FORAMINIFERA FROM THE CRETACEOUS OF SOUTHERN LIMBURG, NETHERLANDS, VIII.

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THE GENUS *ALLOMORPHINA* IN THE DUTCH CRETACEOUS.

Genus *Allomorphina* Reuss. Denkschr. k. Akad. Wiss. Wien, 1, 1950, p. 380.
Genotype: *Allomorphina trigona* Reuss.
Synonym: genus *Quadrimorphina Finlay,* Trans. Roy. Soc. New Zealand, 1939, 69, p. 325.
Gen.: *Valvulina allomorphinoides* Reuss.

The author stated, that *Allomorphina trigona* from the european Tertiary (Miocene) and the cretaceous species *Valvulina allomorphinoides* must belong to a single genus; all characteristics, the opaque wall with very fine densely placed pores , the arrangement of chambers in a typical spiral, the inflated shape of the chambers, the slit-like aperture in most species covered by a narrow lip, the lack of an umbilical hollow, and the simple cassiduline toothplate behind the aperture (as described first by Brotzen) point to a very close allience of all the species. The only difference between *Allomorphina* and *Quadrimorphina,* being the number of chambers in a whorl, cannot be maintained as a generic character.

The genus *Allomorphina* very much resembles the characters of *Praebulimina,* together with those of true *Cassidulina.* Both genera show the spiral arrangement of the chambers, together with the opaque texture of walls, fine densely placed protopores, opaque calcarine structure in polarised light and the simple toothplate. The genus forms a link between these two genera, but for the shape of the aperture, which is not that of a loop, but of a slit. This character seems to have developed caused by the inflation of the chambers.

The Dutch species of *Allomorphina* show a very typical range of forms of typical quadrimorphine habitus *(Allomorphina allomorphinoides),* through much inflated *Allomorphina bullata* Hofker with open umbilicus due to the high inflation of the chambers, over much inflated quadrimorphine to allomorphine *Allomorphina halli* up to typically allomorphine *Allomorphina cretacea.*

Since these four species succeed in chronological order, they seem to form a phylletic range also.

Allomorphina allomorphinoides (Reuss).

Valvulina allomorphinoides Reuss, Sitz. ber. k. Akad. Wiss. Wien, 40, 1860, p. 223, pl. 11, fig. 6.

Discorbina allomorphinoides (Reuss) Franke, Abh. geol. pal. Inst. Univ. Greifswald, 6, 1925, p. 91, pl. 8, fig. 11.

Valvulineria allomorphinoides (Reuss) White, Journ. Pal., 2, 1928, p. 304, pl. 41, fig. 8.

Quadrimorphina allomorphinoides (Reuss) Cushman et Todd, Contr. Cushman Lab. For. Res., 1949, p. 69, pl. 57, figs. 10—12.

Test with at least four chambers in a whorl, always distinctly compressed from dorsal to ventral side, last chamber distinctly pointed at its periphery, with narrow somewhat triangular lip at its ventral side covering totally the slit-like aperture. Longest diameter of test 0,70-0,80 mm, thickness 0,30-0,35 mm. Spiral flattened, not protruding from the dorsal surface.

Very rare in the Cr 3a and Cr 3b (Upper Campanian), more common in the lower Cr 3c (Lowest Upper Maestrichtian).

Allomorphina bullata Hofker.

Allomorphina bullata Hofker. Beihefte Geol. Jahrb., 195?, p. ?, figs. ?. (In press).

Four chambers in a whorl, much inflated, last formed chamber rounded at its periphery, with crenulated lip over the slitlike aperture opening into a narrow but distinct umbilical hollow. Spiral always protruding at the dorsal surface, typically conical. Largest diameter about 0,65 mm, thickness 0,35—0,40 mm.

Wall very thin and translucent.

Common in several gatherings from the Cr 3c (Maestrichtian).

The species was found for the first time in samples from Basbeck and uppermost part of the quarry at Hemmoor, Germany.

Allomorphina halli Jennings.

Allomorphina halli Jennings 1936, Bull. Americ. Paleont., 23, p. 34, pl. 4, fig. 5.

