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NOTE ON SOME LATE MAASTRICHTIAN RHYNCHOLITES FROM LIMBURG, THE NETHERLANDS[1]

L. A. VAN DER TUUK

ABSTRACT

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Upper Maastrichtian rhyncholites (cephalopod mandibles) from the province of Limburg, The Netherlands, were described by Binckhorst as early as 1861. Recently discovered material makes a revision possible. A survey is given of the available material, which was identified as *Rhyncolites minimus* Binckhorst, from the Late Cretaceous deposits of various localities of the Maastrichtian type area.

INTRODUCTION

Rhyncholites are jaw parts of nautiloids and ammonoids which consist of curved chitinous plates with large attachment areas for strong buccal muscles. The upper and lower jaws perform scissor-like movements. For this purpose the anterior part of the upper jaw is furnished with a calcareous arrow-shaped extremity: the rhyncholite, and the lower jaw is provided with an internal denticulated calcareous element: the conchorhynch.

Usually, only the most important biting part of the mandibles, the rhyncholite, is found fossilized. It consists of a hard, smooth calcareous outer layer, enclosing a spongelike structure (SAUNDERS ET AL., 1978).

In 1861, VAN BINCKHORST VAN DEN BINCKHORST listed *Rhyncholithus debeyi* Müller, 1851, from the Maastrichtian deposits in the Dutch province of Limburg. He discovered two worn specimens in the St. Pietersberg in the vicinity of Maastricht, possibly from the Nekum Chalk, and six specimens at the base of the Meerssen Chalk in exposures between Valkenburg and Sibbe. He also described a few smaller specimens from the base of the Maastricht Formation in the Lanaye area, which he named *Rhyncholithus minimus* Binckhorst, 1861. Except for their size, these rhyncholites do not differ from the former species. *Rhyncholithus buchi* Müller, 1851, also listed bij Binckhorst, is not a rhyncholite but a barnacle plate.

HOLZAPFEL (1888) presented a description of three species of rhyncholites from the Vaals and Gulpen Formation from the Dutch-German border area near Vaals (Limburg): *Rhyncholites vaalsensis* Holzapfel, 1888, *Rhyncholites debeyi* Müller, 1851 and *Rhyncholites aquisgranensis* Müller, 1851.

Recently collected material made it possible to identify the species, to which most of the Limburg specimens of rhyncholites belong.

The genus *Rhyncolites* was established by BIGUET in 1819. Before that date rhyncholites were referred to as bird's beaks. Names like Histerolites and Glossopetrae were also used. GAILLARDOT (1824) mentioned the difference between conchorhynchs and rhyncholites, which D'ORBIGNY (1825) described as 'espèces sans capuchon' and 'espèces à capuchon', respectively. The latter were considered by D'ORBIGNY to be mandibles of nautiloids.

The rhyncholites are subdivided into a number of form genera of which the genus *Rhyncolites* probably belongs to

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[2] Flamingostraat 20, 3582 SX UTRECHT, The Netherlands.

the Nautilida. It will be necessary for the time being to treat these isolated mandibles as parataxons. HAGENOW (1842) and MÜLLER (1851) described the first rhyncholites from the Cretaceous period (TEICHERT ET AL., 1964).

Rhyncholites are scarce fossils. Most have been found in Europe and Northern Africa, in sediments from Triassic to Miocene age (TEICHERT & SPINOSA, 1971). The calcareous parts of the jaws of the recent pearly nautilus easily become detached postmortally from their horny substrate. This was probably also the case in fossil nautiloids and ammonoids, for finds of rhyncholites inside fossil shells are extremely rare. The geographic distribution of rhyncholites should approximately match the original living area of their bearers, because horizontal transport of rhyncholites is rather short. Because of their rigid construction rhyncholites are not likely to be as easily destroyed by sedimentation and subsequent diagenesis as the external shells of their bearers. That is why their numbers give a more direct impression of the size and density of cephalopod populations than the number of preserved shells.

SYSTEMATIC PART

GASIOROWSKY (1973) incorporated the upper jaw of the present-day *Nautilus* in the genus *Rhyncolites* Biguet, 1819. The genera *Nautilus* and *Rhyncolites* would therefore be synonymous if it were not likely that the bearers of the parataxial genus *Rhyncolites* belong to a higher taxon of nautilaceans than just the genus *Nautilus*.

TEICHERT ET AL. (1964) concluded that the spelling of the genus of Biguet should be *Rhyncolite*. This was corrected by WARD & COOPER (1972) in *Rhyncolites*, which was accepted by TEICHERT & STANLEY (1975) and is commonly accepted nowadays.

Class: Cephalopoda Cuvier, 1798
Order: Nautilida Agassiz. 1847
Superfamily: Nautilaceae de Blainville, 1825
Family: uncertain
Genus: *Rhyncolites* Biguet, 1819
Species: *Rhyncolites minimus* Binckhorst, 1861

1861 *Rhyncholithus debeyi* Binckhorst, p. 17, non Müller, 1851
1969 *Rhyncolite donetzensis* Shimanskiy, p. 143, Fig. 1a, b, c
1971 *Rhyncolite americanus* Teichert & Spinosa, p. 5, pl. 1, Fig. 1-8, pl. 2, Fig. 1-6

MATERIAL EXAMINED

The material examined was obtained from the following collections (with abbreviations as cited in Table I):
GRB – G. Renkens, Brunssum, The Netherlands;
JZB – J. J. P. Zijlstra, Brunssum, The Netherlands;
RGM – National Museum of Geology and Mineralogy, Leiden, The Netherlands;
TMH – Teylers Museum, Haarlem, The Netherlands;
ABK – A. Beerends, Kerkrade, The Netherlands;
MLE – M. van Loo, Eindhoven, The Netherlands;
LBU – L. Blezer, Ubachsberg, The Netherlands;
HHD – H. J. Horstmann, Düsseldorf, Germany;
LTU – L. A. van der Tuuk, Utrecht, The Netherlands.

