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Serratolamna serrata (Agassiz) (Pisces, Neoselachii) from the Maastrichtian (Late Cretaceous) of Jamaica

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ABSTRACT. **Three teeth of the shark *Serratolamna serrata* (Agassiz) from the Guinea Corn Formation (Central Inlier) represent the first recorded occurrence of fossil sharks from Cretaceous rocks of Jamaica. This occurrence increases the known palaeogeographical distribution of *S. serrata*, which appears to have been global. This species is largely known from the Upper Maastrichtian, which helps confirm the stratigraphic position of the Guinea Corn Formation.**

INTRODUCTION

The Late Cretaceous was a period of extensive radiation within the Neoselachii ('modern' sharks and rays) (Cappetta 1987a). This resulted in the establishment of diverse shark and ray communities within the latest Cretaceous, with sharks probably filling all of the niches that they occupy within modern oceans (e.g., Siverson, 1992). These assemblages are well known from numerous Maastrichtian localities across North America, northern Europe and North Africa. Shark faunas from other parts of the world are less well known.

GEOLOGICAL SETTING

The geological succession within the central part of the Central Inlier (Fig. 1) consists of (from the base upwards) the Main Ridge Formation, Slippery Rock Formation, Guinea Corn Formation and Summerfield Formation. The stratigraphy of the Guinea Corn Formation has been redescribed in detail by Mitchell (1999), where it was divided into seven units lettered A to G. The selachian material discussed here was collected from Unit D of Mitchell (1999) from the section at Guinea Corn West (Figs. 1-3). A bulk sample of about 200 kg of rock was collected and

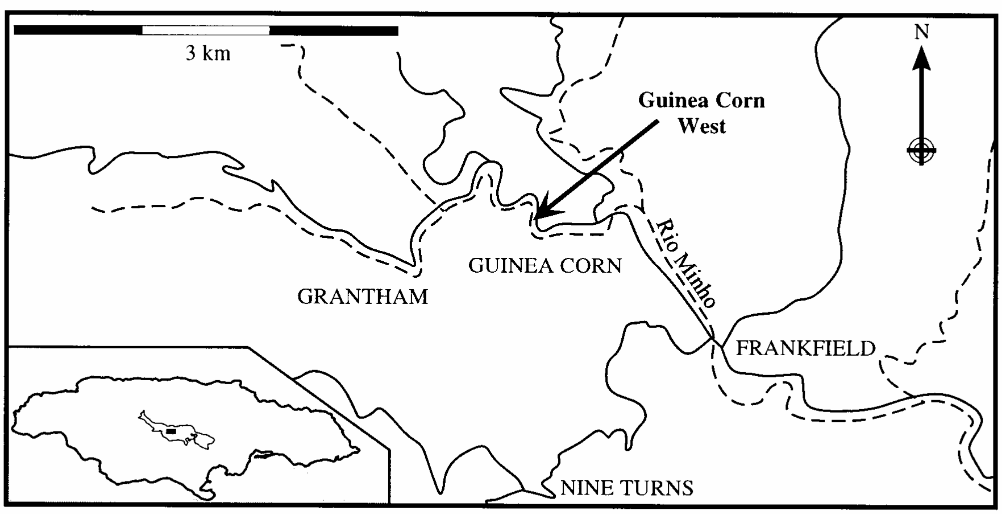

Figure 1. Location of Guinea Corn West section in the Central Inlier, Jamaica.