Allomorphina trigona (non Reuss) Franke, 1927, Danmarks geol. Unders., II, 46, p. 12, pl. 1, fig. 11.

Allomorphina halli Jennings, Brotzen, Sver. geol. Unders., C, 493, 1948, p. 127, pl. 19, fig. 4, text-figs 39—41.

Quadrimorphina allomorphinoides (non Reuss) Visser, l.c. 1950, p. 281, pl. 1, fig. 16.

Chambers much inflated, so that the whole test is nearly globular. There are in the beginning of coiling four chambers in a whorl, but in outgrown tests there may be three or four chambers in a whorl. The last formed chamber is large, but rounded at its periphery, never pointed. There is no umbilical hollow at the ventral side, and the slit-like aperture is covered by a very narrow, often triangular lip. Outgrown specimens measure a length of about 0,70—0,90 mm, but many specimens are smaller.; thickness up to 0,70 mm; at the dorsal side the initial spire is distinctly protruding in some specimens, in other ones more flattened.

The species was found in the swedish and danish Paleocene but is found also in the danish Danian, where it is not common.

In Holland the species is found in the Cr 4 (Uppermost Maestrichtian) and in the whole Mb, rarely in the Ma. In the transgressional layers of the lowest Mc it disappears totally. Visser mentions a single specimen from the Mc (Geulhem); it is here taken for *Quadrimorphina allomorphinoides;* this specimen may be also a somewhat aberrant specimen of *A. cretacea.*

Allomorphina cretacea Reuss.

Allomorphina cretacea Reuss, Haidinger's Abh. 4, 1851, p. 42, pl. 5, fig. 6.

Allomorphina trigona (non Reuss), Hofker, Mém. Inst. Roy. Sc. Nat. Belg., 112, 1949. p. 41, fig. 18.

Allomorphina trigona (non Reuss), Visser, Thesis Leyden, 1950, p. 280, pl. 2, fig. 20.

Allomorphina trigona (non Reuss), Hofker, 1951, Publ. Nat. Genootschap Limburg, IV, p. 9, figs. 9, 10.

Test rather large, thick, but the chambers not inflated, last formed chamber very large and slightly pointed at its periphery, so that the initial chambers are not found at the proper dorsal side of the test, but at its side, forming one of the edges of the triangular test. Chambers in the initial coil 4, later 3 or even at the end of the test two chambers in a whorl. Aperture a long narrow slit without a distinct lip. Length of outgrown specimens about 1 mm, thickness about 0,70 mm.

This species is different from real *A. trigona* Reuss from the Vienna Basin Miocene. The description given by Reuss from his Lemberg specimens agrees fully with the species found in Limburg. So it may be, that the species is deriving from southern Europe, as, moreover, it is found only in the Mc and Md, which layers contain many species of southern areas. It appears suddenly in the basal conglomerate of the Mc and is found up to the upper layers of the Md, but never in large quantities; it is commonest in the Lower Md.

The distribution of the species of *Allomorphina* gives us once more a base to distinguish the different horizons of the Dutch Cretaceous.

Allomorphina allomorphinoides ..... Cr 3 a, Cr 3 b and lowest Cr 3 c.

Allomorphina bullata ..... Cr 3 c.

Allomorphina halli ..... Cr 4 and Mb, and lowest Kunrade.

Allomorphina cretacea ..... Mc and Md, and upper Kunrade.