Table I
Material examined.

collection	locality	stratigraphical position (Felder, 1975)
GRB, no. Mk275	quarry Blom	IVf-4
GRB, no. Mk562	quarry Nekami	IVd-1
GRB, no. Mk562	quarry Nekami	IVd-1
JZB, no. 1143	quarry Nekami	IVd-1
RGM, no, 76456	Limburg	IVe/f
RGM, no. 14701	Geulhem	IVf
JZB, no. 1144	quarry Nekami	IVb
JZB, no 1145	quarry Nekami	IVb
JZB, no. 695	quarry Blom	IVf-4
TMH, no. 11157	Maastricht	IVe/f
TMH, no 11157	Maastricht	IVe/f
ABK, no. 51-79	Benzenrade	Kunrade Chalk
MLE	quarry Blom	IVf-3
LBU, no. 1	quarry Blom	IVf-4
LBU, no. 2	quarry Blom	IVf-4
LBU, no. 3	quarry Blom	IVf-4
LBU, no. 4	quarry Blom	IVf-4
LBU, no. 5	quarry Blom	IVf-4
LBU, no. 6	quarry Blom	IVf-4
HHD, no. 1	quarry Blom	IVf-4
LTU, no. 165	quarry Nekami	IVd-1
LTU, no. 166	quarry Nekami	IVd-1
LTU, no. 167	quarry Nekami	IVd-1
LTU, no. 168	quarry Nekami	IVd-1
LTU, no. 182	quarry Nekami	IVd-1
LTU, no. 198	quarry Nekami	IVd-1
LTU, no. 199	quarry Nekami	IVd-1

The material available has been collected from the Maastricht Formation (late Maastrichtian) from beds that can be correlated with the *Belemnitella junior* Partial-range-zone (VAN DER TUUK & BOR, 1980). The specimens from the Maastricht Chalk occur at all levels of this formation, from IVa up to and including IVf (lithostratigraphical division: FELDER, 1975); the bed in which the specimen from the Kunrade Limestone was found can be correlated with the lower part of the Maastricht Formation (FELDER, 1977). All accurately sampled specimens were found in layers of fossil grit at the base of a sedimentary cyclothem, except for one specimen, which was found in a soft layer of chalk without fossil grit.

All specimens were found in the western part of southern Limburg, except for one specimen from the Kunrade Chalk, which was found in the eastern part of Limburg. The geographical distribution of the rhyncholites here described is

generally spoken determined by the occurrence of the Maastricht Formation (Fig. 1).

DESCRIPTION

This species of rhyncholite is arrow-shaped and it may reach a relatively large size. The broad rhomb-shaped hood has a median keel and is pointed anteriorly as well as posteriorly. The ventral longitudinal outline is convex. The angle α^3, made by the medial keel and the ventral plane, ranges between 40° and 60°. The angle β^3, formed by the anterior hood margins, ranges between 70° and 100°. The angle γ^3, formed by the posterior hood margins, ranges between 95° and 180°. The surface of the hood is convex. The posterior hood margins extrude slightly over the shaft. The width of the hood is greater than its length. The shaft is approximately of the same length as the hood and is transversely rounded on the dorsal side. The dorsal shaft edges, however, form a triangle. The sides of the shaft are parallel. The width of the shaft is slightly greater than half of its length. The ventral surface is slightly concave. The concave area is symmetrically divided by a rounded longitudinal ridge which widens posteriorly and disappears in a depressed region. The ventral margins are sharp. Parallel growth marks appear on the ventral side of both the hood and the shaft.

COMPARISONS WITH RELATED RHYNCHOLITES

Rhyncholithus bohemicus Till, 1906 from the Cenomanian of northern Germany is distinguished from the described specimens by its, in lateral view, delta-shaped hood; moreover the long sides of *R. bohemicus* are straight, which is in contrast to the Limburg specimens.

Rhyncholithes simplex Fritsch from the Cenomanian of northern Germany seems to differ from *Rhyncolites minimus* by its relatively low hood.

Rhyncholithes rectus Till, 1907 is more slender than the described specimens and the sculpture of the ventral surface is more complex.

DISCUSSION

The following cephalopods occurring in the Maastricht Formation may be considered as the possible bearers of *Rhyncolites minimus*. The known nautiloids from the Maastricht and Kunrade Chalks are *Eutrephoceras depressus* (Binckhorst, 1861), *Eutrephoceras heberti* (Binckhorst, 1861) and *Pseudocenoceras lehardyi* (Binckhorst, 1861). Associated belemnite species are *Belemnitella junior* Nowak, 1913 and *Belemnella*

[3]For rhyncholite terminology and dimensions: see Teichert & Spinosa (1971, Fig. 1).

