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## Lower Cretaceous Terebratulidae of the Jura region

### 2. The Aptian fauna of La Presta and Noirvaux Dessus and the Upper Albian Fauna of La Vraconne

By FRANK A. MIDDLEMISS<sup>1)</sup>

#### ABSTRACT

The Aptian of La Presta contains five terebratulid species, that of Noirvaux Dessus two and the Upper Albian of La Vraconne one. The species are reviewed and two new species described: *Boubeithyris prestensis* from La Presta and *Musculina vraconnensis* from la Vraconne.

#### Introduction

Aptian and Albian strata are at present poorly exposed in the Jura region. They were better exposed in the nineteenth century and the early part of this century, when asphalt impregnations in the urgonian limestones below were being exploited and the Albian shales were in places, notably at La Vraconne, dug for tile-making. CAMPICHE, PICTET, DE LORIOLE and RENEVIER all described faunas from these horizons.

Outcrops of Aptian strata are particularly rare in the Jura. GUILLAUME (1966) gives a map of the subcrop beneath the Albian, showing that it rests on Barremian (usually urgonian facies assumed to be Barremian in age) throughout most of the region, with absence of Aptian. Although Albian sediments are more widespread than those of Aptian age they are seldom exposed as they are mainly of easily weathered lithologies. The most important part of the central Jura in which Aptian rocks occur is around Sainte-Croix and in the Val de Travers, for which RENZ & JUNG (1978) have summarized the Aptian-Albian succession.

The richest sources of Aptian fossils in this area have been the asphalt mine at La Presta in the Val de Travers (see FREY 1922 for details of this mine, although he does not mention fossils) and the slopes above Noirvaux Dessus, 1.5 km northwest of Sainte-Croix (detailed map in RENZ & JUNG 1978), specimens from which are present in many collections, especially at Neuchâtel, Basel, Lausanne and Geneva, the British Museum, Natural History (London) and the Sedgwick Museum (Cambridge). According to RENZ & JUNG the Aptian sediments in the mine at La Presta range from the Deshayesites deshayesi Zone of the Lower Aptian up into the Upper Aptian; the sandy glauconitic limestone forming the upper part of the sequence, and

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yielding *Parahoplites* cf. *nutfieldensis*, also yields *Hypacanthoplites milletioides*, indicating that it passes up into the Lower Albian. The great majority of brachiopods from this locality have a sandy, highly glauconitic calcareous matrix, showing that they come from the Upper Aptian or possibly Lower Albian part of the succession. A few specimens have a glauconitic yellow marl matrix which may indicate a lower horizon which, however, could be of Upper Aptian age (RENZ & JUNG 1978, p. 5).

Specimens from Noirvaux Dessus, without exception, have a coarsely bioclastic, sandy, glauconitic matrix indicating derivation from the "grès vert quartzeux" (RITTENER 1902), the upper lithological unit of the Aptian at that locality (RENZ & JUNG 1978, fig. 2), called the "grès a grosses térébratules" by BOURQUIN (ms.).

The uppermost Albian (Vraconnian) fauna of La Vraconne was well-known in the mid-nineteenth century period of Pictet and Campiche but is now best represented by the collections at Basel made by Renz, Jung and Panchaud from temporary exposures and specially dug trenches during the 1960s and 70s. The brachiopods come from the upper part of the Vraconnian (Stoliczkaia dispar Subzone) and without exception are represented by phosphatic internal moulds in a strongly glauconitic sandy matrix.

### The fauna

At La Presta the Aptian fauna contains five species of Terebratulidae, the first four of which are members of the subfamily Sellithyridinae: *Sellithyris sella* (J. DE C. SOWERBY), *S. essertensis* (PICTET), *Loriolithyris russillensis* (DE LORIOLO), *Boubeithyris prestensis* n.sp. and *Cyrtothyris* sp. These are accompanied by numerous rhyntonellids, which await revision.

The Upper Aptian fauna of Noirvaux Dessus contains two terebratulid species: *Cyrtothyris cyrta* (WALKER) and *Cyrtothyris uniplicata* (WALKER), accompanied by *Cyclothyris latissima* (J. DE C. SOWERBY).

The uppermost Albian fauna of La Vraconne contains one terebratulid species, *Musculina vraconnensis* n.sp., accompanied by rare small terebratellids.

### Palaeontology

Phylum **Brachiopoda** DUMERIL 1806

Class **Articulata** HUXLEY 1869

Order **Terebratulida** WAAGEN 1883

Suborder **Terebratulidina** WAAGEN 1883

Superfamily **Terebratulacea** GRAY 1840

Family **Terebratulidae** GRAY 1840

Subfamily **Sellithyridinae** MUIR-WOOD 1965

Genus *Sellithyris* MIDDLEMISS 1959*Sellithyris sella* (J. DE C. SOWERBY 1823)

*Material from La Presta.* – 25 specimens.

For details of this species see MIDDLEMISS 1959, 1968a, 1968b and 1981.

Specimens from La Presta are in the British Museum, Natural History (Walker Coll.), Sedgwick Museum and the collections at Geneva, Lausanne, Neuchâtel (Bourquin and Jaccard Colls.) and Basel (Baumberger Coll.). It is also recorded from the locality by PICTET & DE LORIOU (1872). The Lausanne Collection also includes specimens from the Aptian of Boveresse, 4 km up the Val de Travers from La Presta.

*S. sella* apparently originated during the late Valanginian in the Jura faunal province (in the broad sense of MIDDLEMISS 1979) and was confined to it until the Aptian when it spread northwestwards to northern Spain and southern England and southeastwards to the Bakony Forest.

*Sellithyris essertensis* (PICTET, 1872)

*Material from La Presta.* – 38 specimens.

This species has recently been revised (MIDDLEMISS 1981).

Specimens from La Presta are in the collections at Neuchâtel (Bourquin and Jaccard Colls.) and Basel (Baumberger, Gilliéron and Couvet Colls.). PICTET & DE LORIOU (1872) record this species from the Aptian of both La Presta and Boveresse but only from the “aptien inférieur ou rhodanien”. Most of the available specimens, however, have a sandy glauconitic calcareous matrix suggesting the Upper Aptian.