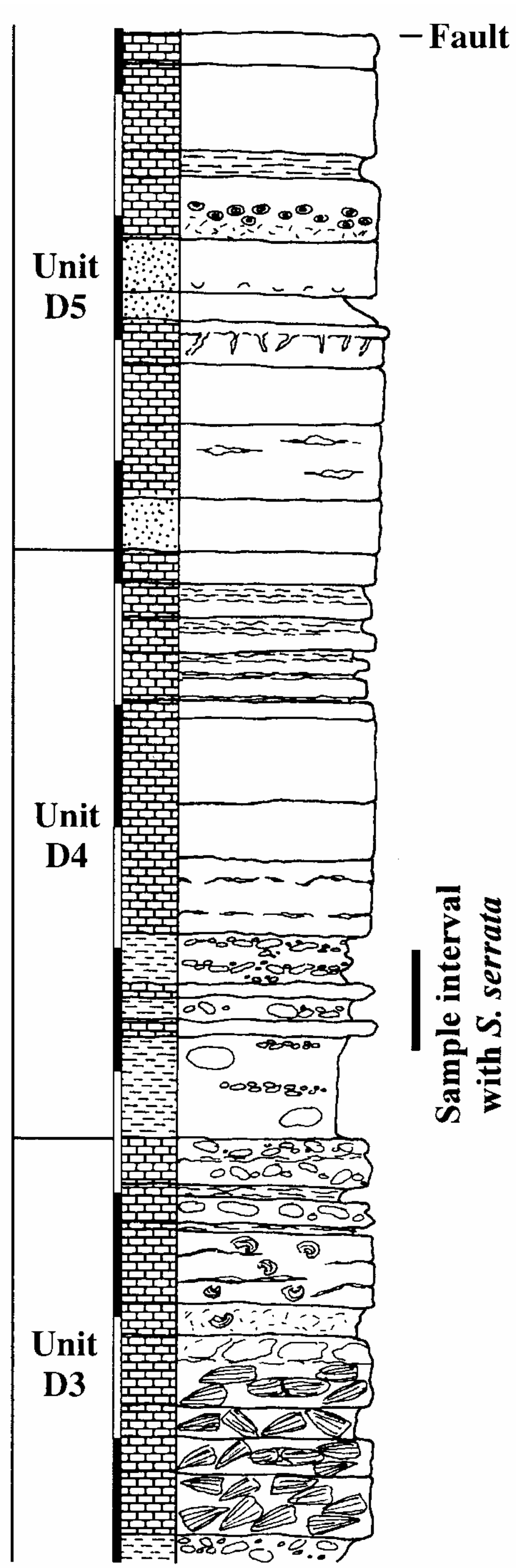

Figure 2. Log showing sampling interval. Scale bar in metre intervals. See Figure 3 for key.

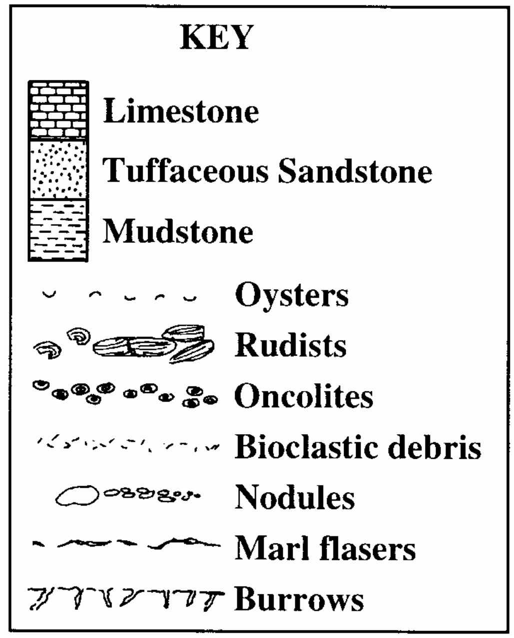

Figure 3. Key to symbols used in log

sieved through a 250 μm sieve. The extensive residue was picked and yielded numerous micro-invertebrates together with the small amount of vertebrate remains considered here. This material is is housed in the collections of the Geology Museum at the University of the West Indies, Mona (UWIGM).

Additional vertebrate material was associated with the three shark teeth, but was rare. Other fish material is represented by a single indeterminate crushing tooth of an actinopterygian fish. The presence of a finely reticulate surface sculpture suggests that this probably represents a pharyngeal tooth of a teleost, rather than the tooth of a pycnodont or semionotid.

SYSTEMATIC PALAEONTOLOGY

All shark teeth collected belong to a single species. They are all damaged, but are generally well preserved.

Order LAMNIFORMES Berg, 1958
Family CRETOXYRHINIDAE Glickman, 1958
Genus *Serratolamna* Landemaine, 1991

Serratolamna serrata (Agassiz, 1843)
Fig. 4

Material: Three incomplete teeth (UWIGM.2000.1 to UWIGM.2000.3); two upper? lateral teeth of adults, one anterolateral? tooth of a juvenile.