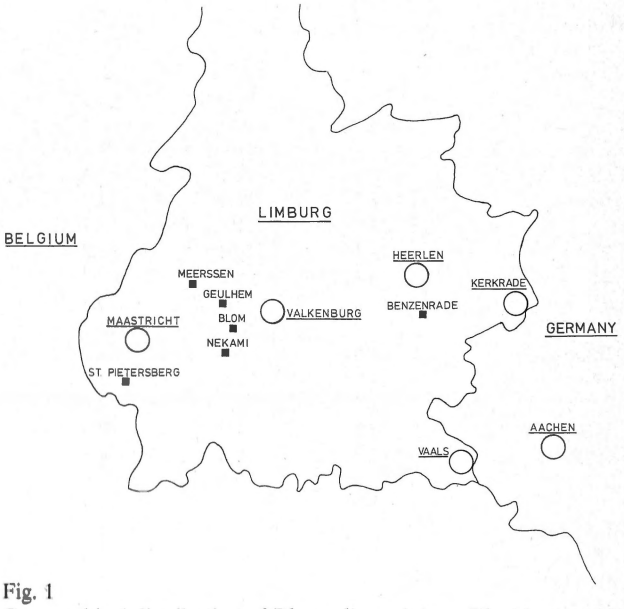


Fig. 1
Geographical distribution of *Rhyncolites minimus* Binckhorst, 1861.

casimirovensis (Skolozdrówna, 1932). One coleoid without external shell was found: *Acanthoteuthis maestrichtensis* Binckhorst, 1861. The known ammonites from the Maastricht Formation are *Neophylloceras velledaeforme* (Schlüter, 1876), *Gaudryceras kayei* (Forbes, 1845), *'Hamites rotundus* Sowerby, 1814', *Baculites vertebralis* Lamarck, 1801, *B. anceps* Lamarck, 1822, *B. carinatus* Binckhorst, 1861, *Nostoceras* sp. undet., *Diplomoceras cylindraceum* (Defrance, 1822), *Hoploscaphites constrictus* (Sowerby, 1817), *H. pungens* (Binckhorst, 1861), *Pachydiscus colligatus* (Binckhorst, 1861), *P. neubergicus* (Hauer, 1858) and *Sphenodiscus binckhorsti* Böhm, 1898. All ammonites mentioned have been associated with aptychi except for *Neophylloceras velledaeforme* (Schlüter, 1876) and *Gaudryceras kayei* (Forbes, 1845) (ARKELL, 1957).

TANABE ET AL. (1980) described rhyncholites discovered *in situ* in ammonites of the genera *Tetragonites, Gaudryceras* and *Neophylloceras* of late Cretaceous rocks in Japan and the U.S.S.R. In contrast with the Limburg rhyncholites, the upper jaws of ammonite mandibles do not show a differentiation in hood and shaft, moreover they are more slender. That is why ammonites are here left out of consideration as the bearers of the described rhyncholites.

According to recent views the above described group of rhyncholites are considered to be derived from representatives of the superfamily Nautilaceae, mainly due to the strong resemblance of certain rhyncholites to the calcareous parts of the upper jaw of the recent *Nautilus*. The following nautilaceans known from the Maastricht and Kunrade Chalks may therefore be considered as the possible bearers of *Rhyncolites minimus: Eutrephoceras depressus* (Binckhorst, 1861), *Eutrephoceras heberti* (Binckhorst, 1861) and *Pseudocenoceras lehardyi* (Binckhorst, 1861).

Small specimens of rhyncholites from Limburg were de-

Table II
Dimensions[3]

	length (mm)	height (mm)	width (mm)	α (degrees)	β (degrees)	γ (degrees)	state of preservation
TMH 11157	26.6	12.1	16.4	45	70	140	good
GRB Mk275	24.0	12.0	14.7	50	70	115	good
MLE	22.7	11.5	13.7	50	80	125	good
TMH 11157	21.1	10.3	13.2	45	70	140	good
LBU 3	17.4	8.2	7.3	–	–	–	worn
LBU 4	17.0	6.2	6.6	–	–	–	worn
RGM 76456	17	10	10	55	75	95	worn
ABK 51-79	15.3	6.4	7.2	–	–	–	worn
LBU 5	14.9	7.2	9.0	–	–	–	worn
LBU 1	14.5	6.7	9.0	–	–	–	worn
HHD	14.0	7.7	7.4	40	70	100	worn
JZB 695	12.7	6.4	8.4	45	80	130	worn
LBU 2	12.4	6.2	5.6	–	–	–	worn
LBU 6	11.0	5.2	3.2	–	–	–	worn
RGM 14701	6	2.5	4.	40	80	–	worn
JZB 1145	5.7	2.3	3.6	50	95	150	good
JZB 1143	5.1	2.3	4.0	60	90	150	good
LTU 198	5.0	2.1	3.4	–	–	–	good
LTU 165	5.0	2.2	3.4	–	–	–	good
LTU 168	4.1	2.0	2.9	–	–	–	good
LTU 199	4.1	1.9	3.3	–	–	–	good
GRB Mk562	3.4	1.6	2.3	55	100	160	crumbled
JZB 1144	3.4	1.4	2.2	55	90	180	good
LTU 182	3.3	1.6	2.4	–	–	–	good
LTU 166	3.0	1.4	2.3	–	–	–	good
LTU 167	2.9	1.4	2.7	–	–	–	good
GRB Mk562	2.6	1.0	1.7	45	95	180	crumbled

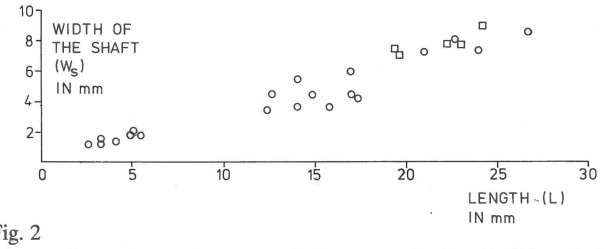


Fig. 2
Scatter diagram showing the ratio between the length (L) and the width of the shaft (W_s) of *Rhyncolites minimus* Binckhorst, 1861. ○=Limburg specimens, □=Mississippi specimens, ⊿=Donetz Basin specimen.

