BAJOCIAN AMMONITES FROM THE MSATA HILL (LUGOBA-FORMATION) IN THE HINTERLAND OF DAR ES SALAAM, TANZANIA

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ABSTRACT

Ammonites from the Middle Jurassic exposures of the Lugoba Formation at Msata, are described for the first time in Tanzania. Out of a number of ammonite fragments recovered from the bluish-green silty limestone (M3), only three fragments were fairly well preserved to permit their specific identification. Two species were identified: Dorsetensia cf. D. romani *(OPPEL) and*_Oecotraustes (Paroecotraustes?) *cf.* angustus DOUVILL*E. This ammonite assemblage is biostratigraphically correlatable with the Lower Bajocian Posidonia shale of the Kambe Limestone series in Kenya, in which similar ammonites species and other related Bajocian species have been described. Pending new discovery of ammonoid fauna and other guide fossils, on the basis of this ammonite evidence, the Lugoba Formation is reasonably assigned to the Humphrieasianum – Zone of the Lower Bajocian*

INTRODUCTION

The coastal basin of Tanzania became fully a continental marine shelf during the Middle Jurassic widespread marine transgression, which marked the development of coralliferous limestones in the hinterland of Dar es Salaam. Historical review of this geological development of the Middle Jurassic coralliferous limestone outcrops in the hinterland of Dar es Salaam from the Wami River, extending southwards through Msata to Lugoba (Fig. 1) was first given, among others, by Kent *et al.* (1971). The limestones form small isolated hills stretching in a NE-SW direction parallel to the Tanga Fault pattern. The sediments dip gently to the east at shallow angles of between 10 and 20 degrees. The stratigraphic term "Lugoba – Limestone Series" has been extensively used to describe them. However, since the term "Lugoba-Limestone" does not conform to the modern stratigraphic nomenclature and practice as spelt in the International Stratigraphic Guide (Hedberg 1976), the term has been renamed as the Lugoba-Formation (Kapilima 1984). At Msata, the basal transgressive sediments of the Lugoba-Formation unconformably overlie the basement complexes of the Usagaran Belt, overstepping the NE-SW Tanga Fault Pattern to the west. A breciated zone stretching parallel to the Tanga Fault is here evident in the underlying basement complex in which sedimentary lithoclasts including limestones, siltstones and mudstones are commonly mixed with Precambrian lithoclasts principally gneiss. Based on lithological similarities, the Lugoba-Formation was correlated with the Kambe Limestone series across the Kenya boarder (Kapilima 1984). On ammonite evidence, the Kambe-Limestone Series had been dated as Bajocian (Westermann1979). Although various geological and palaeontological investigations had been extensively carried out in these areas, the present study is the knowledge of the author the first to document discovery of ammonites at the Msata.

The present study therefore attempts to give a detailed systematic palaeontological description of ammonites collected from Msata and to interpret their

biostratigraphical implications in relation to the age of the coralliferous limestone of the Lugoba-Formation.

METHODS

During Geology fieldwork in 2001, ammonite fossil fragments were observed and collected from for the first time from Msata hill which is located about 35 km. N. of the Chalinze junction, along Chalinze Tanga highway (Fig. 1). Following this observation, a detailed geological profile was taken at the hill (Figs. 1 and 2). The profile documentation included lithological, palaeontological and structural analysis. All ammonite specimens were encountered and systematically collected from a single bed of hard bluish-green, fossiliferous silty limestone (Fig.2). The bed lies between the basal, detrital conglomeratic sandstone and overlying cryptocrystalline limestone. Associated with ammonite assemblage, were poorly preserved pelecypods, gastropods *(Nerinea)* and echinodermata. About 10 ammonoid fossil fragments were collected for laboratory studies. Most of them were incomplete, representing either part of phragmocone or body chamber. Out of this collection only three specimens were relatively well preserved to permit their specific identification, which was accomplished through comparative studies with already established literature in the world including that of the Indo-Madagascar Province.

The specimens are kept at the Department of Geology, University of Dar es Salaam as reference material. The catalogue number (M) refers to the fossil locality-Msata.