The specimens from La Presta show particularly clearly the unusually large punctae upon which PICTET & DE LORIOU commented (1872, p.65). Juvenile specimens up to about 16 mm in length often retain the uniplicate form. It is a characteristic species of the urgonian facies in the central and southern Jura and continues as a relict into the Aptian.

Genus *Loriolithyris* MIDDLEMISS 1968*Loriolithyris russillensis* (DE LORIOU, 1866)

*Material from La Presta:* 6 specimens.

For details of this species see MIDDLEMISS 1968a, 1980 and 1981.

Common though this species is in the Barremian, I am not aware that any author before MIDDLEMISS (1981) noted its presence in the Aptian of the Jura region. Specimens from La Presta are in the collections at Lausanne (two specimens, with another from the Aptian of Boveresse), Neuchâtel (BQ4, Bourquin Coll.) and Basel (two specimens numbered 1480 and one numbered L9557). It is thus a rare species at this horizon, at the extreme end of its stratigraphical range, as it is in its other known Aptian occurrences – Vercors (Madame Arnaud’s Collection, Grenoble, and Grenoble general collection), Aude (MIDDLEMISS 1968a), eastern Spain (according to MALLADA 1887) and southwest Morocco (MIDDLEMISS 1980).

Genus *Boubeithyris* COX & MIDDLEMISS 1978

Type species: *Terebratula boubei* D'ARCHIAC 1847

*Boubeithyris prestensis* n. sp.

P. 1, Fig. 1-4; Text Fig. 1-3

- 1854 *Terebratula Dutemplei* D'ORBIGNY, PICTET & ROUX, p. 326, Pl. 51, Fig. 1 (non Fig. 2-4).  
 1858 *Terebratula biplicata* SOWERBY, PICTET & RENEVIER, Pl. 20, Fig. 2.  
 V1872 *Terebratula Dutempleana* D'ORBIGNY, DE LORIOLE in PICTET & DE LORIOLE, p. 82, Pl. 205, Fig. 1-5.

*Holotype*. - The specimen figured by DE LORIOLE in PICTET & DE LORIOLE (1872, Pl. 205, Fig. 1a-c) as *Terebratula Dutempleana*. This specimen is preferred as that author chose it as his "exemplaire type" (1872, p. 84). The specimen is preserved in the Lausanne University Museum, card 22391, labelled "Campiche Coll., Aptien, La Presta".

*Material*. - About 140 specimens.

*Diagnosis*. - *Boubeithyris* attaining moderately large size (up to 35 mm in length). Regularly oval in dorsal profile, with maximum width near the midline; valves regularly and equally convex. Umbo suberect. Foramen permesothyrid, slightly labiate. Beak ridges rounded; symphytium well-exposed, bordered. Lateral commissure regularly arched; anterior commissure sulcinate, lateral plicae close together, with narrow median sinus. Shell little-folded. Hinge plates feebly corniced.

*Description*. - In most respects this is a very homogeneous species. Variation mainly concerns the length/width and length/thickness ratios (Fig. 3a-b). The degree of labiation of the foramen also varies. Juvenile forms are relatively thin (Fig. 3a) and retain a rectimarginate anterior commissure up to a length of about 24 mm, when it passes directly into a gently sulcinate stage. Internally, the degree to which the generic character of corniced hinge plates is developed varies among individuals (compare Fig. 1 and 2).

*Remarks*. - This species was mistakenly identified by DE LORIOLE with *Terebratula Dutempleana* D'ORBIGNY (= *Moutonithyris dutempleana*), which accounts for his puzzling insistence that that typically Albian species occurred in both the Lower and Upper Aptian around Sainte-Croix, as well as in the Aptian of La Presta. PICTET had earlier recorded it under the name of *Terebratula Dutempleana* (PICTET & ROUX, 1854) and under that of *Terebratula biplicata* SOWERBY (PICTET & RENEVIER 1858) from the Upper Aptian of La Perte du Rhône.

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Fig. 1. Serial sections through *Boubeithyris prestensis* n.sp. The pedicle collar is seen at 1.6 and symphytium at 4.4. 4.8 and 5.6 (both enlarged) show the initial concave shape of the hinge plates. Cornicing of the hinge plates is seen at 7.6-8.4, 8.OB being enlarged to show detail of the structure seen in 8.OA. Maximum height of the crural processes is seen at 10.8 and the high-arched transverse band at 14.4-14.8. LA 1, Lausanne Museum Collection, Aptian, La Presta. Dimensions of specimen: L 28, W 20.25, T 16.5.

B = scale for section 4.8; C = scale for sections 5.6 and 8.OB; A = scale for the remaining sections.



*B. prestensis* differs externally from *M. dutempleana* above all in its regular oval dorsal profile and in its typically boubeithyrid closely-spaced lateral plicae and narrow median sinus of the anterior commissure. Other differences are that in *B. prestensis*: the foramen is less labiate, the P/A ratio is lower, the valves are more equally convex. Internally the differences are generic in value and especially concern the hinge plates (concave and corniced in *Boubeithyris*, horizontal cuneate and keeled in *Moutonithyris*) and the transverse band (moderately high-arched in *Boubeithyris*, low-arched in *Moutonithyris*).

From other species of *Boubeithyris* it can be distinguished by minor characters of shape. It is more oval, less pentagonal, in ventral profile and more convex in lateral profile than *B. boubei*; relatively narrower and much thicker than *B. buzzardensis*. It is more elongated, more convex in lateral profile and has a more strongly arched lateral commissure than *B. tibourrensis*. It is much narrower and less tumid and has more closely spaced lateral plicae than *B. pleta*. The cornicing of the hinge plates is less well developed in *B. prestensis* than in any other species of the genus; on the other hand, its foramen is more labiate than in the other species.