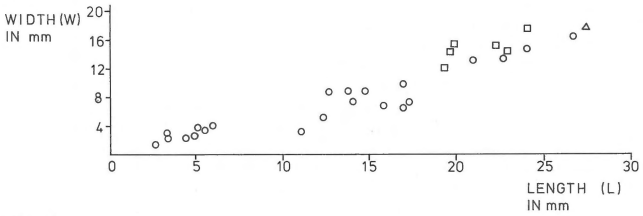


Fig. 4
Scatter diagram showing the ratio between the length (L) and the width (W) of *Rhyncolites minimus* Binckhorst, 1861.

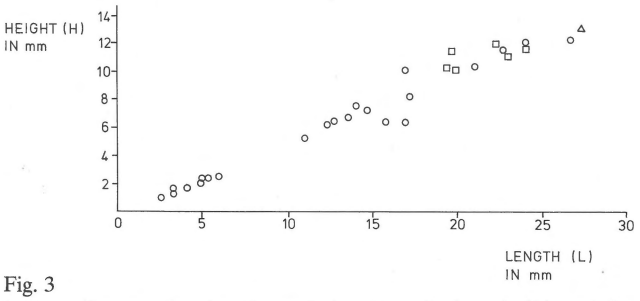


Fig. 3
Scatter diagram showing the ratio between the length (L) and the height (H) of *Rhyncolites minimus* Binckhorst, 1861.

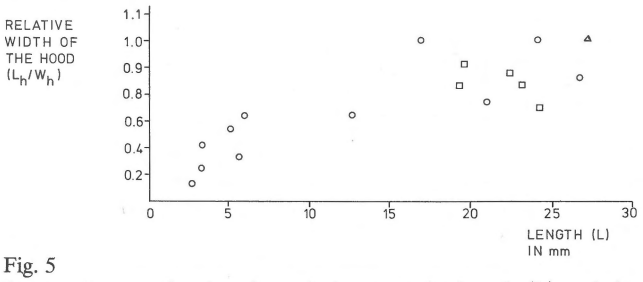
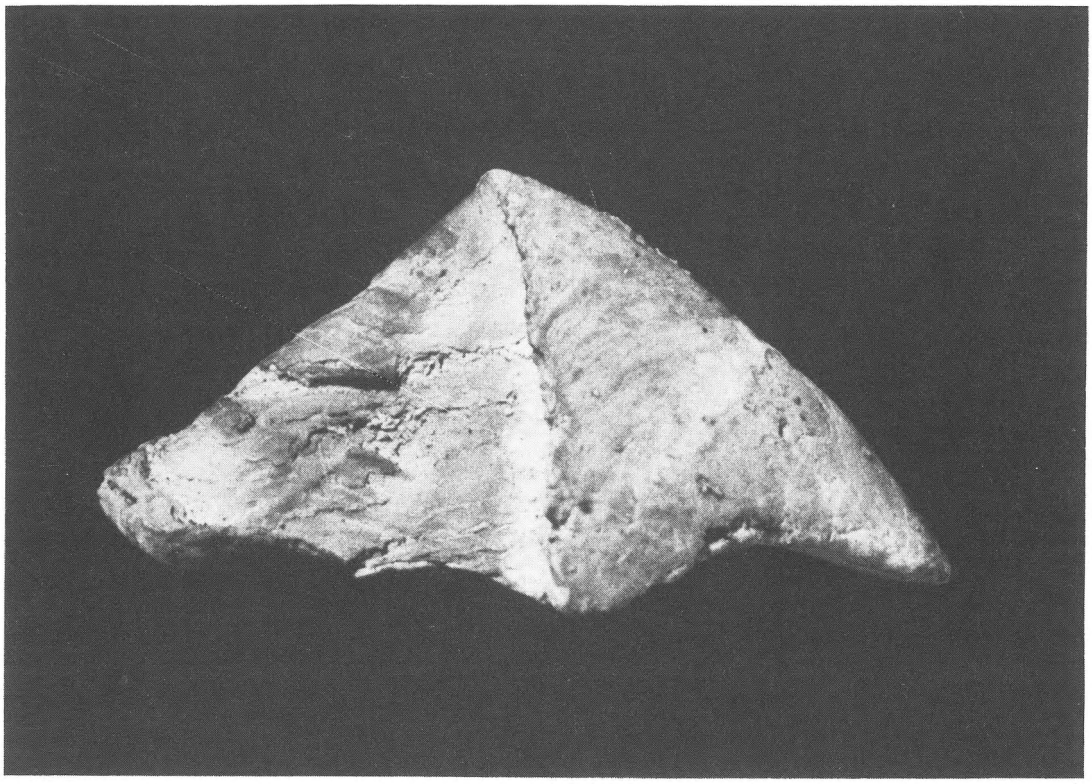
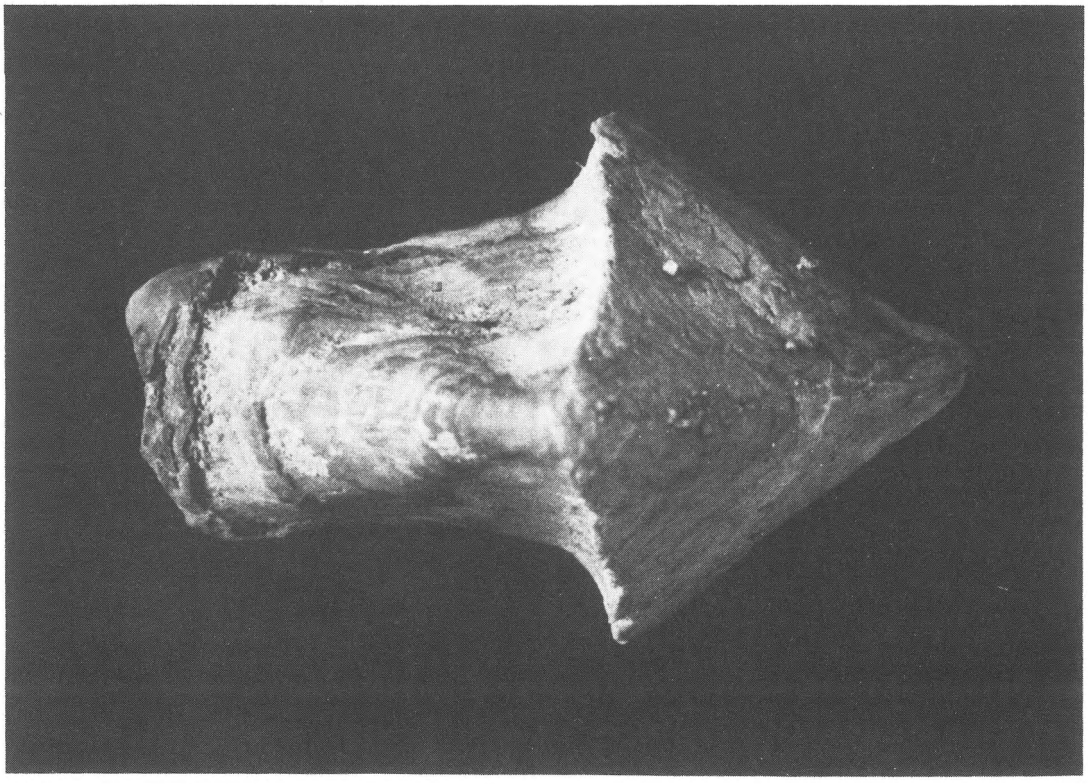