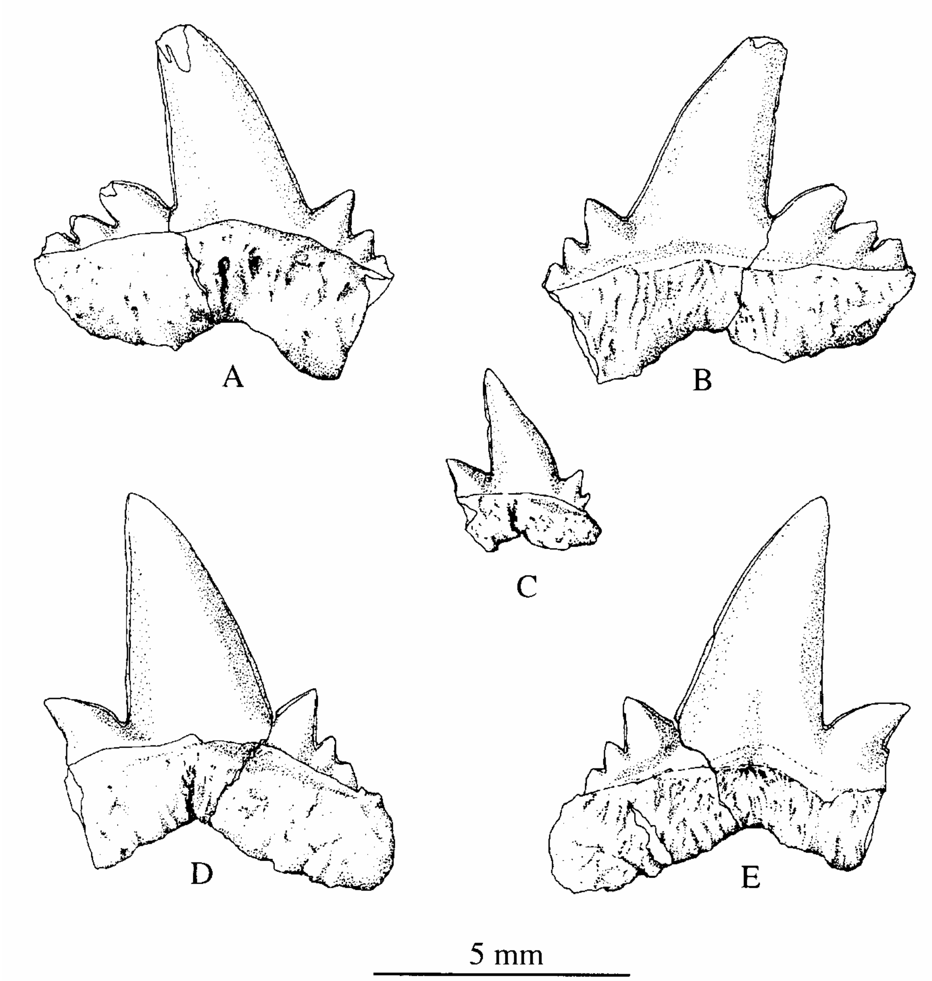

Figure 4. Camera lucida figures of teeth of the shark *Serratolamna serrata* from the Guinea Corn Formation. A-B (UWIGM.2000.1), A - labial view, B - lingual view; C (UWIGM.2000.2), labial view; D-E (UWIGM.2000.3), D – labial view, E, lingual view.

Description: The main cusp is at least twice as high as wide and slopes somewhat to the posterior. This is flanked on both sides by smaller lateral cusplets. These are all considerably shorter than the main cusp and decrease in size laterally. These cusplets, in particular the innermost pair, slightly project laterally. Only one tooth shows both posterior and anterior cusplets, and has three of each. The other adult tooth has three anterior cusplets, whilst only two are seen on the juvenile tooth. All cusps are compressed, the labial (outer) face being more convex than the lingual (inner) face, the base of which may be flat or faintly concave. A very well developed cutting edge is present over all cusps. No surface sculpture or serrations are present on any cusps. On the labial face of the tooth, the enameloid covering of the cusps has an abrupt contact with the upper surface of the root, whereas on the lingual face a thin veneer of enameloid extends over the upper part of the root. The root is relatively deep and compressed, and may be wider than the crown. The root is divided into two lobes, which are expanded basally. The central part of the labial face of the root is slightly swollen. This is cut by a nutritive groove with a central foramen, although this does not extend to the top of the root. Smaller foramina are present over both faces of the root, but are poorly preserved.

Discussion: The genus *Serratolamna* was originally erected to include a range of Late Cretaceous taxa possessing multiple lateral cusplets (Landemaine, 1991). This included several species that are clearly not related to *S. serrata*, the type species (Case and Cappetta, 1997), and should be placed within other genera. It is unclear whether *Cretolamna maroccana* (Arambourg, 1935), *C. caraibaea* (Leriche, 1938) and *C. biauriculata* (Wanner, 1902) should be included in *Serratolamna*, although Case and Cappetta (1997) retained *C. maroccana* and *C. biauriculata* in *Cretolamna*, presumably due to their lack of a distinct root axial groove.