*Distribution.* – Aptian only, mainly in the Jura region. The great majority of specimens come from La Presta (collections at Neuchâtel, Basel, Lausanne, Geneva, Université Charles et Marie Curie [Paris], British Museum [Natural History], Sedgwick Museum). The Lausanne collection includes specimens from Fleurier, the Geneva collection specimens from various Jura localities, the Neuchâtel collection one specimen from Boveresse (all Aptian). DE LORIOLE'S (1872) figured specimens are in the Lausanne collection.

PICTET & ROUX'S (1854) Plate 51, Figure 1, from the Upper Aptian "grès inférieur" of Perte du Rhône, certainly represents this species; Figures 2–4 are probably not the same species. PICTET & RENEVIER'S (1858) Plate 20, Figure 2, is also almost certainly *B. prestensis*.

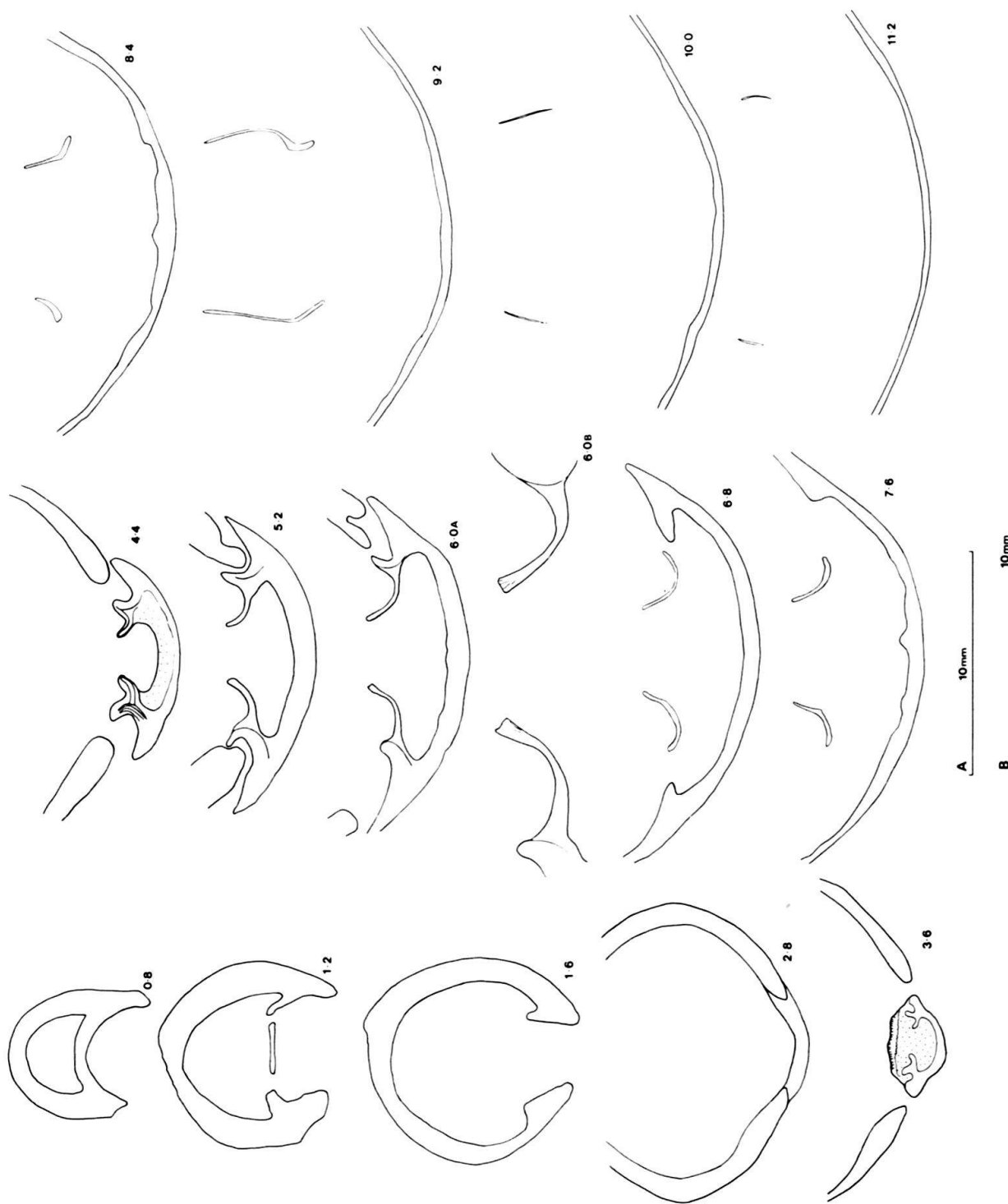
At Grenoble there are several specimens from Clansayés (Drôme), labelled "*T. dutemplei*", and a few specimens in Madame Arnaud's collection from the Aptian of the Vercors which appear to be this species.

The species forms, according to present knowledge, an important link in the geographical distribution of species of *Boubeithyris*, between the Barremian species known in southwest Morocco (MIDDLEMISS 1980), the Albian species known in England (COX & MIDDLEMISS 1978) and the Cenomanian type species in Belgium. Members of the genus thus appear to have spread northeastwards along the narrow belt of the Jura faunal province (MIDDLEMISS 1979, p. 355; 1981, p. 729) and then to have migrated northwestwards into the margins of the boreal province in the Lower Albian.

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Fig. 2. Serial sections through *Boubeithyris prestensis* n.sp. The pedicle collar is seen at 1.2 and symphytium at 2.8. 3.6 shows the initial concave shape of the hinge plates. Stipple in 3.6 and 4.6 represents punctate skeletal tissue. Cornicing of the hinge plates is seen at 6.OA and B (6.OB being enlarged). Maximum height of the crural processes is seen at 9.2. The transverse band was not present. BQ 6, Bourquin Collection (Neuchâtel), Aptian (labelled "Gault"), La Presta. Dimensions of specimen: L 31.25, W 23.5, T 18. B = scale for section 6.OB; A = scale for the remaining sections.







Genus *Musculina* SCHUCHERT & LE VENE, 1929, emend.