Fig. 5
Scatter diagram showing the ratio between the length (L) and the relative width of the hood (L_h/W_h) of *Rhyncolites minimus* Binckhorst, 1861.

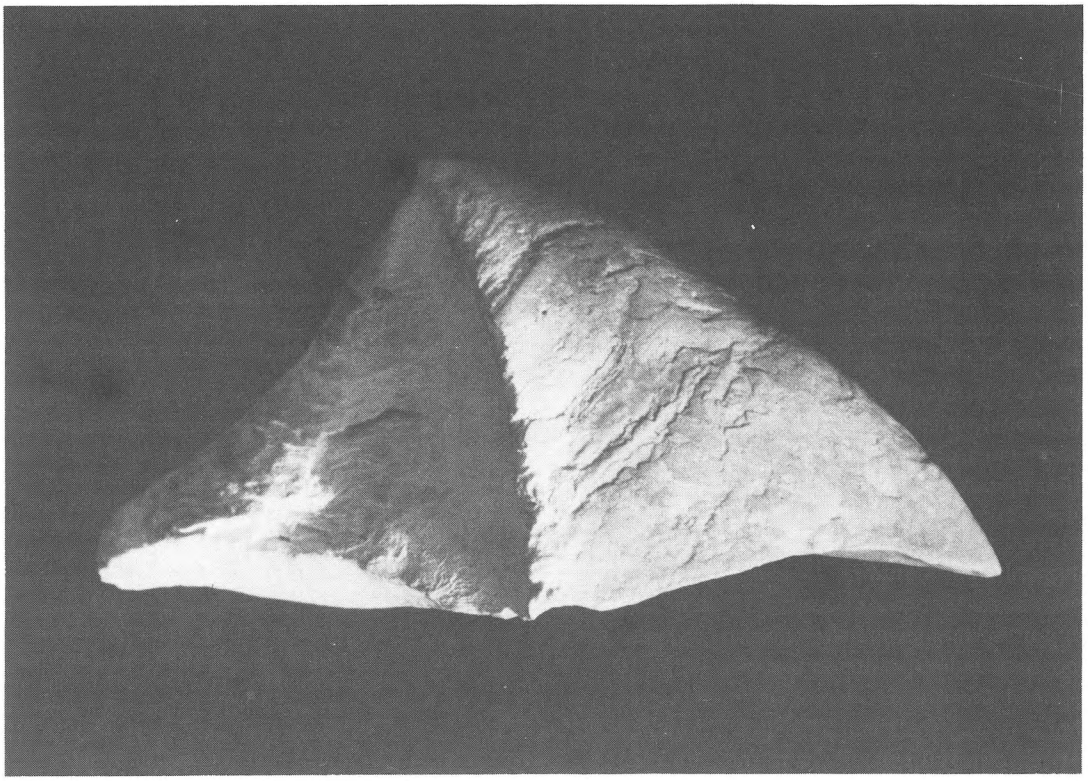


a



b

Fig. 6
Rhyncolites minimus Binckhorst, 1861; Upper Maastrichtian of Maastricht, Limburg. Collection Teylers Museum, Haarlem, no. 11157. a: lateral view; b: dorsal view.



