

## First record of fossil *Cornisepta* McLEAN 1998 from the North Sea Basin (Early Oligocene, Central Germany)

(Gastropoda Vetigastropoda: Fissurellidae)

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### Abstract

A very diverse, early Oligocene mollusc assemblage of the Mammendorf quarry nearby Magdeburg includes many Fissurellidae. Most of them belong to *Emarginula* species but some small, highly conical shells possessing a typical internal septum belong to the extant genus *Cornisepta* McLEAN 1998.

Two species could be observed: *Cornisepta anhaltina* n.sp. having a smooth shell, and *C. granulocostata* n. sp. with granulose radial costae. Both species represent the first fossil record of that genus for the North Sea Basin.

**Key words:** Gastropoda, Fissurellidae, *Cornisepta*, new species, early Oligocene, Rupelian, Central Germany, Sachsen-Anhalt.

### Kurzfassung

Eine sehr diverse, unteroligozäne Molluskengemeinschaft aus dem Steinbruch Mammendorf bei Magdeburg enthält zahlreiche Fissurellidae. Die meisten davon gehören zu *Emarginula*-Arten, doch einige kleine, hoch konische Gehäuse mit internem Septum gehören zur bisher ausschließlich rezent bekannten Gattung *Cornisepta* McLEAN 1998.

Zwei Arten konnten beobachtet werden: *Cornisepta anhaltina* n.sp. mit einem weitgehend glänzend glattem Gehäuse sowie *C. granulocostata* n.sp. mit einer radialen Skulptur aus feinen, granulosen Rippen. Die beiden Arten repräsentieren den fossilen Erstnachweis dieser Gattung für das Nordseebecken.

**Schlüsselworte:** Gastropoda, Fissurellidae, *Cornisepta*, neue Arten, Unteroligozän, Rupelium, Mitteldeutschland, Sachsen-Anhalt.

### Introduction

During the last decades many new informations about deep sea molluscs were published due to the intensification of investigation of deep sea biota. One aspect of this research are new records of very specialized Fissurellidae.

McLEAN & GEIGER (1998) gave a very good overview of that group, and established numerous new taxa (genera and species). In their phylogenetic analysis on generic level McLEAN & GEIGER subdivided Fissurellidae

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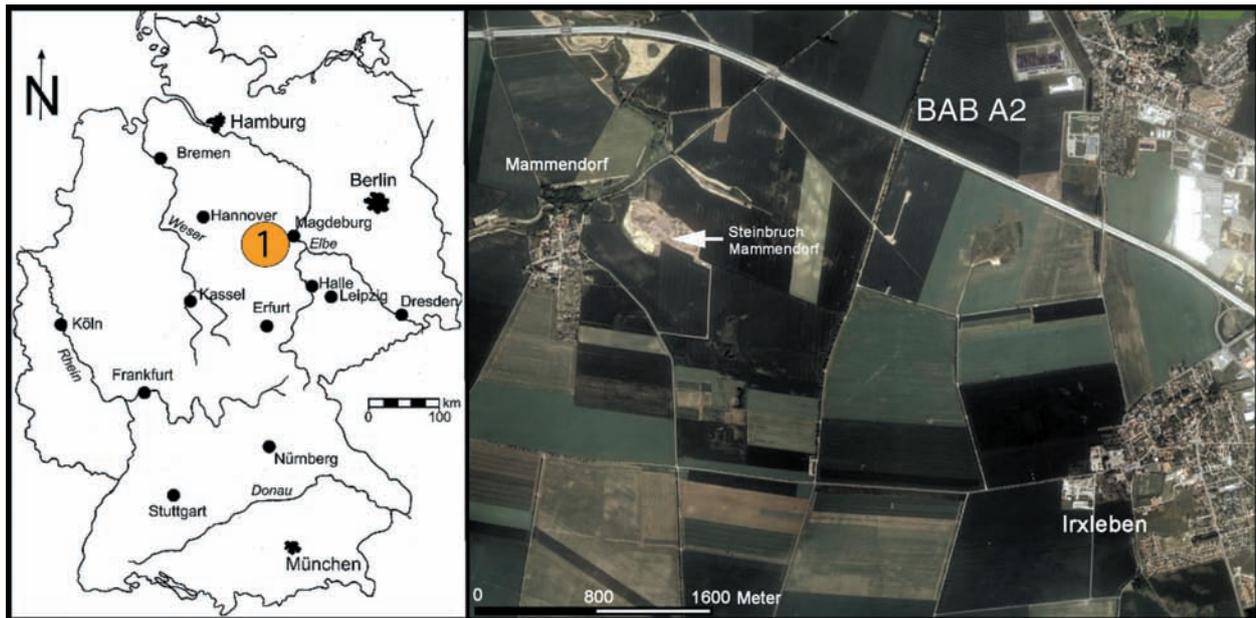