*Type species: Terebratula biplicata acuta* VON BUCH, 1834 [= *Musculina sanctaecrucis* (CATZIGRAS, 1948)] (non *Terebratula acuta* SOWERBY, 1816)

*Emended diagnosis.* – Small (not more than 35 mm long but usually much less); elongated, drawn out posteriorly. P/A ratio high (2 or nearly 2). Brachial valve strongly convex posteriorly, flattening or becoming concave anteriorly. Umbo straight to suberect; symphytium well exposed and bordered by ridges. Foramen rather small, mesothyrid to permesothyrid; beak ridges rounded. Anterior commissure sulcinate. Shell folded in accordance with the plication. Plication and folding developed at an early growth stage. Hinge plates strongly concave. Crural bases high but not sharply differentiated from the hinge plates; may be clubbed. Crural processes thickened at their bases and incurved at their tips; crura not flanged. Transverse band moderate to high-arched. This genus has been revised recently (MIDDLEMISS 1976).

*Musculina vraconnensis* n. sp.

Pl. 1, Fig. 5–8; Text Fig. 4, 5

*Holotype.* – Basel Museum Collection 12029/1. Upper part of Vraconnian (Dispar Zone), La Vraconne.

*Dimensions of holotype.* – L 16 mm, W 13 mm, T 9.5 mm.

*Material.* – About 105 specimens.

*Diagnosis.* – *Musculina* relatively short and wide in ventral profile. P/A ratio about 2 in adult stage. Brachial valve in lateral view markedly convex in posterior half and concave in anterior half. Maximum convexity of pedicle valve close to umbo. Lateral commissure strongly arched. Anterior commissure sulcinate with shallow median sinus. Anterior adductor muscle scars in brachial valve and diductor muscle scars in pedicle valve strongly granular on internal mould. Impressions of main pallial sinus trunks prominent in both brachial and pedicle valves on internal mould. Loop short; transverse band moderately arched.

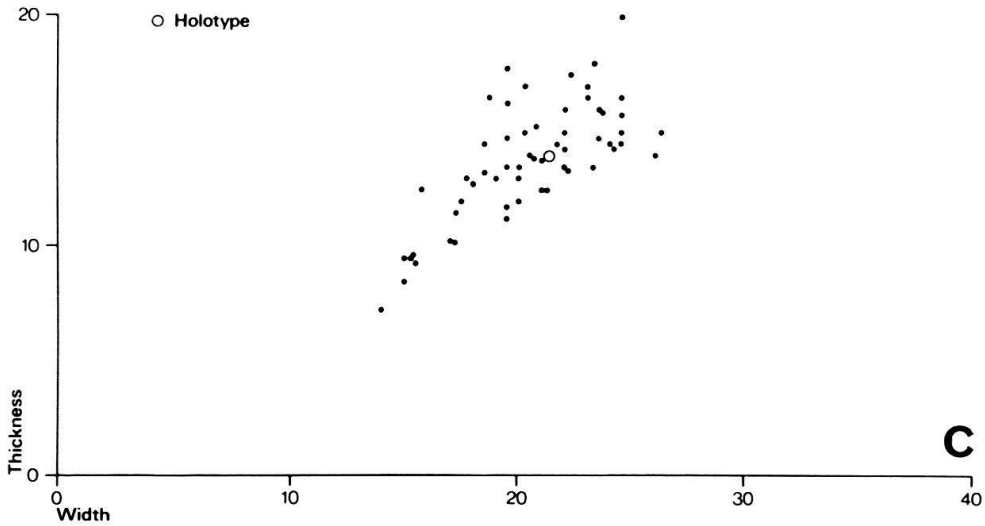
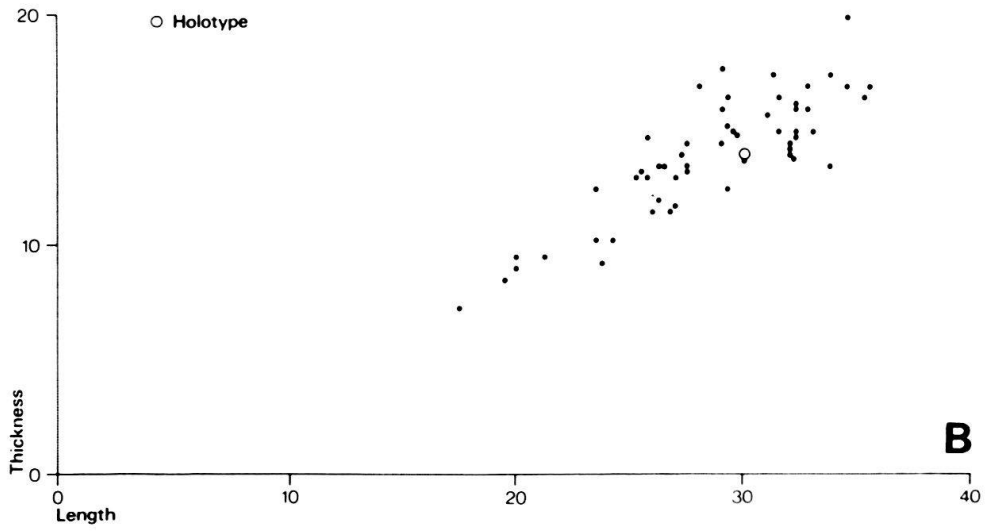
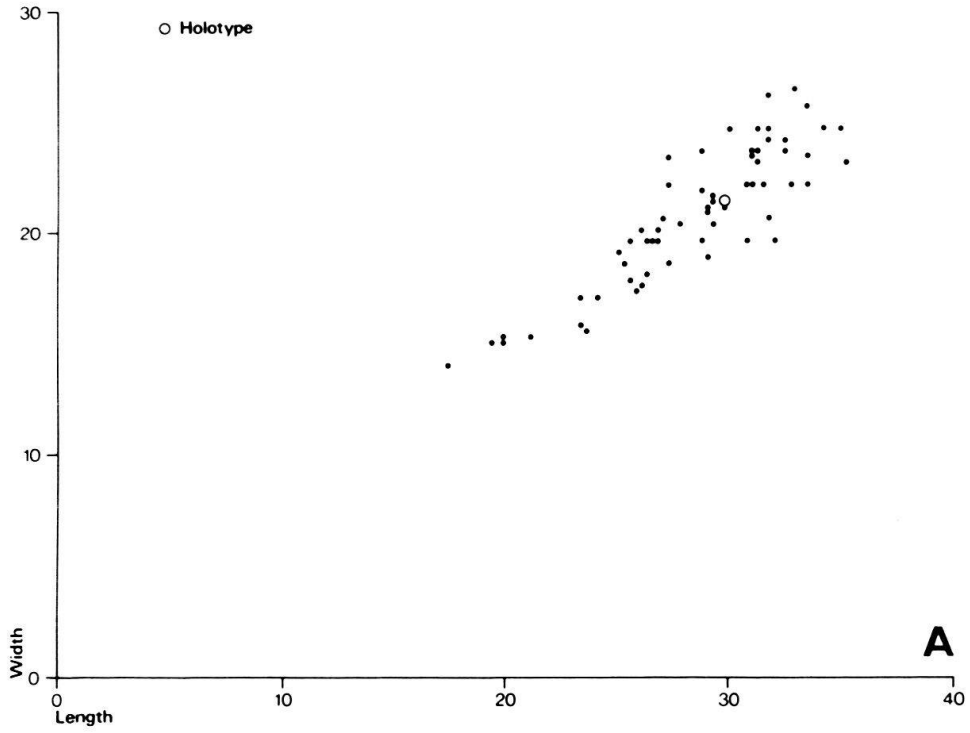
*Description.* – All the available specimens are internal moulds in brown phosphate. There is little variation in shape. Juveniles are thin and rectimarginate. The characteristic dorsal and ventral convexity is acquired by a length of about 9 mm, at which stage the anterior commissure is uniplicate. A sulcinate anterior commissure starts to be developed at a shell length of about 11 mm.