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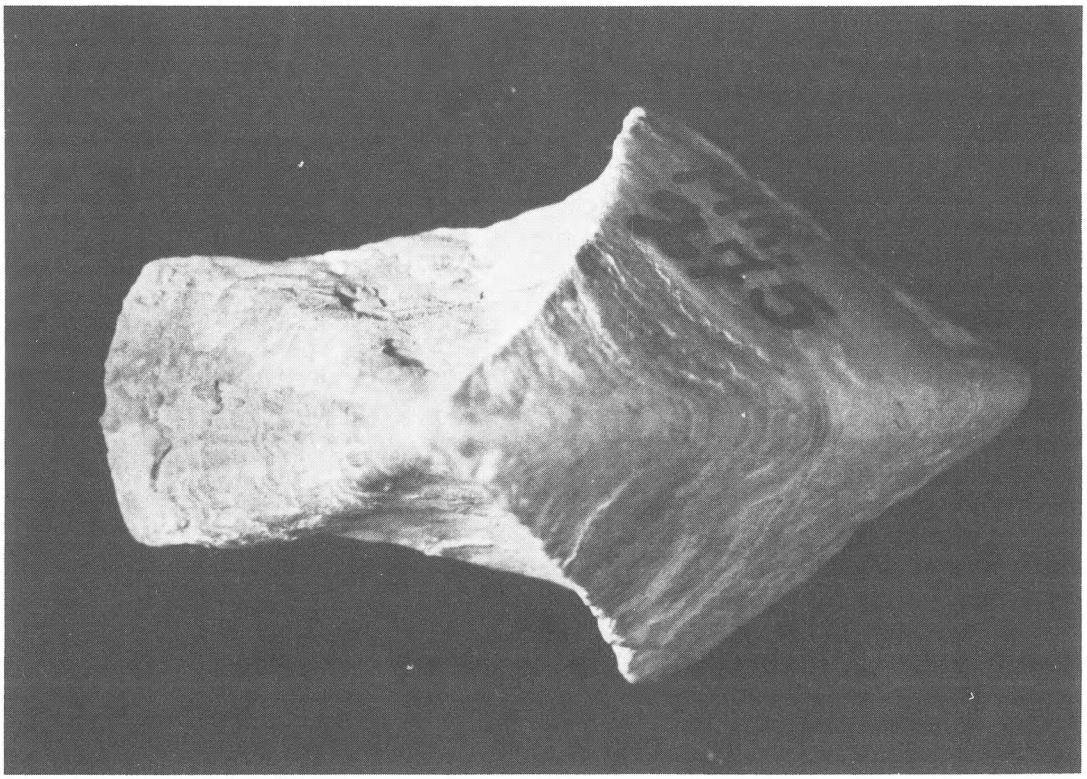
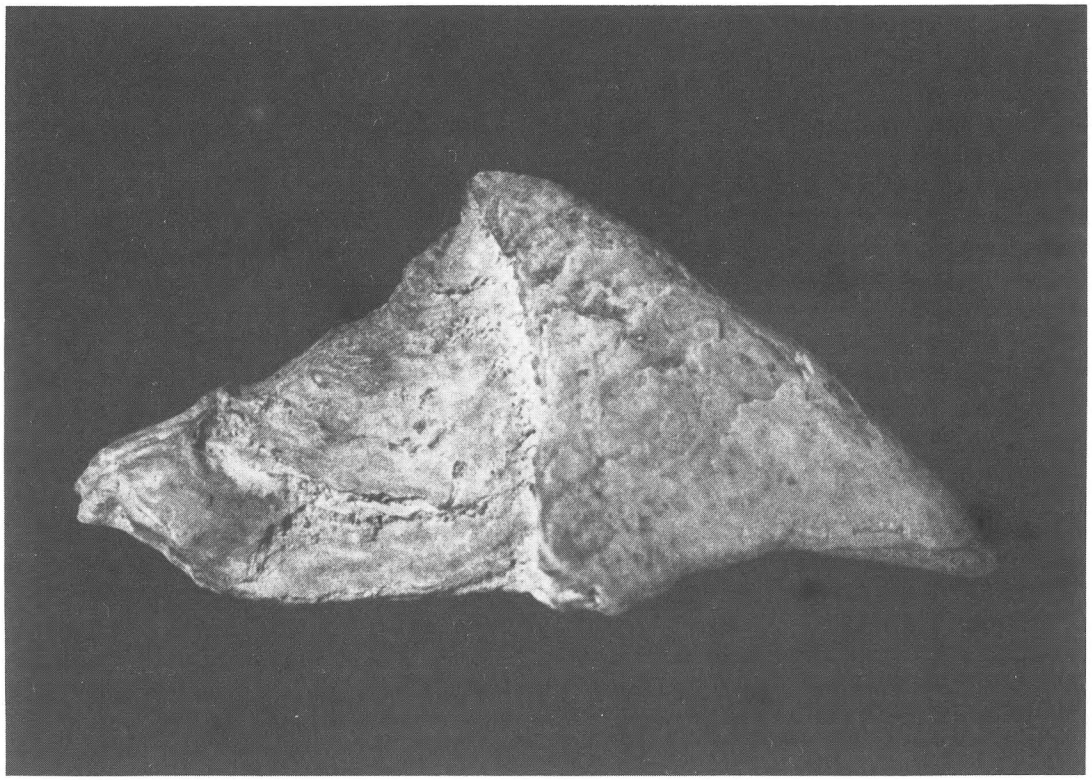


Fig. 7
Rhyncolites minimus Binckhorst, 1861; Upper Maastrichtian of quarry Blom, Berg en Terblijt, Limburg. Collection G. Renkens, Brunssum, no. Mk 275. a: lateral view; b: dorsal view.