Fig. 1. Topographical position of the Mammendorf quarry.

(Emarginulinae) into several clades or groups, in first order into two main groups named Plesiomorphic Group and Apomorphic Group. Fossil records of Fissurellidae of the „Apomorphic Group“ sensu McLEAN & GEIGER (1998) mostly include *Diodora* GRAY 1821, in some cases also *Altrix* PALMER 1942. *Diodora* and *Puncturella* are well known from the classical early Oligocene Latdorfian Beds in Central Germany (KOENEN 1889–1894). In contrast to the numerous fossil *Diodora* records only one fossil record of members of the highly apomorphic „*Fissurisepta* Group“ sensu McLEAN & GEIGER 1998 (*Clathrosepta-Fissurisepta-Cornisepta*) is known to the author: *Fissurisepta papillosa* SEGUENZA 1862 from the Plio-Pleistocene of Sicily/Italia (see DI GERONIMO & LA PERNA 1997; GHISOTTI & GIANNINI 1983).

Especially concerning the „*Fissurisepta* Group“ McLEAN & GEIGER (1998) discussed shell characters which are very useful for determination of fossil material. As one result of their cladistic analysis the new genus *Cornisepta* has been interpreted as the most apomorphic genus of Fissurellid genera. Concerning the fossil Mammendorf material and its determination we follow the criteria listed in McLEAN & GEIGER (1998).

#### Geological setting

The fossils of the Mammendorf quarry have been described by MÜLLER (2008, 2011). In this paper only a short introduction into the geological situation may be given. More detailed informations can be found in the mentioned papers of MÜLLER.

The Mammendorf quarry (Cronenberger Steinindustrie, FRANZ TRICHES GmbH & Co KG) is located about 20 kilometres NW of the city of Magdeburg (fig. 1), along the eastern slope of the Flechtingen Ridge. Dur-

ing Tertiary the Flechtingen Ridge played an important paleogeographic role because it is the northernmost rise of Hercynian basement in Central Germany, and borders along the deeper parts of the Northern German part of the Cenozoic North Sea Basin. Sediments and vulcanites of late Carboniferous to early Permian age are exposed on surface of the ridge, and some quarries operate in this area. Concerning Oligocene fossils the most interesting point is the large Mammendorf quarry. The quarry works in early Permian Andesites which were well exposed over some hundred square meters during the last years. Sediments of early Oligocene rocky shore environments are preserved on the surface of the Andesite. Mostly boulder beds have been observed but sometimes also fissure fillings, and sediment fillings of larger pockets in the surface of the Andesite were present. The boulder beds consist of a mixed substratum of boulders, pebbles and more or less glauconitic, green and highly fossiliferous sands and clays (fig. 2). Two different faunal assemblages could be observed:

Lower faunal assemblage (M1–M3): it is characterized by mass occurrences of the bivalve *Isognomon sandbergeri* (DESHAYES 1861). Many corals (*Lobopsammia*), brachiopods („*Terebratula*“, *Argyrotheca*), and about 175 mollusc species (about two-third of them gastropods) have been discovered in this lower faunal complex. The whole fauna indicates a shallow rocky shore environment and warm water conditions. On top of the lower complex a brown horizon could be observed which is interpreted here as paleosol. The rare findings of some amphibic gastropods (Melampidae or Ellobiidae) support this interpretation. Thus, the first complex represents an eustatic cycle with final emersion of this rocky shore environment. Because of its affinities to the mollusc associations of classical Latdorfian (latest Priabon-

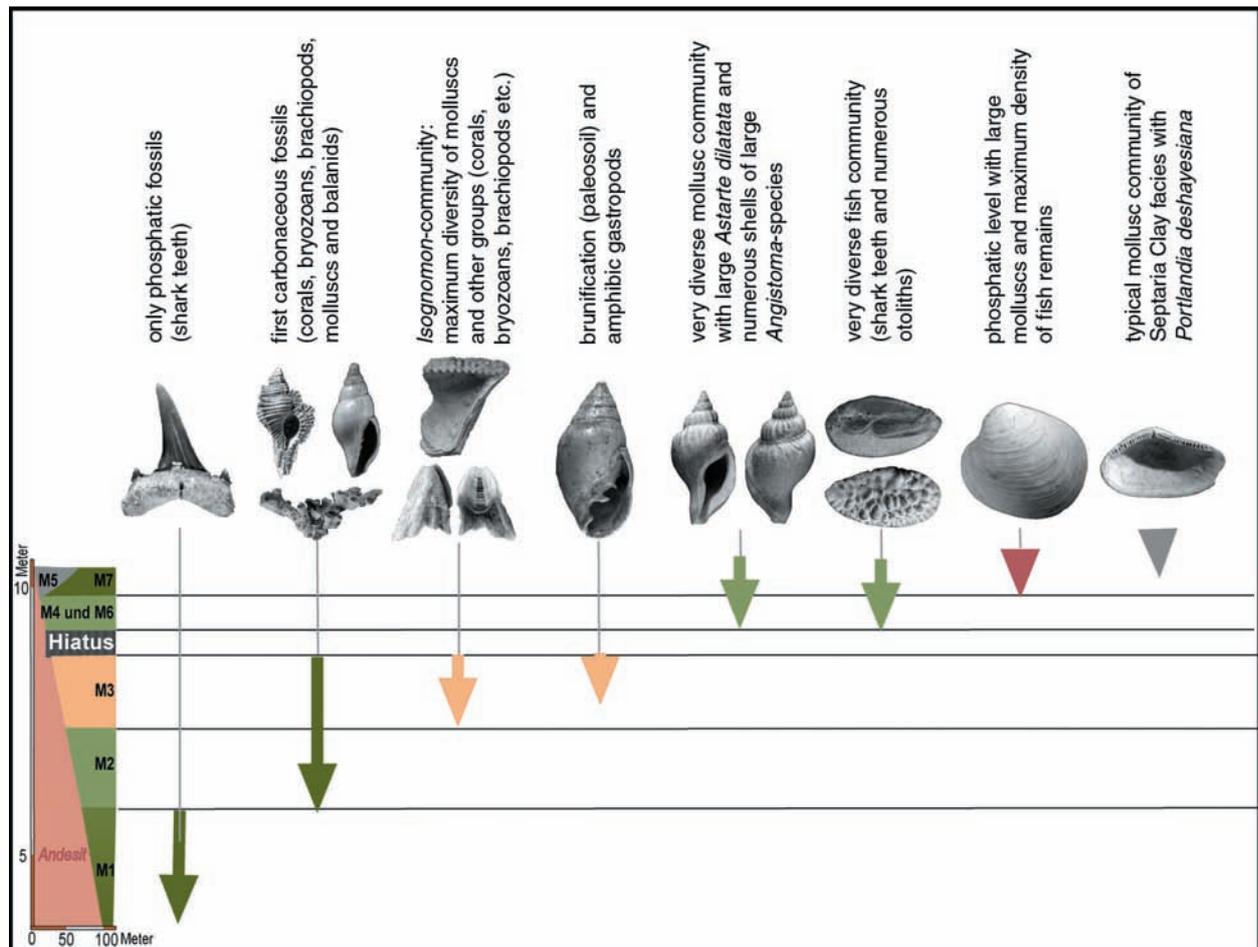


Fig. 2. Faunistic overview illustrating two sequences (the first includes levels M1 to M3, and the second includes levels M4/M6 to M5/M7), and stratigraphical range of essential fossil groups.

ian to earliest Rupelian) localities (type locality Latdorf and localities in the Egelbassins, Central Germany) the first complex should correlate with a late „Latdorfian“ eustatic cycle.

The upper faunal complex originates in a re-flooding of the Flechtingen Ridge during an further early Oligocene eustatic cycle. During this cycle the so called „Magdeburg Sands“ were deposited (Nannoplankton Zone NP22, early Rupelian) grading upward into typical Septaria Clay. Many new taxa of molluscs and fishes occur. On the other hand many typical species of the lower faunal complex have been disappeared, especially *Isognomon sandbergeri* (DESHAYES 1861), and other warm water molluscs of Latdorfian affinities. Most important seems to be a mass occurrence of *Emarginula*-species and large *Angistoma*-species (gastropoda) accompanied by numerous otoliths of *Raniceps*, *Palaeogadus* and other fishes (mostly Gadiformes). The whole complex indicates a rapid flooding and submerging of the Flechtingen Ridge, and a fast transition from rocky shore environments with boulder beds to a deeply submerged rocky swell. Finally the sedimentation of Septaria Clay illustrates quiet conditions below the base of storm waves.