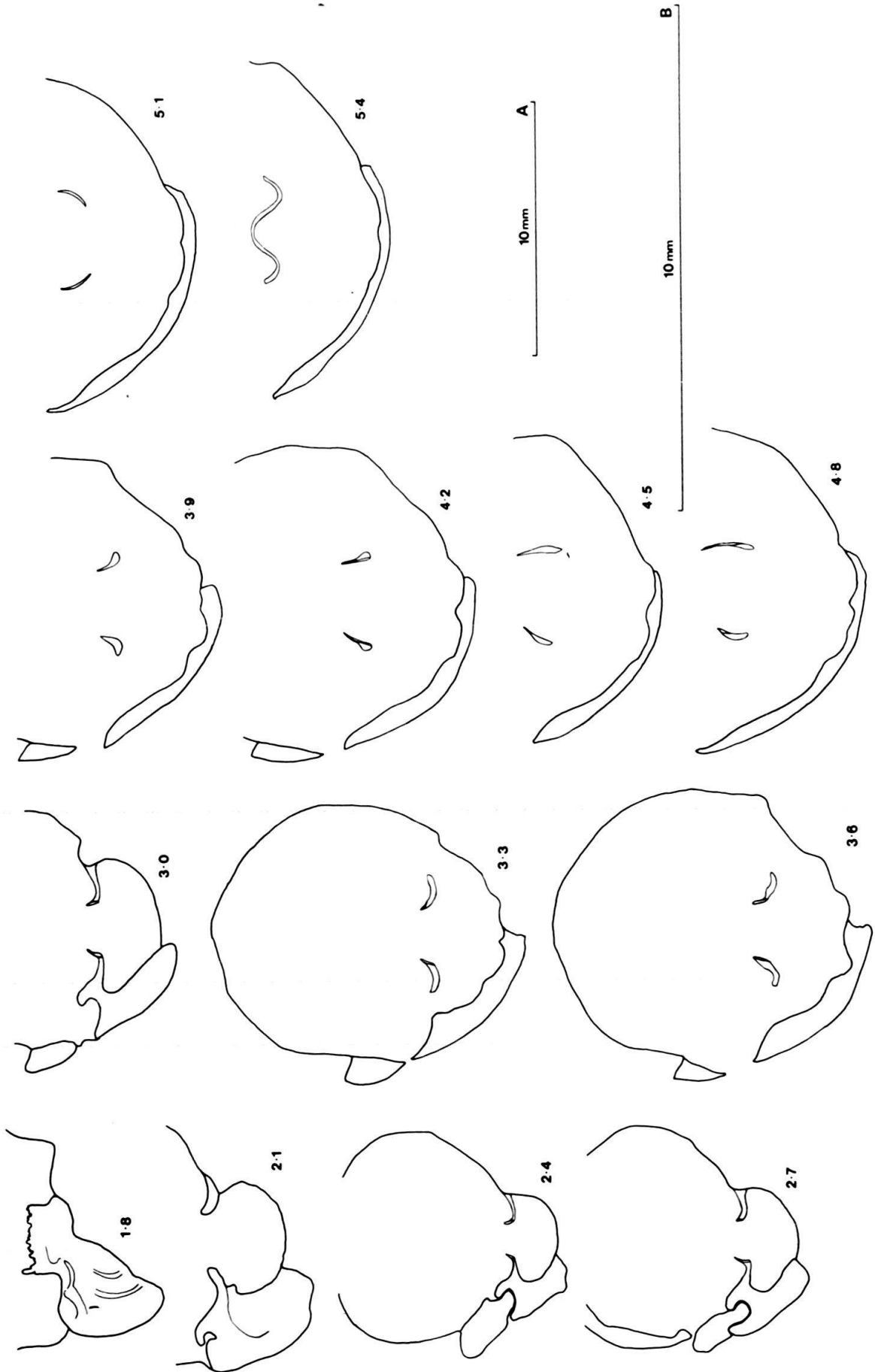
*Remarks.* – This species differs from the only other species so far assigned to the genus, *M. sanctaecrucis*, mainly in having a lower length/width ratio (Fig. 5) and in having a brachial valve relatively more concave in its anterior half as seen in lateral view. Internally the main difference is that the loop of *M. vraconnensis* is shorter, stouter and has a notably lower transverse band.