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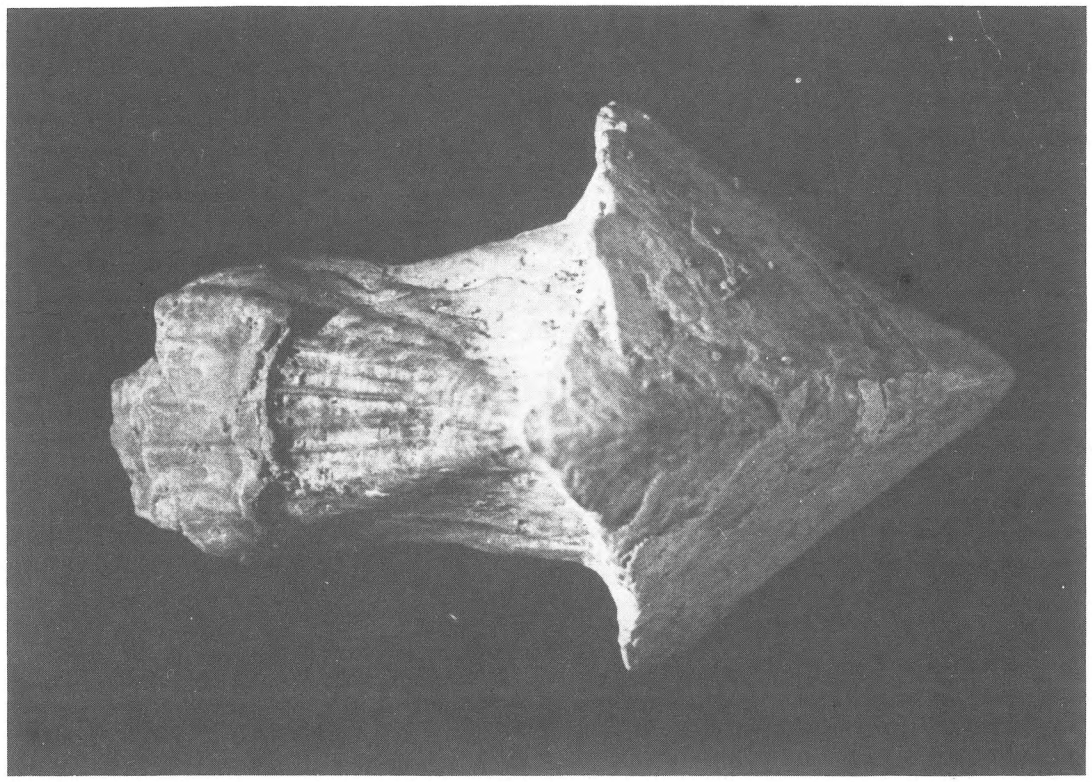

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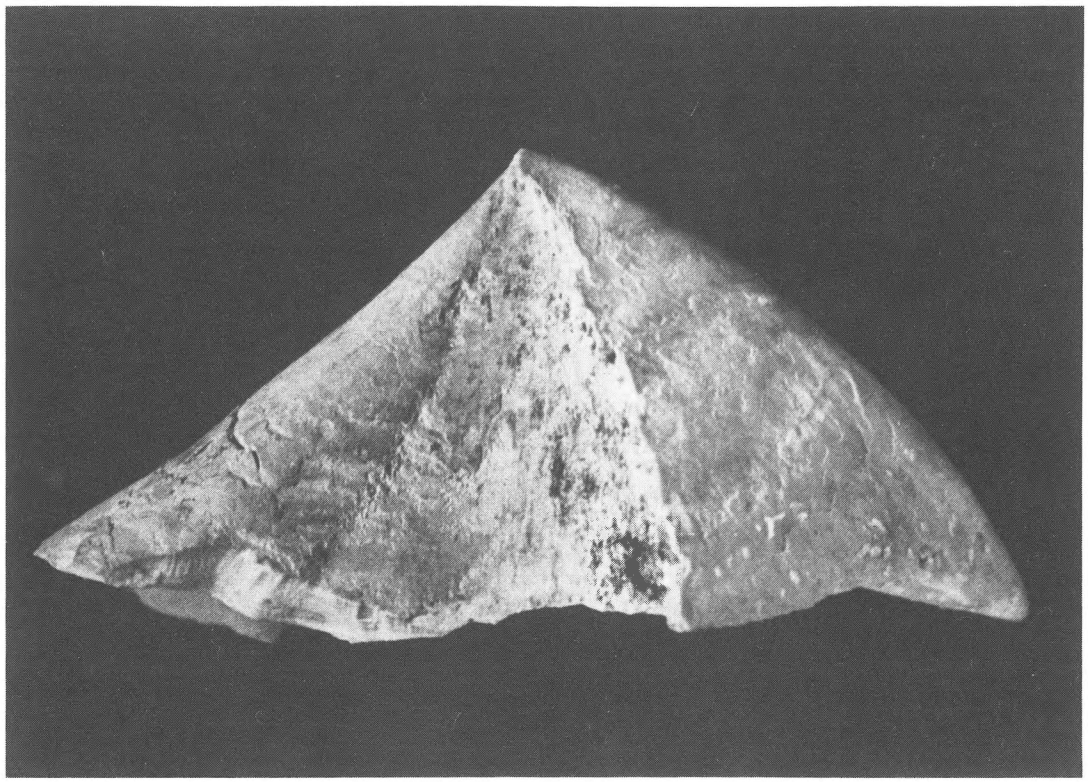
Fig. 8
Rhyncolites minimus Binckhorst, 1861; Upper Maastrichtian of Maastricht, Limburg. Collection Teylers Museum, Haarlem, no. 11157.
a: lateral view; b: dorsal view.