The relatively short time span between submerging of the ridge and beginning of the sedimentation of typical Septaria Clay has produced the most interesting faunal association. Our *Cornisepta*-material originates from sediments and faunal associations which may characterize a seamount-like phase of the early Oligocene history of the Flechtingen Ridge.

#### Material and Methods

Samples of sediments (sands and clay) were washed through sieves from 10 mm down to 0,4 mm mesh. Hydrogen peroxide has been used to wash very stiff clays of horizon M7. After this procedure residues were picked out. Because cleaning of the rare specimens may provoke the risk of damaging we prefer digital photos to illustrate the material. SEM pictures should be taken if more material will be collected in future. The material published in this paper is stored in the „Geological-Paleontological Collection“ (GPSL) of the Institute for Geophysics and Geology of the Leipzig University, special collection Mammendorf (abbreviation MM\_ and collection number).

## Systematics

As noted above we follow McLEAN & GEIGER (1998) concerning systematics of Fissurellidae/Emarginulinae. For general systematics see SASAKI (1998).

Class Gastropoda CUVIER 1775

Order Vetigastropoda SALVINI-PLAWEN 1980

Superfamily Fissurelloidea FLEMING 1822

Family Fissurellidae FLEMING 1822

Subfamily Emarginulinae GRAY 1834

Genus *Cornisepta* McLEAN in McLEAN & GEIGER 1998

Type species: *Fissurisepta antarctica* EGOROVA 1972.

*Cornisepta anhaltina* n. sp.

Figs 3–6

**Locus typicus:** Mammendorf quarry (Cronenberger Steinindustrie, FRANZ TRICHES GmbH & Co KG), Mammendorf nearby Magdeburg, Sachsen-Anhalt, Central Gemany.

**Stratum typicum:** intensively green, glauconitic clay of the upper faunal complex of Mammendorf (M7), early Oligocene, early Rupelian.

**Material:** holotype MM\_968 (horizon M7, Fig. 3/4), paratypes MM\_881 (horizon M6, Fig.3/1), MM\_969 (horizon M7, Fig. 3/2), and MM\_970 (horizon M7, Fig. 3/3).