*Distribution.* – Upper Albian (Vraconnian) of the neighbourhood of La Vraconne.

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Fig. 3. Scatter diagrams of A = length/width, B = length/thickness and C = width/thickness in *B. prestensis* from La Presta.





Subfamily **Rectithryidinae** MUIR-WOOD 1965Genus *Cyrtothyris* MIDDLEMISS 1959

In the collection at Lausanne are twelve specimens from La Presta which are poorly preserved or juvenile members of *Cyrtothyris*, although attribution to a species is uncertain.

Most specimens of this genus from the Jura come from the Upper Aptian of Noirvaux Dessus and are represented in the collections of the British Museum, Natural History, and at Geneva, Lausanne, Neuchâtel and Basel. At Neuchâtel are seven specimens from the same horizon at La Vraconne.

Most of these specimens are referable to *C. cyrta* (WALKER) but some are nearer to *C. uniplicata* (WALKER). Of those figured by PICTET & DE LORIOLE, as *Terebratula depressa* (1872, Pl. 205), Figures 7 and 9 are good examples of *C. cyrta*, while Figure

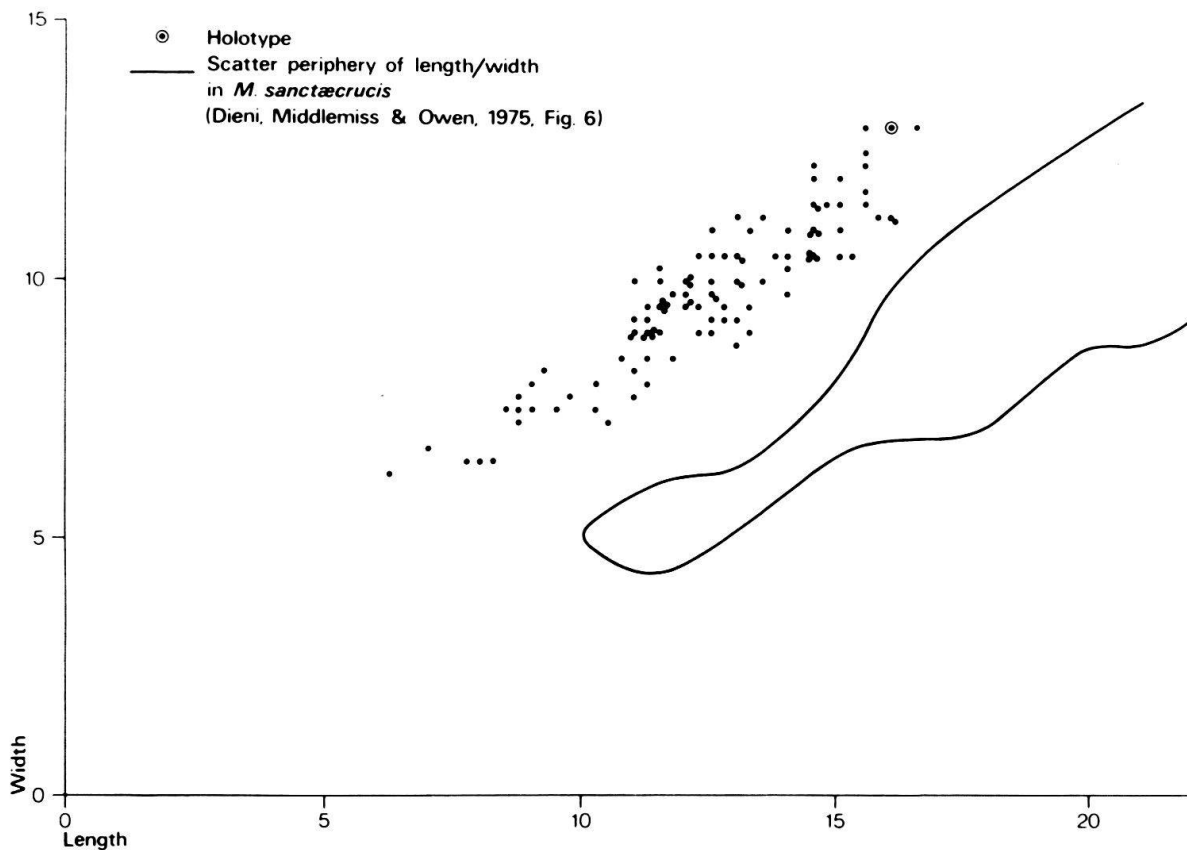


Fig. 5. Scatter diagram of length/width in *M. vraconnensis* from La Vraconne compared with length/width in *M. sanctaerucis*.

Fig. 4. Serial sections through *Musculina vraconnensis* n.sp. The specimen was mainly an internal mould. The initial concave shape of the hinge plate is seen at 1.8 and 2.1 (both enlarged). Crural bases appear at 2.4. Maximum height of the crural processes is shown at 4.8. The short, stout descending lamellae of the loop are seen at 5.1 and the moderately arched transverse band at 5.4. L 3564/1, Campiche Collection (Basel), Albian, Sainte-Croix. Dimensions of specimen: L 14, W 11, T 8.5. B = scale for sections 1.8 and 2.1; A = scale for the remaining sections.

6, especially, and also Figure 8 approach nearer to *C. uniplicata*. All these specimens are at Lausanne (Campiche Coll., cards 22389 and 22390) and come from Noirvaux Dessus. Figure 9, a very transverse form, is comparable to some specimens of *C. cyrta* in the Tealby Limestone (Lower Barremian) of Lincolnshire, England. Other variants among the numerous specimens at Lausanne are relatively elongate (Fig. 6). Some of these examples, especially the PICTET & DE LORIOI figured specimens, show well the "fines stries rayonnantes" mentioned by PICTET, the original of Figure 7 demonstrating particularly clearly that the striae are visible only when the outer shell layer is eroded but the inner shell layer remains.