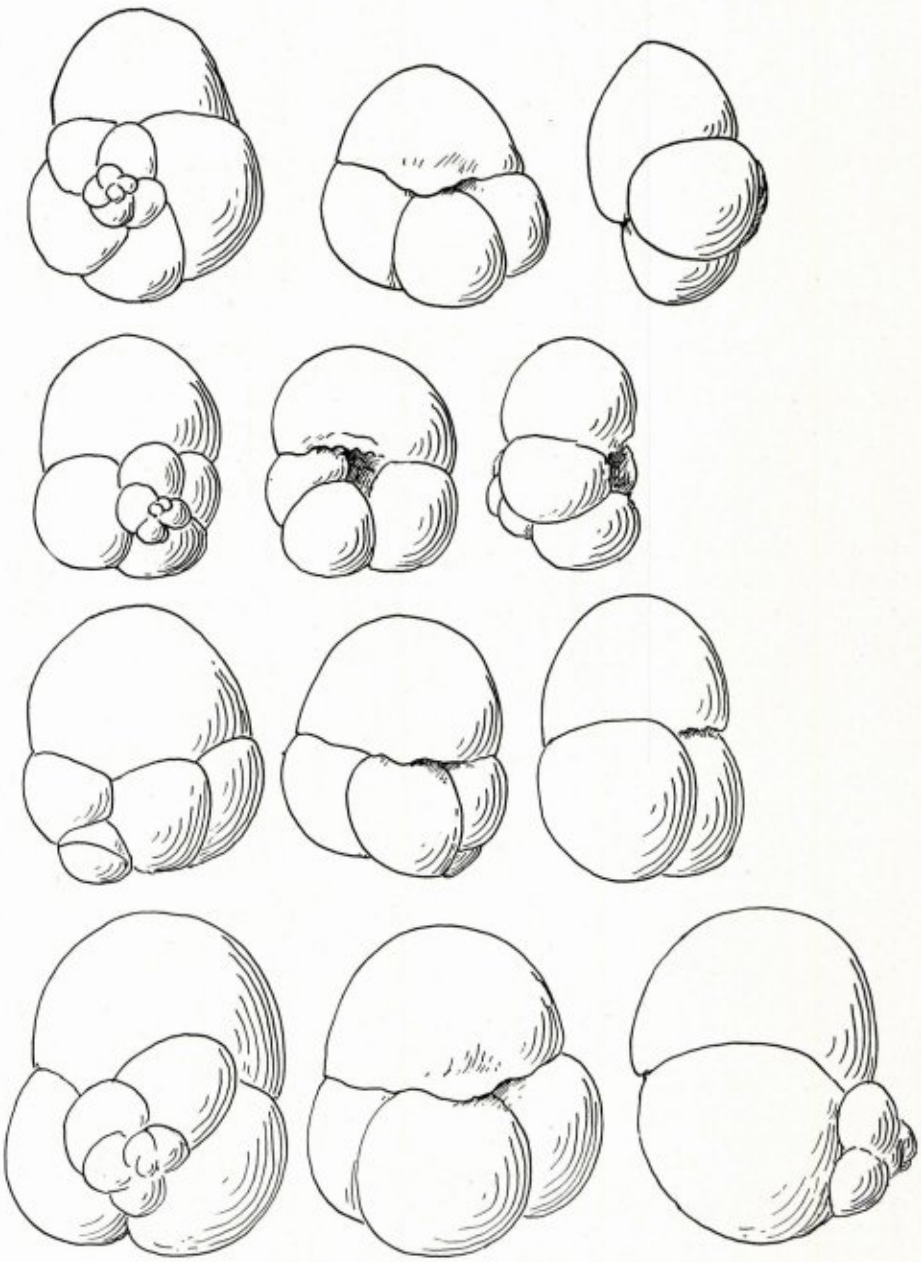

Fig. 1. Each row of figures shows a species from three different sides, first the dorsal, then the ventral and last the side-view. All figures are enlarged × 50.
Upper row. *Allomorphina allomorphinoides,* from the Cr 3 c of Mesch, Mescherheide, middle Maestrichtian
Second row. *Allomorphina bullata,* from the upper layer of the outcrop at Cosberg, Cr 3 c, Lower middle Maestrichtian.
Third row. *Allomorphina halli,* from outcrop Enci, Maestricht, sample Kruit, 547, Middle Cr 4, Upper Maestrichtian.
Fourth row. *Allomorphina halli,* from outcrop Enci, sample Kruit 471, Lower Mb.