**Derivatio nominis:** after Anhalt, part of the German state Sachsen-Anhalt, in which the type locality is situated.

**Dimensions:** holotype: MM\_968, H = 4.35 mm, L = 3.75 mm, B = 3.05 mm; paratype MM\_881, H = 2.45 mm, L = 2.24 mm, B = 1.50 mm.

**Diagnosis (holotype):** Shell very high, markedly higher than long, conical, laterally compressed and oval in outline. In lateral view a nearly straight anterior slope and a very slightly convex to almost straight posterior slope is developed. At the summit of the apex a small part of the shell is very well separated from the major part of the shell. Maybe it represents a rest of the former protoconch. It bears a short, channel-like structure ending in a rounded foramen. The aperture shows an oval, laterally compressed outline. The septum is very well preserved, thin and straight, and it reaches about two-thirds of the total shell height. The external surface of the shell is almost smooth showing very fine growth lines and some more distinct growth lines in greater intervals. Occasionally

some very fine and incised radial lines occur. No additional radial sculpture could be observed in all specimens.

**Discussion:** See below under *Cornisepta granulocostata* n. sp.

*Cornisepta granulocostata* n. sp.

Fig. 7

**Locus typicus:** Mammendorf quarry (Cronenberger Steinindustrie, FRANZ TRICHES GmbH & Co KG), Mammendorf nearby Magdeburg, Sachsen-Anhalt, Central Gemany.

**Stratum typicum:** green, glauconitic sands of the upper faunal complex of Mammendorf (M7), early Oligocene, early Rupelian.

**Material:** Single specimen, holotype MM\_902 (horizon M7).

**Derivatio nominis:** after the characteristic external sculpture consisting of granulated costae.

**Dimensions:** H 2.25 mm, other dimensions not really capable.

**Diagnosis (holotype):** The holotype is not completely preserved. The shell is very high, much higher than long, conical, laterally compressed and oval in outline. In lateral view the anterior slope is nearly straight and the posterior slope remains very slightly convex. On top of the apex a small part of the shell is very well separated from the shell as seen in *C. anhaltina*. It also bears a short, channel-like structure accompanied by a rounded foramen. Aperture oval, laterally compressed and somewhat depressed around the the area of fusion of the septum with the shell cone. Septum very well developed, thin and straight.