RESULTS

Lithostratigraphy

The profile at Msata begins from the northwestern end in a quarry with gneiss of the Precambrian age. The gneiss is breciated, in which sedimentary lithoclasts from the overlying sediments form about 2% of total components. The basal, transgressive conglomeratic sandstones, in which lithoclasts form about 20% of the total allochems (Fig.2, sample M/1) unconformably overlie the gneiss. The lithoclasts include large pebbles of gneiss (>7cm in diameter), siltstones, mudstones and coal fragments. Also present are bioclasts including corals, echinodermata and molluscans. Total thickness of this unit (M/1) is about 10 m. The transgressive horizon is overlain by about 10m thick sequences of pebbly coralliferous limestones intertongued with fossiliferous sandstones and conglomerates (M/2). Fossil fragments include corals, hydrozoans, gastropods, bivalves, brachiopods and echinodermata. This is in turn overlain by ca. 15 m thick hard, bluish grey silty limestones to detrital limestones (M/3) rich in fossils including the described ammonites, gastropods (*Nerinea*), brachiopods, echinodermata, hydrozoans and pelecypods. The topmost part of the profile is terminated by karstified cryptocrystalline limestone with occasional coral bioherms.

Ammonite systematic descriptions

The ammonite species from the Msata hill were identified through comparative studies with previously published Middle Jurassic literature in the Indo-Madagascar province in particular neighbouring country Kenya (Westermann 1979). Taxonomic classification at the suborder, superfamily, family and generic levels mainly follows the work of Arkell *et al.* (1957) supplemented by Donovan *et al.* (1981) as indicated below.

Order: Ammonoidea ZITTEL 1884
Suborder: Ammonitina HYATT 1889
Superfamily: Hildocerataceae HYATT 1867
Family: Sonninniidae BUCKMAN 1892
Genus: *Dorsentensia* BUCKMAN1892
Dorsetensia cf .*D. romani* OPPEL 1975 (see Pl. 1 Figs 1-2 this paper) (see Westerman 1975 Pl. 2 Fig. 1 p. 42-43)

