was quite logical to associate the channel with the suture and DUCLOS (1844) indifferently used "*canal*", "*canal spiral*" and "*canal sutural*". From there on, the habit was established and until today nobody questioned the appropriateness of the channel-suture association. For instance, one finds the terms: "*groove on the suture*" in GRAY (1842), "*sutural canal*" in MARRAT (1871) and PETUCH & SARGENT (1986); "*sutural channel*" in TURSCH & GERMAIN (1985); "*suture canaliculated*" in TRYON (1883); "*channeled suture*" in ZEIGLER & PORRECA (1969), ABBOTT (1974) and KANTOR (1991); "*suture*" in KANTOR (1991), TURSCH & VAN OSSELAER (1987), VAN OSSELAER & TURSCH (1988); "*open suture*" in GREIFENEDER (1981).

Amongst gastropods, the "channeled suture" is found only in the family Olividae where it is a hallmark of the genera *Oliva*, *Olivella*, *Olivancillaria* and *Agaronia*. It has been shown to constitute an operational taxonomic character in the genus *Oliva* by TURSCH & GERMAIN (1985), TURSCH & VAN OSSELAER (1987) and VAN OSSELAER & TURSCH (1988). The "channeled suture" seems to be a very important feature, as it is always maintained open (at least on nearly one full volution) even in the many species where the spire is covered with a thick callous layer. The channel is also present in freak specimens. It is a very old feature, clearly displayed in the oldest *Oliva* shells (such as the Miocene fossil *O. dufresnei* Basterot, 1925). The "channel" appears right after the protoconch transition and is already present in very juvenile specimens.

One would predict that a structure so carefully preserved both in phylogeny and in ontogeny has to be functional, but what could that function be? From early days, the channel was related to a peculiar organ, the *posterior filament*. The first observation we could trace was in QUOY & GAIMARD (1834): "*le manteau ... se termine en arrière par un filament plus ou moins long qui se loge dans le canal tout particulier que forment les sutures de la spire*". GRAY (1842) writes of "*the thread-like elongation at the hinder angle, which forms the groove on the suture*". TRYON (1883), in the general characters of the subfamily Olivinae,

writes: "*an appendage behind which reposes in the channeled suture*". In OLSSON (1956), one finds: "*In Oliva, the channel in the suture is maintained open and deep by a slender, tail-like appendage attached to the back of the mantle. This appendage lies along the channel when the animal is expanded but is lifted out as the soft parts are pulled back in the shell. Its real purpose is unknown*". KEEN (1971) writes: "*The mantle edge also has an unusual threadlike extension that lies along the suture, called a filament, which probably has a sensory function*".

2. OBSERVATIONS

2.1. Observations of shell sections.

Examination of polished longitudinal sections of the shell of several *Oliva* species brought unexpected results. Figure 1 shows the part of the shell that will be examined here.

The two external crystal layers of each whorl are very easily recognised and allow easy localizing of the external boundary of each whorl. In all the sections (figures 2, 3 and 4) one can see in each whorl that the channel (c) lies in the third, cross-lamellar layer, counting from outside.

On the sections of *Oliva reticularis* Lamarck, 1811 (Fig. 2) and of *O. reticulata* (Röding, 1798) (Fig. 3) the suture (s) is clearly separated and well above the channel (c). For the latter, one should note that the suture now lies close to a channel, but it is the channel of the *preceding whorl* ! This is the most usual case amongst *Oliva*. Albeit easily detectable on polished cuts, the real sutural line of these *Oliva* is nearly invisible on the intact shell, even under magnification. The location of the suture cannot be guessed at by changes of coloration on the whorls of the spire: these are generally due to variations in the thickness of the outer layer.

An interesting and common case is that of some heavily calloused shells, such as the specimen of *Oliva carneola* (Gmelin, 1791) illustrated in Figure 4. The channel is still distinct from the external boundary of the preceding whorl, as in the previous examples. But in this shell, every volution entirely covers the whole spire and there is no external line marking the separation between consecutive whorls. In such cases the common concept of suture (as *a continuous line marking the junction of whorls*) does not make sense.

2.2. Observations on live specimens

The posterior filament has been routinely observed for about thirty species of *Oliva* of which we have studied the live animal. For every species, the filament (when extended) could be seen lying inside and along the spiral channel, as schematically depicted in Figure 5. This fully confirms the relationship described by earlier authors. A clear sketch of the positioning of the posterior filament of *Olivella biplicata* has been published by BURCH (1988). One should note that the posterior filament is not always obvious because in many species it is nearly translucent.

3. DISCUSSION

Our observations show clearly that the spiral channel of *Oliva* shells is completely distinct from the suture. The real suture is never "*canaliculated*" or "*channeled*" and is hardly visible on the shell. The classical names "*sutural canal*", "*sutural channel*" or "*suture*" that have been applied to the channel are misleading and have to be replaced. Because of its obvious association with the posterior filament, we suggest that it be named the "**filament channel**".

The shape of the transversal section of the filament channel differs from species to species and several examples have been illustrated in TURSCH & VAN OSSELAER (1987). These features can be utilised as operational taxonomic discriminants (see TURSCH & VAN OSSELAER, 1987 and VAN OSSELAER & TURSCH, 1988).