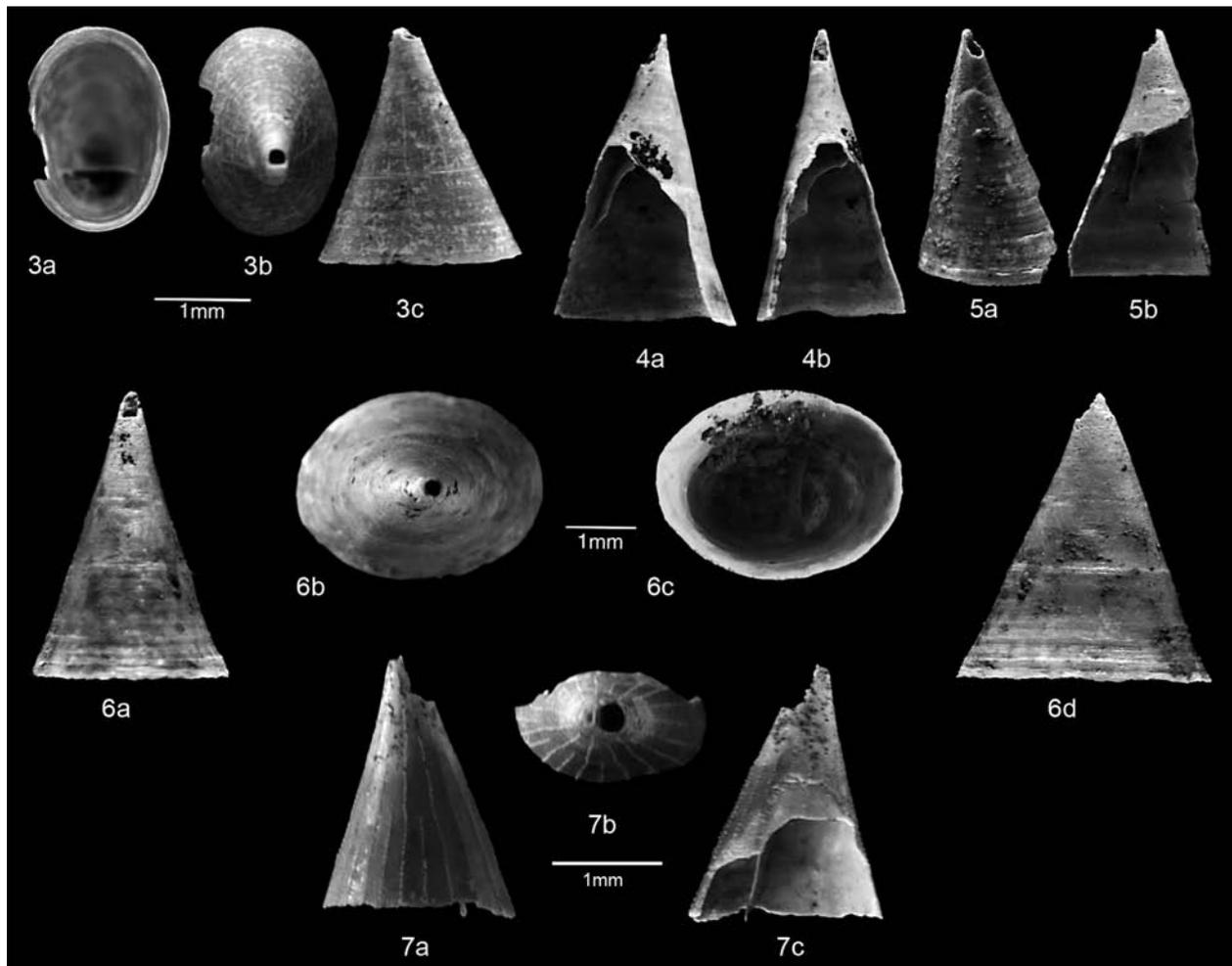
On the external surface a system of radial ribs is developed consisting of about 16 primary costae and some secondary costae on the lower part of the posterior slope of the shell. As a result of this interfingering the total number of costae reaches at least 20. The radial costae are thin, sharp, and well developed. They consist of very fine but distinct rounded pustules or granules. Some fine growth lines complete the external sculpture.

**Differential diagnosis:** The only specimen of *C. granulocostata* is incomplete but shows all morphological features which are necessary for determination. It differs from *C. anhaltina* n. sp. by its unique sculpture consisting of very sharp and granulated costae. On the smooth surface of *C. anhaltina* n. sp. sometimes very fine, incised lines occur but no prominent costae.

## Discussion

With regard to the diagnostic shell characters which are listed in McLEAN & GEIGER (1998: 26), there is no doubt about the systematical position of the fossil

shells. The lack of selenizone and the lost of protoconch are typical features of the „*Fissurisepta*-Group“ sensu McLEAN & GEIGER (1998). The combination of a high



Figs 3–7. New species of *Cornisepta* from the Oligocene of Mammendorf. 3–6) *Cornisepta anhaltina* n. sp. 3) paratype (MM\_881), a: adapical, b: apical, c: lateral; 4) paratype (MM\_969), a: lateral, b: posterior; 5) paratype (MM\_970), a: posterior, b: lateral; 6) holotype (MM\_968), a: posterior, b: apical, c: adapical, d: lateral. — 7) *Cornisepta granulocostata* n. sp., holotype (MM\_902), a and c: lateral, b: apical.

conical shell and a high straight septum is restricted to *Cornisepta*. Thus, our material matches all essential diagnostic features of that genus.