a



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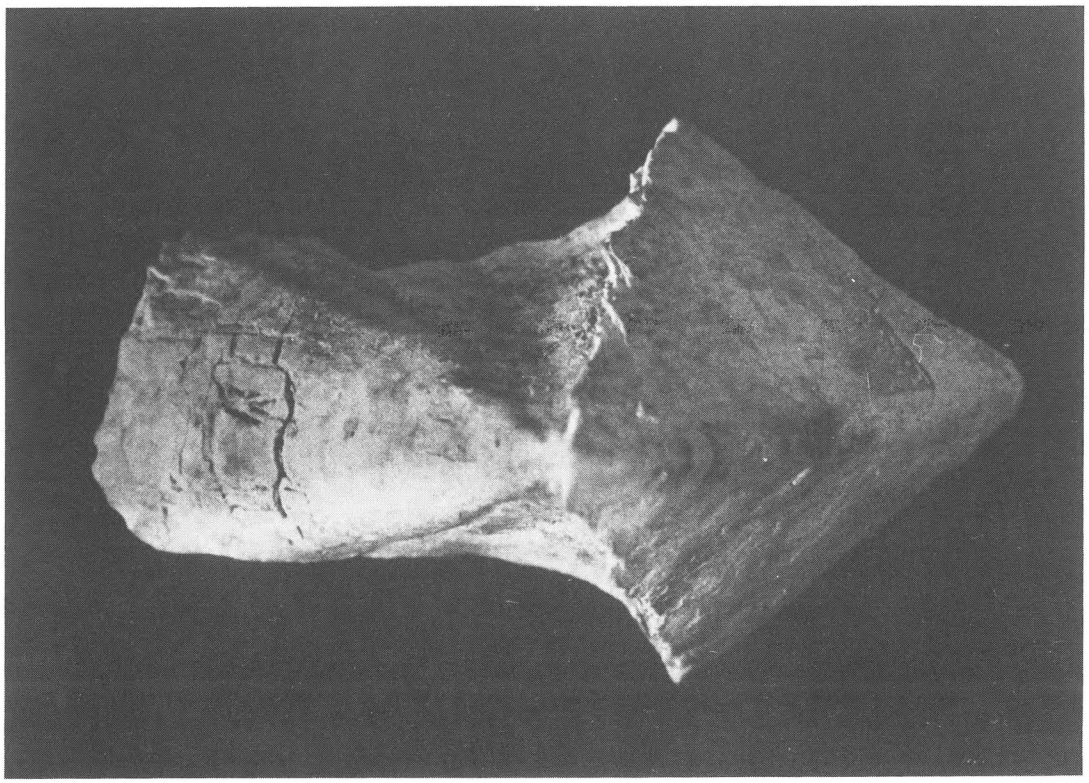

Fig. 9
Rhyncolites minimus Binckhorst, 1861; Upper Maastrichtian of quarry Blom, Berg en Terblijt. Collection M. van Loo, Eindhoven. a: lateral view; b: dorsal view.

scribed by VAN BINCKHORST VAN DEN BINCKHORST (1861) as *Rhyncholithus minimus* and large specimens were described as *Rhyncholithus debeyi* Müller, 1851. However, the latter species, which was obtained by Müller from the Vaals Formation (Campanian) near Aachen (Germany), has a relatively longer shaft than the Limburg specimens. Unfortunately, Müller did not give any measurements of his poorly described specimens.

Rhyncholithus minimus Binckhorst, 1861, of which the holotype is reposited at the Humboldt University (Berlin, German Democratic Republic), probably represents a juvenile stage, because intermediate sizes were also found. The only difference mentioned by TEICHERT & SPINOSA (1971) between *Rhyncolite americanus* Teichert & Spinosa, 1971, from the Maastrichtian of Mississippi and *Rhyncolite donetzensis* Shimanskiy, 1969, from the Maastrichtian of the Donetz Basin (U.S.S.R.) is the width of the shaft of *R. americanus*, which is greater than that of *R. donetzensis*. This difference is not significant, because it falls well within the variation range of the shaft-proportions as shown by the Limburg specimens (Fig. 2). The only difference between the holotype of *Rhyncolite donetzensis* and both the Mississippi and Limburg specimens is the slightly greater size of the Russian holotype. This, however, does not justify a distinction on specific level.

R. americanus and *R. donetzensis* are therefore considered to be junior synonyms of *Rhyncolites minimus*. TEICHERT & SPINOSA (1971) percipiently noted that measurements and proportions of the holotype of *R. donetzensis* 'could well fall within the range of variation present in *R. americanus*'. This prediction is borne out by the measurements plotted in the figures 2-5.

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