For further details of these species see MIDDLEMISS (1959, 1976). *Cyrtothyris* is interesting from a biogeographical point of view as a genus which was essentially boreal in the earlier Cretaceous (north Germany and northeast England) but spread southwards and became part of the Jura fauna in the Upper Aptian (MIDDLEMISS 1979).

#### Appendix

The interesting species described below comes from the Vraconnian of the Sainte-Croix area, although it has not been recorded from La Vraconne itself. The

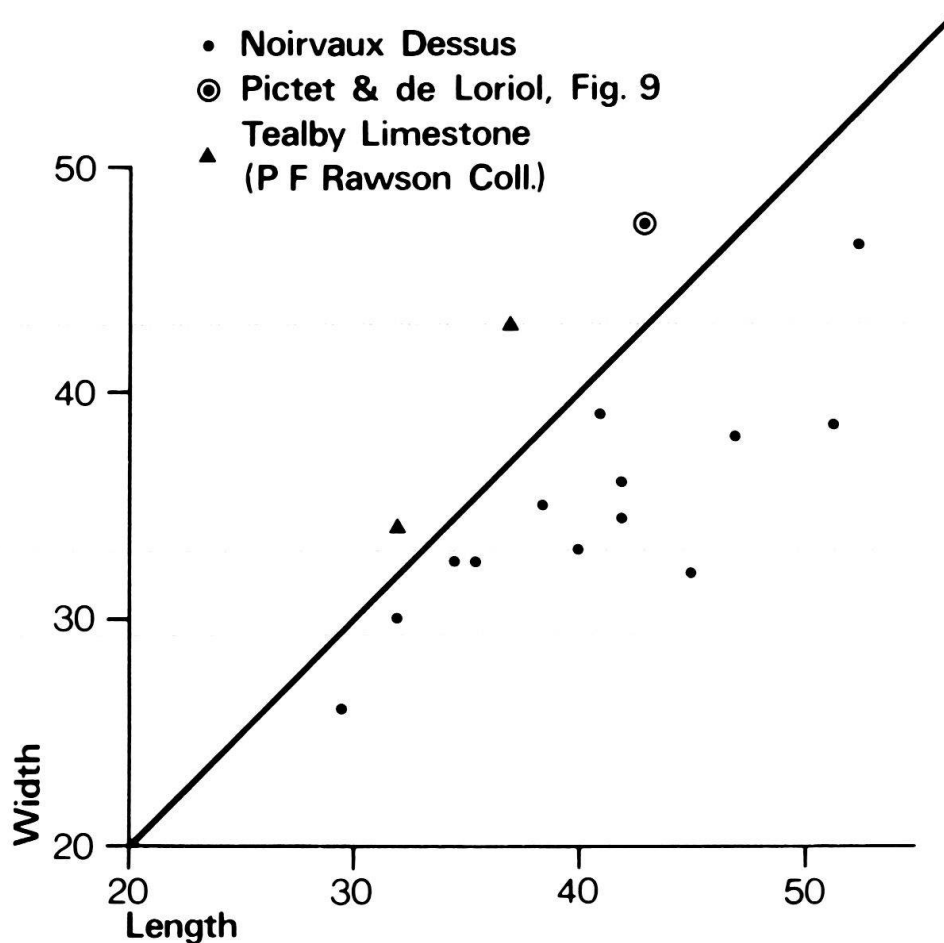


Fig. 6. Scatter diagram of length/width in *C. cyrta* from Noirvaux Dessus and from the Tealby Limestone of England.

species was referred by DE LORIOLO to MANTELL's *Terebratula squamosa* (now *Capillithyris squamosa*) but is here regarded as a dwarf species of *Ornatothyris*.

Subfamily **Rectithyridinae** MUIR-WOOD 1965

Genus *Ornatothyris* SAHNI 1929

*Ornatothyris miniscula* n. sp.

Text Fig. 7

1872 *Terebratula squamosa* MANTELL, DE LORIOLO in PICTET & DE LORIOLO, p. 84, Pl. 205, Fig. 10-14.

1978 *Terebratula squamosa* DE LORIOLO, MIDDLEMISS, p. 43.

*Holotype* - The specimen figured by DE LORIOLO in PICTET & DE LORIOLO (1872, Pl. 205, Fig. 10a-d), from the Vraconnian of Sainte-Croix. The specimen is in the Museum d'Histoire naturelle at Geneva.

*Material*. - 13 specimens from the Vraconnian of Sainte-Croix, Pictet Coll. (Geneva Museum). 13 specimens from the same horizon and locality, Davidson Coll. (British Museum, Natural History, B 6279).

*Diagnosis* - *Ornatothyris* of very small size; elongate-oval to rounded pentagonal in ventral profile. Maximum width well anterior of mid line (P/A ratio about 2). Both valves highly convex, thickness almost equalling width; brachial valve may be slightly flattened anteriorly. Ventral umbo massive, suberect to erect. Foramen circular, marginate. Symphytium broad and short, bordered, almost hidden; beak ridges rounded. Anterior commissure gently sulcate, to rectimarginate, to gently sulcinate. Surfaces of both valves marked by strong, closely-spaced concentric growth ridges. Cardinalia and loop short and thick. Hinge plates horizontal, thick, cuneate, moderately differentiated from inner socket ridges. Crural bases developed at early stage; crural processes close to midline, strongly incurved. Transverse band low-arched, with narrow median arch.

*Description* - This is a dwarf species; the largest specimen among the available material has the dimensions L 9.5, W 7.25, T 6.25 and DE LORIOLO's largest figured specimen has a length of 9.75 mm. Most of the specimens have a sulcate or rectimarginate commissure, only those over about 8 mm in length becoming biplicate. Even the smallest specimens (5 mm) on the other hand show the characteristic tumidity of both valves and the erect umbo. The latter, indeed, is slightly less erect, and the symphytium slightly more exposed, in the largest specimens.