The morphology of the shell of *C. anhaltina* n.sp. is very closely related to the living Antarctic species *C. antarctica* (EGOROVA 1972) but lacks any radial sculpture which is present on surface of *C. antarctica* - shells (for comparison see fig. 10 D–E in McLEAN & GEIGER 1998). This seems to be a remarkable difference between *C. anhaltina* n. sp. and *C. antarctica*. The sculpture of *C. granulocostata* n. sp. is very closely related to the sculpture of *C. rostrata* (SEGUENZA 1862) from the north-eastern Atlantic and Mediterranean (for comparison see McLEAN & GEIGER 1998: fig. 11 A–B).

The occurrence of *Cornisepta* in the early Rupelian of Mammendorf is the first fossil record of that genus. Recent species of *Cornisepta* have been observed in deep sea environments and in faunal associations of seamounts. This occurrence indicates the very unique position of the Mammendorf faunal associations cover-

ing environments from rocky shore habitats to seamount-like conditions. Such places are very scarcely reported in the fossil record, especially in the Tertiary North Sea. We believe that fossil members of the „*Fissurisepta*-group“ (sensu McLEAN & GEIGER 1998) were not uncommon in Tertiary seamount-like environments but such environments are too scarcely reported. Furthermore, *Fissurisepta* and related genera mostly are small and inconspicuous. Thus, in some cases they may be hardly to find in large shelly samples.

#### Some Remarks on ecology

Most of extant members of the *Fissurisepta*-group were reported from deep sea environments, and no records of shallow water or coastal occurrences could be obtained from literature or internet sources. As minimum a depth about 50 m is most likely. Some informations from the paper of McLEAN & GEIGER 1998 may illustrate the situation:

The type-species *C. antarctica* is recorded from Weddel Sea (Antarctica) in depths of 280 to 700 m. *C. rostrata* (SEGUENZA 1862) is known from Northeastern Atlantic and Mediterranean deep waters (1000 – 2000 m). *C. pacifica* (COWAN 1969) has been observed along the Pacific coast of North America, from Alaska down to Southern California covering a depth range from 440 to 880 m. Similar depth ranges can be stated for other species. For *C. soyoae* (HABE 1951) at the coasts of Japan a minimum water depth of 120 to 270 m is recorded. Species of *Fissurisepta* SEGUENZA 1862 have been observed in shallower waters: *F. granulosa* JEFFREYS 1883 from 50 to 500 m (NE Atlantic and Mediterranean), other species from about 250 m downward to greater depths. Species of *Clathrosepta* McLEAN & GEIGER 1998 show an abyssal distribution.

BECK, METZGER & FREIWALD (2006) recorded *Profundisepta profundum* (JEFFREYS 1877), *Cornisepta crossei* (DAUTZENBERG & FISCHER 1896), *C. rostrata* (SEGUENZA 1862) and *Fissurisepta granulosa* JEFFREYS 1883 from Lusitanian seamounts SW off Portugal but no specific informations concerning depth range are noted (only summit depths of the seamounts):

Seine Seamount: summit depth about 170m; *P. rofundum*,  
*C. rostrata*, *C. crossei*, *F. granulosa*.

Sedlo Seamount: summit depth about 750m, *C. rostrata*,  
*C. crossei*.

Ampere Seamount: summit depth about 59m, *C. crossei*.

On the other hand, because no fossil record of shallow neritic environments could be observed hitherto, we conclude that possible fossil members of that group also were adapted to deep waters like extant representatives. The occurrence of *Cornisepta* in the early Oligocene Mammendorf faunal sequence is constricted to a relatively short time span. At this time the Flechtingen Ridge passed a seamount-like stage until beginning of Septaria Clay sedimentation, and the change to soft bottom conditions (silty clay) caused a very prominent faunal break: rapid rising of the typical *Portlandia deshayesiana* – community of the Septaria Clay, and fast disappearance of all hard ground-associated taxa.

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- WoRMS (World Register of Marine Species): <http://www.marinespecies.org/index.php>