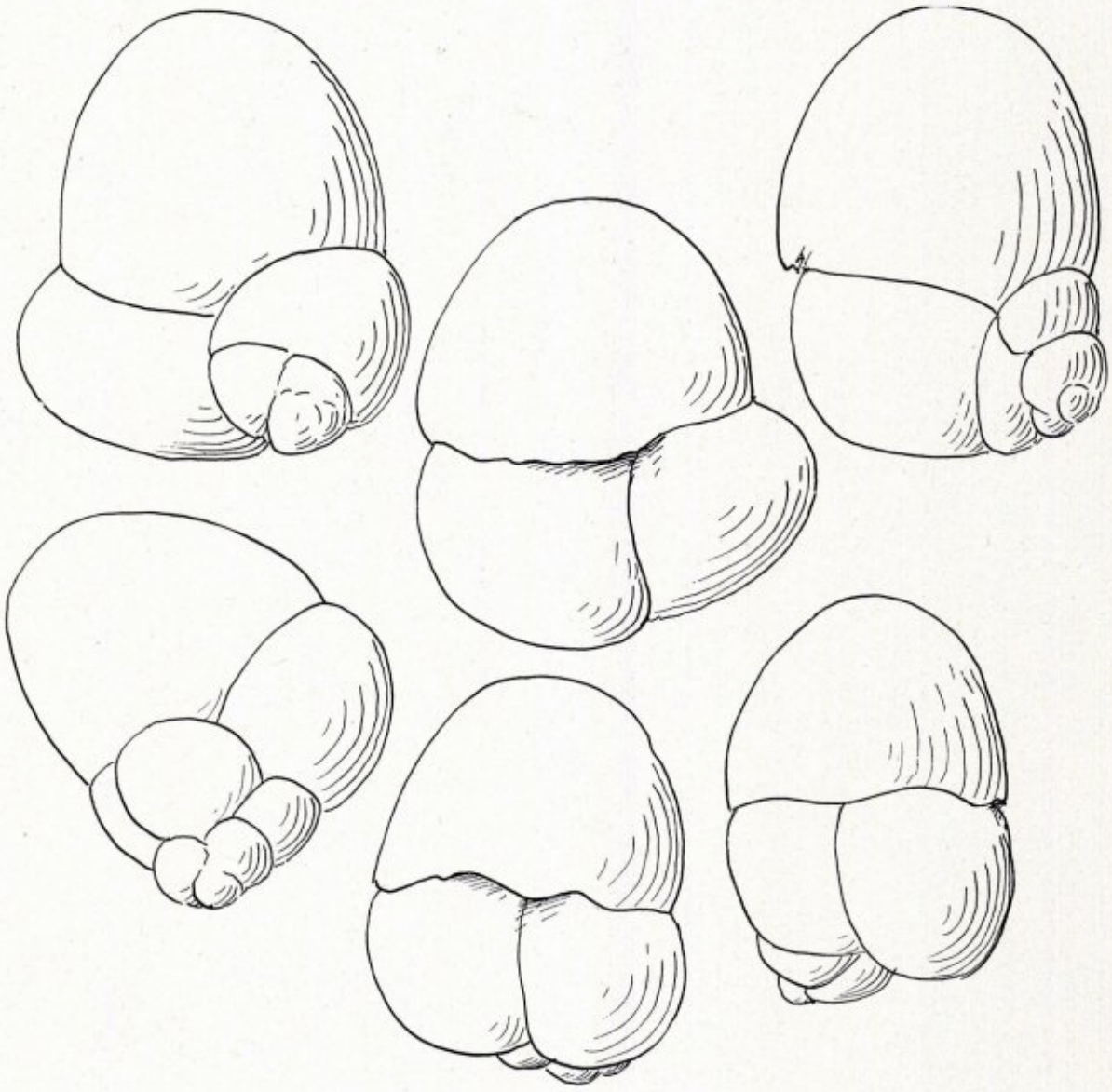

Fig. 2. Each horizontal row shows a specimen from three different sides. Enlargement × 60.
Upper row. *Allomorphina cretacea*, from outcrop 4, Enci sampling R o m e i n, level at 15,50 m, middle Mc.
Lower row. *Allomorphina cretacea*, from outcrop Enci, sample K r u i t 507, boundary Mb-Mc.