Serratolamna serrata has been recorded from many parts of the world (e.g., Herman, 1977), and may be one of the most widely distributed Cretaceous shark taxa. Despite this wide palaeogeographical range, *S. serrata* appears to have been a short lived taxon, being restricted to the Maastrichtian. This is unlike the closely related *Cretolamna appendiculata* (Agassiz, 1843), which ranges from Albian to early Eocene (Cappetta and Case, 1999). *Serratolamna serrata* is well known from the Maastrichtian of North America (e.g., Case, 1979; Case and Cappetta, 1997), Belgium and Holland (e.g., Leriche, 1929; Herman, 1977), France (e.g., Landemaine, 1991), Morocco (e.g., Noubhani and Cappetta, 1997), Egypt (Wanner, 1902), Angola (Herman, 1977) and Brazil (Reboucas and Santos, 1956). Where the age of enclosing strata has been differentiated, these occurrences appear to be restricted to the Late Maastrichtian. This Late Maastrichtian age is further reinforced by the absence of *S. serrata* from some very rich Early Maastrichtian faunas, such as in Egypt (Cappetta, 1991) and Belgium (Herman, 1977). Records of this species in Campanian sedimentary rocks from Egypt (e.g., Priem, 1914) and Israel (Raab, 1963) are probably due to poor dating; the Israeli assemblage also contains other taxa otherwise only recorded from the Maastrichtian. Additional Campanian and earlier records of *S. serrata* (e.g., Leriche, 1902; Welton and Farrish, 1993) are probably due to mis-identification of species of *Cretolamna* (Case and Cappetta, 1997). It is therefore evident that the presence of this species is a good indicator for Maastrichtian, and probably Late Maastrichtian, age.

The age of the Guinea Corn Formation in the Central Inlier has been a subject of some debate. Sohl and Kollmann (1985) studied the actaenonellid gastropods and suggested that the Guinea Corn Formation was of mid to late Maastrichtian age. The nannofauna was discussed by Jiang and Robinson (1987), and Robinson (1988), who concluded that the Guinea Corn Formation was of late Camapanian to earliest Maastrichtian age. Our record of *S. serrata* from the Guinea Corn Formation agrees with the age derived from the actaeonellid gastropods rather than the calcareous nannofossils.

PALAEOBIOLOGY

The seemingly global distribution of *Serratolamna serrata* suggests that it must have been an extremely cosmopolitan species. This wide distribution would not, however, necessitate long ocean crossings, although the southern Atlantic and Tethyan oceans would have been relatively narrow during the Maastrichtian. *Serratolamna serrata* appears to have been present within a range of palaeoenvironments, including the cratonic chalk seas of northern Europe, offshore mudstones of the American interior seaway and condensed phosphatic mudstones on the Tethyan margin of North Africa. It has been recorded within a range of both carbonate and clastic sediments, both within broadly neritic settings and more inshore environments, as is represented by this occurrence.

Serratolamna is only known from isolated teeth, fossil skeletal material of sharks being generally very rare (Cappetta, 1987b). The only member of the Cretoxyrhinidae for which skeletal material is well known is *Cretoxyrhina mantelli* (Agassiz, 1843) (Shimada, 1997). This was a large shark, probably reaching over 6 m in length, not dissimilar to the extant *Carcharodon carcharias* (great white shark), and to a lesser extent other members of the Lamnidae, in general form (Shimada, 1997). This body form suggests that *C. mantelli*, and by analogy other cretoxyrhinids, was an active nectic predator. The small teeth of *S. serrata* suggest a far smaller shark, with a tearing-type dentition (Cappetta, 1987b). Comparison with analogous taxa with a comparable dentition, such as some extant species of *Carcharhinus*, suggests that probably reached less than 1.5 m in length. This is smaller than any extant lamnids, although it is within the size range of smaller species of *Carcharhinus*.

Many extant sharks, especially members of the Lamnidae (mackeral sharks) and Carcharhinidae (requiem sharks) are very widely distributed (see Compagno, 1984, for more details). These species may be present throughout the tropics, such as *Carcharhinus leucas* (Valenciennes in Müller and Hehle, 1839) (bull shark) and *Galeocerdo cuvier* (Peron and LeSuer in LeSuer, 1822) (tiger shark) or throughout tropical and temperate seas, such as *Prionace glauca* (Linnaeus, 1758) (blue shark) and *Isurus oxyrinchus* (Rafinesque, 1809) (shortfin mako). These wide-ranging species include taxa generally regarded as oceanic (*P. glauca*), inshore (*G. cuvier*) and cosmopolitan (*C. leucas*).

The distribution of *S. serrata* suggests that it represented a widely distributed form, possibly living as an active pelagic predator in neritic and inshore environments. This wide distribution was also shown by other Cretaceous lamniformes such as *Cretolamna appendiculata* and *Cretoxyrhina mantelli* (e.g., Herman, 1977). Other taxa, such as *Cretolamna moroccana* and *Scapanorhynchus texanus* (Roemer, 1852), appear to have shown strong endemicity, being retricted to the North African shelf and the North American cratonic seaway respectively.

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