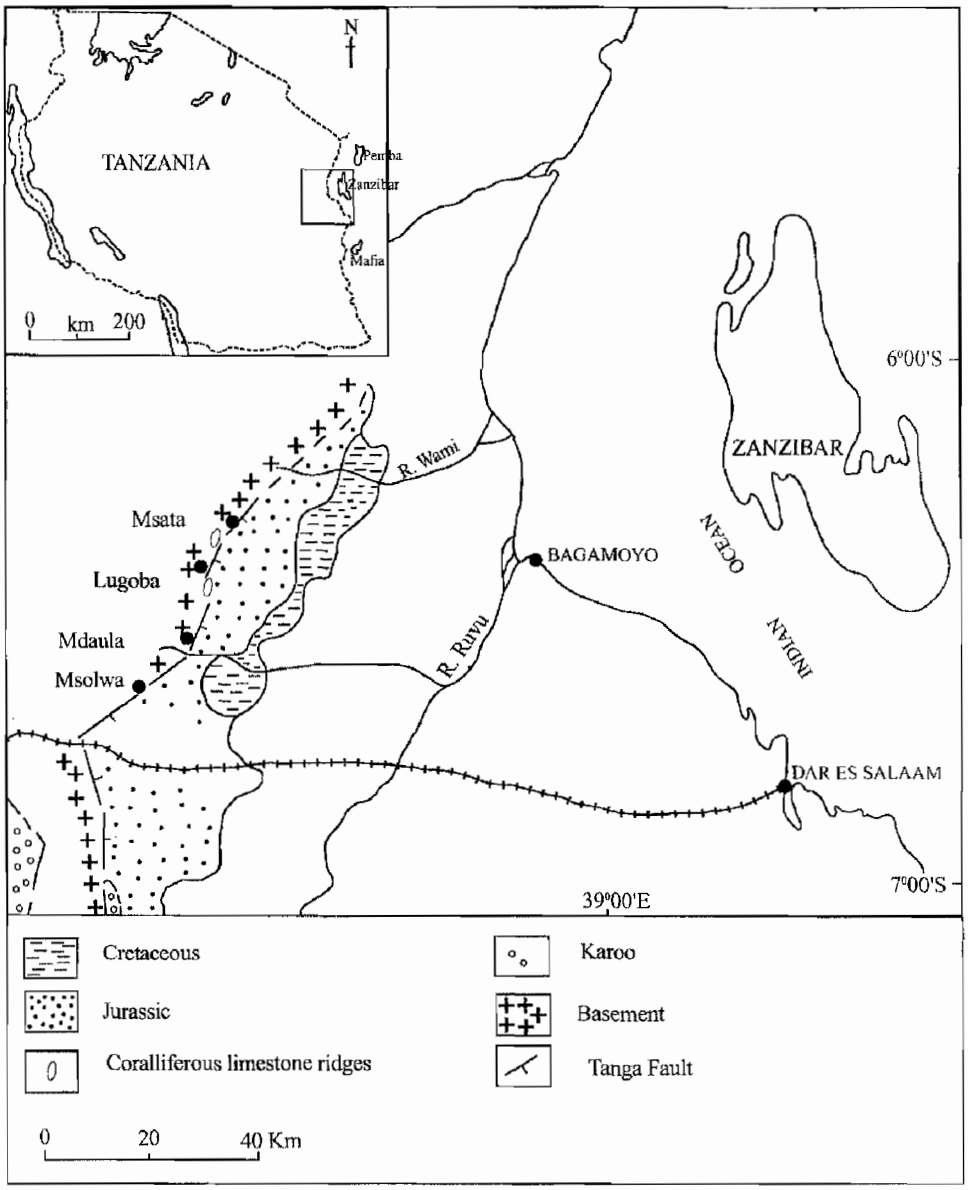

Figure 1: Geological and geographical situation of the study area

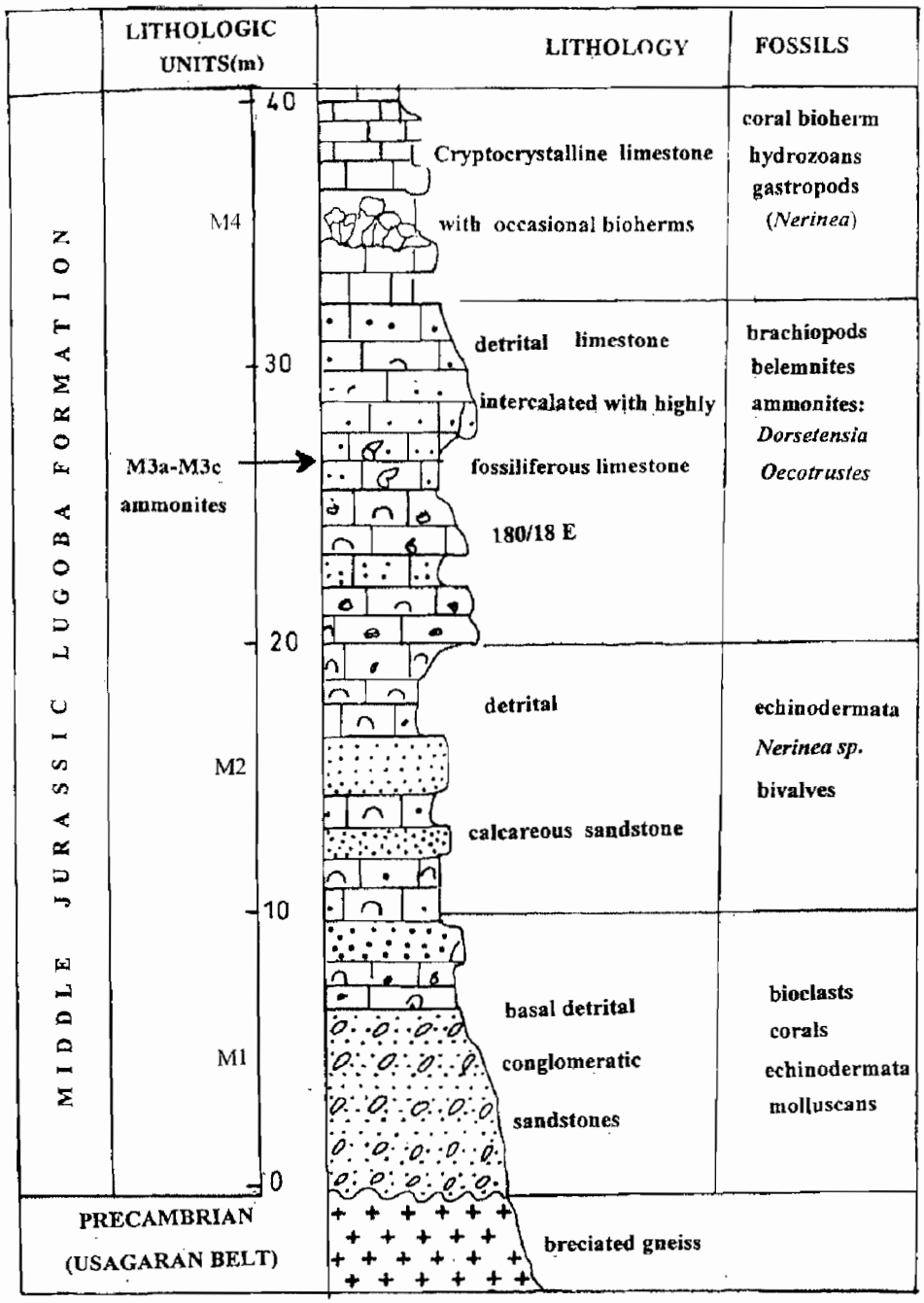

Figure 2: Stratigraphical column of the Msata section, Tanzania

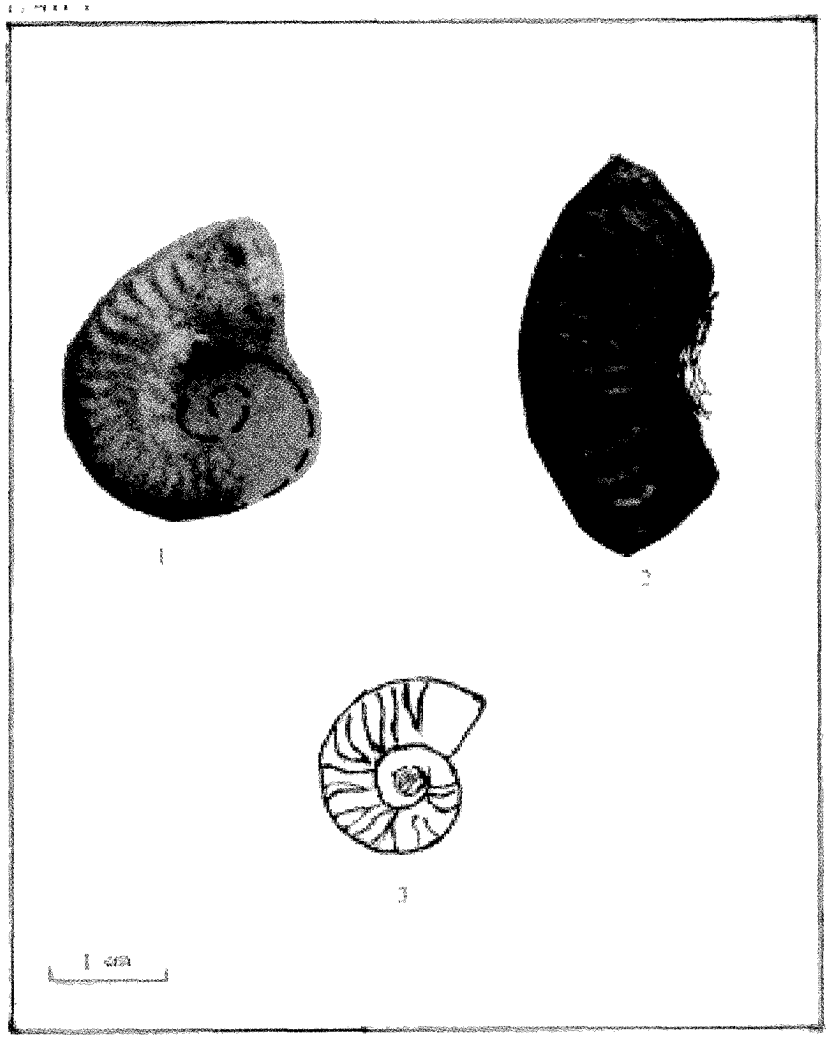

Plate 1 Ammonites from the Lugoba Formation, Tanzania of the Bajocian age

Out of several ammonite specimen fragments probably belonging to this genus, only two specimens M3a and M3b are well preserved to permit their specific identification. The specimens are incomplete and represented by one septate fragment with a portion of a whorl – only internal mould.