*Remarks* - DE LORIOLO identified this species as *T. squamosa* MANTELL (DE LORIOLO's spelling was *squamosa*), although admitting that the characteristic capillae of MANTELL's species were not visible. DE LORIOLO explained this difference as due to post-mortem erosion of the surfaces of the Sainte-Croix specimens but, in fact, scrutiny of the specimens reveals no sign at all of capillation, which is an essential diagnostic character of MANTELL's species (MIDDLEMISS 1978, p. 39). The concentric ornamentation of DE LORIOLO's species takes the form of raised rounded rugae corresponding to the growth lines, whereas in MANTELL's species it consists of

flat, scale-like steps. DE LORIOI's species also differs from MANTELL's in developing a biplicate anterior commissure in later growth stages, having a higher P/A ratio and a more massive ventral umbo. Internally, the thin tapering hinge plates, lacking crural bases, of the earlier growth stages in *T. squamosa* MANTELL are quite different from the thick cuneate hinge plates, due to the very early development of crural bases, seen in DE LORIOI's species.

DE LORIOI remarked (1872, p. 86) that his *T. squamosa* had some resemblance to a miniature *T. sulcifera* MORRIS (= *Ornatothyris sulcifera*) and this resemblance is in fact very close as regards the general tumid shape, massive umbo, circular marginate foramen and distinct concentric rugae. Comparison of the internal structures of *T. squamosa* DE LORIOI with those of *O. sulcifera* shows that the former has relatively narrower, thicker, more horizontal and more distinctly cuneate hinge plates and that the whole cardinal and brachidial apparatus is relatively short and condensed, as could be expected in a dwarf species. Also the very distinctive little W-shaped transverse band of *T. squamosa* DE LORIOI is a character confined to that species. On the other hand, the early development of crural bases is a character shared with *Ornatothyris* spp. and, in fact, the hinge plates of *T. squamosa* DE LORIOI very closely resemble those of normal-sized species of *Ornatothyris*, such as *O. sulcifera*, at early growth stages. The free crural bases between the hinge plates and the crural processes (Fig. 7, section 2.4) also resemble a condensed form of the corresponding structures in *O. sulcifera* (MUIR-WOOD 1965, Fig. 667, 2f).

The above considerations might suggest the possibility that *T. squamosa* DE LORIOI is merely a juvenile stage of some larger species of *Ornatothyris*. It is here regarded as a separate, dwarf, species for the following reasons. Juvenile stages of the larger species of *Ornatothyris*, although showing the characteristic ornament of rugation, are relatively much thinner than adults, rectimarginate to uniplicate, with suberect ventral umbos. Even the smallest specimens of DE LORIOI's species are relatively obese, sulcate, with massive erect umbones and almost hidden symphytia. Distinct sulcification of the anterior commissure is present in specimens only 8 mm in length, a length at which juveniles of normal-sized *Ornatothyris* spp. are still thin, lenticular and rectimarginate. Internally, the thick stocky hinge plates are the result of secondary thickening and do not indicate juvenility.

*Distribution.* – Vraconnian of the Sainte-Croix area (Vaud).

### Acknowledgments

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Fig. 7. Serial sections through *Ornatothyris miniscula* n.sp. Crural bases are already well developed at 1.6. The free crural bases are seen at 2.4, crural processes at 2.6 and 2.8 and the low-arched W-shaped transverse band at 3.2. BM BB 84430, Davidson Coll., Vraconnian, Sainte-Croix.





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**Plate 1**

- Fig. 1-4      *Boubeithyris prestensis* n.sp. 1a-d = typical adult specimen, Jaccard Collection (Neuchâtel) 606/1, Aptian, La Presta. 2a-d = plaster cast of sectioned specimen (see Text Fig. 2), Bourquin Collection (Neuchâtel) BQ 6, La Presta. 3a-d = plaster cast of sectioned specimen (see Text Fig. 1), Lausanne Museum Collection LA 1, Aptian, La Presta. 4a-d = juvenile rectimarginate specimen, Jaccard Coll. (Neuchâtel) 606/22, Aptian, La Presta.
- Fig. 5-8      *Musculina vraconnensis* n.sp. 5a-d = Holotype, Basel Museum Coll. 12029/1, upper part of Vraconnian (dispar Zone), La Vraconne (natural internal mould). 6a-d = typical adult specimen (natural internal mould), showing muscle scars and ventral pallial sinus impressions well, Basel Museum Collection 12034/1, Vraconnian, La Vraconne. 7a-d = plaster cast of sectioned specimen (see Text Fig. 4), Campiche Coll. (Basel) L 3564/1, Albian, Sainte-Croix. 8a-d = juvenile uniplicate specimen (natural internal mould), Basel Museum Collection 12030/43, Vraconnian, La Vraconne.



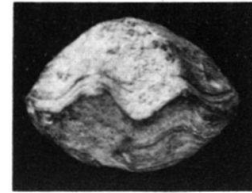
1a



1b



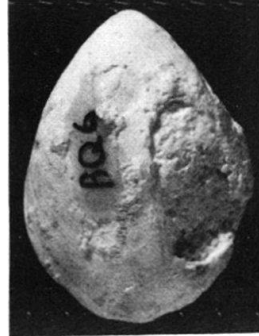
1c



1d



2a



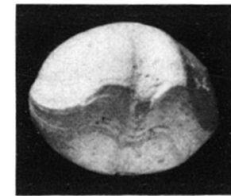
2b



2c



2d



3d



3a



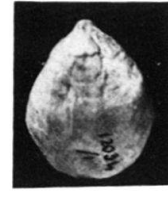
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3c



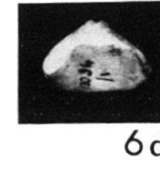
6a



6b



6c



6d



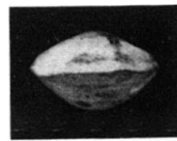
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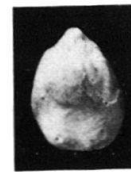
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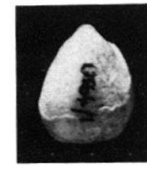
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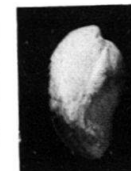
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7a



7b



7c



7d



5a



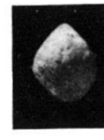
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5c



5d



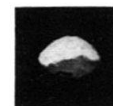
8a



8b



8c



8d