The function of the channel is most probably that of a protecting sheath for the posterior filament. The function of the posterior filament itself still remains a mystery, in spite of the anatomical study of MARCUS & MARCUS (1959). The possibility of the filament being a sensory organ was raised by KEEN (1971). BURCH (1988) reports that the posterior filament senses water currents. Several alternative hypotheses (among which the production of chemical messengers) could be considered. Work on this subject is being pursued in this laboratory for some years but no firm conclusion has been reached so far. The exact function of the filament is a fascinating problem but has no bearing on the conclusion reached here above, i.e. that the channel is not related to the suture.

This case is a fine demonstration of the necessity of checking old postulates. The assumption that the channel was related to the

suture was so logical that for nearly two centuries it was never questioned by any of the many students of *Oliva*. Ironically, this was also the case for the authors of this paper, who performed numerous, detailed measurements on a feature (the filament channel) that was erroneously called "the suture". The name of the character does of course not affect the taxonomic applications (TURSCH & GERMAIN, 1985; TURSCH & VAN OSSELAER, 1987; VAN OSSELAER & TURSCH, 1988) for which these measurements were proposed.

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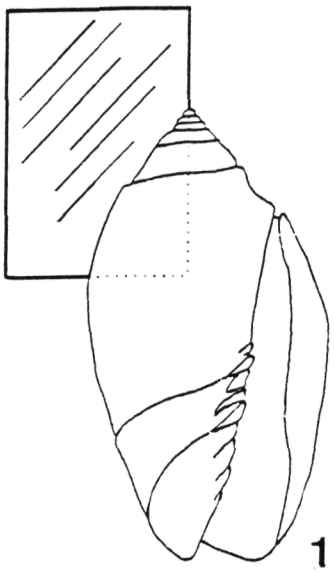

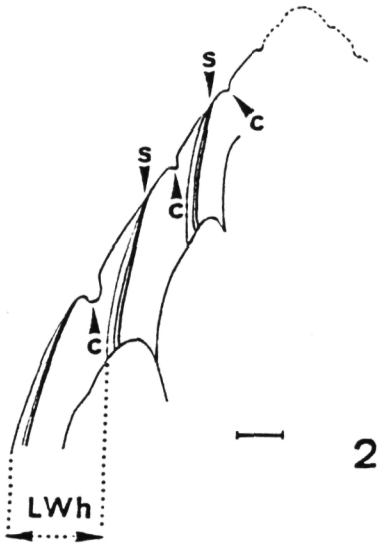

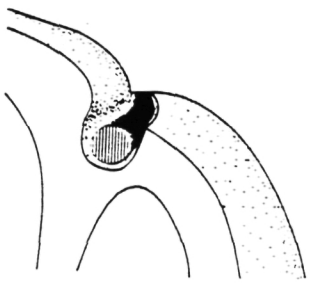

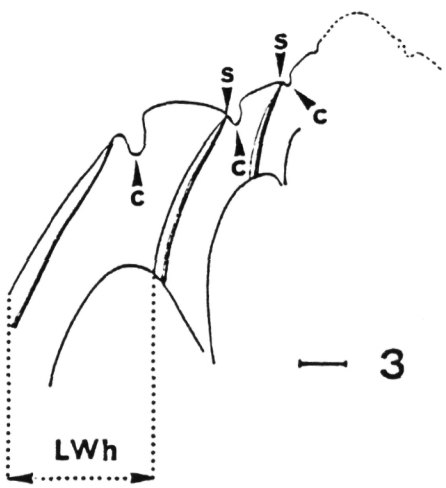

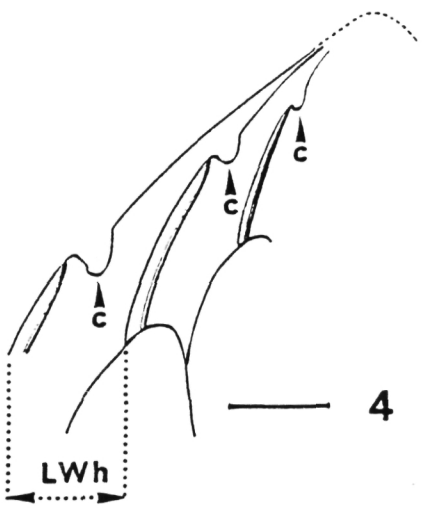

Fig. 1. Plane of the observed cuts in *Oliva* shells.
Fig. 2. Section of *Oliva reticularis* Lamarck, 1811. **s**: suture. **c**: filament channel. **LWh**: last whorl. Scale bar: 1 mm.
Fig. 3. Section of *Oliva reticulata* (Röding, 1798). **s**: suture. **c**: filament channel. **LWh**: last whorl. Scale bar: 1 mm.
Fig. 4. Section of *Oliva carneola* (Gmelin, 1791). **s**: suture. **c**: filament channel. **LWh**: last whorl. Scale bar: 1 mm.
Fig. 5. Schematic view of a portion of the posterior filament lying in the filament channel. In reality, the filament (represented in black for the sake of clarity) is nearly translucent in many species. Its relative size has also been exagerated.