The specimen (M3a) is of a small size. From the reconstructed phragmocone, it measures 22 mm in diameter. It is discoidal and slightly evolute, with flattened flanks. The whorl is strongly compressed with slightly prosiradiate, bifurcate ribs dying out towards the simple, narrow keel. The bifurcation point lies on the umbilical margin.

The specimen shows many similarities in terms of ribbing and whorl section with *Dorsetensia* cf. *D. romani* described by

Westermann (1975) from the Bajocian Kambe Limestone series of Kenya. However, the inner flanks could not be compared to the Westermann's figure, as they were not preserved.

Stratigraphic occurrence: Lower Bajocian *Sauzei-Humphriesianum* Biozone.

Superfamily: Haploceratacеae ZITTEL 1884
Family: Oppeliidae DOUVILLE 1890
Genus: *Oecotraustes*

Oecotraustes (*Paroecotraustes*) cf. *angustus* DOUVILLE 1975 (see this paper Pl. 1, Fig. 3) (see Westermann 1975, Pl. 2 p. 40-42).

One phragmocone (specimen M3c) with diameter of about 16mm was encountered in the Msata profile, locality M3. The phragmocone is slightly evolute with compressed ovate whorl section. The ribs are bipartite whose bifurcation point lies on the umbilical margin. The specimen closely resembles the Kenyan form (*O.* cf. *angustus*) described by Westermann (1975) from the Kambe Limestone Series of the Bajocian age. The comparison is largely based on the minute nucleus of my specimen and that of Westermann (pl. 2, fig. 3). Stratigraphic Occurrence is most likely Aalenian-Bajocian.

DISCUSSION

The pre-Callovian beds of Tanzania including the coralliferous limestone outcrops of the Lugoba Formation and Tanga are generally void of ammonites. Arkell's (1956) dating of the Tanga and Lugoba limestones on the basis of occurrence of small bivalves and brachiopods as Upper Bathonian was highly questionable. However, Arkell (1956) identified ammonite genus *Planammatoceras* sp. and grammoceratids from 90m carbonaceous shales with abundant *Posidonia ornate* penetrated in borehole west of Dar es Salaam at the vicinity of Kidugalo. The occurrence of *Planammatoceras* suggested the presence of Aalenian. The occurrence of ammonites west of Dar es Salaam around Kidugalo was later confirmed by Kapilima (1984). Ammonite species *Planammatoceras* (*Euaptoceras*) cf. *klimakomphalum* (VACEK) of Upper Aalenian age (*Concavum*-zone) had been encountered and described from the marl sequence overlying the Kidugalo Oolite (Kidugalo Formation). Apart from this, most of ammonoid fauna were largely encountered in septarian marls of Callovian to Tithonian age (Zeiss 1979, Kapilima 1984, Groeschke & Kapilima 1995). The recent excursion to the Msata hill and finding of the ammonite fragments, enabled the author, for apparently the first time, to reasonably date the Lugoba Formation as Bajocian.

The *Dorsetensia* and *Oecotraustes* specimens described from Msata closely resemble ammonite collections of Bajocian age from Kenya (Westermann 1975). Westermann has described *Dorsetensia* cf. D. *romani* (OPPEL) from the *Humphrieasianum* Zone in the Lower Posidonia shale of Kambe Limestone series in Kenya. From the Upper Posidonia shale, Westermann (1975) described *Oecotraustes* cf. *angustus*, *Spiroceras* cf. *bifurcates* and *Torrensia* sp. of Upper Bajocian age. Both *Spiroceras* and *Torrensia* genera are missing at Msata. However the incomplete specimen of *Oecotraustes* (M3c) has been encountered at the Msata profile and is comparable with Westermann's figure. The ammonite assemblage of the Bajocian age from Saudi-Arabia (Arkell 1952) shows many similarities with those from Kenya and Madagascar (genera: *Dorsetensia*, *Stephanoceras*). According to the stratigraphic range of the above mentioned stratigraphically important ammonite species and genera of the Bajocian age in Kenya, Saudi Arabia and other parts in the Indo-Madagascar province, the age of the Lugoba Formation may be reasonably assigned to Bajocian. Pending further investigations and new discoveries of ammonites and other guide fossils, the coralliferous limestone and

other sediments forming the Lugoba Formation are dated as Bajocian (*Sauzei – Humphriesianum* Zone).

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