ALBERTA

PALAEONTOLOGICAL

SOCIETY

BULLETIN

VOLUME 6 NUMBER 4

DECEMBER 1991

ALBERTA PALAEONTOLOGICAL SOCIETY

The Society was incorporated in 1986, as a non-profit organization formed to:

a. Promote the science of palaeontology through study and education.
b. Make contributions to the science by:
   1) discovery
   2) collection
   3) description
   4) education of the general public
   5) preservation of material for study and the future.
c. Provide information and expertise to other collectors.
d. Work with professionals at museums and universities to add to the palaeontological collections of the province (preserve Alberta's heritage)

MEMBERSHIP: Any person with a sincere interest in palaeontology is eligible to present their application for membership in the Society.

Single membership	$10.00 annually
Family or Institution	$15.00 annually

THE BULLETIN WILL BE PUBLISHED QUARTERLY: March, June, September and December. Deadline for submitting material for publication is the 15th of the month prior to publication.

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Requests for missing issues of the Bulletin should be addressed to the editor.

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DATES FOR APS MEETINGS

Meetings take place in Room **B108**, Mount Royal College, at **7:30** p.m.

1992

January 17
February 21
March 20*
April 17
May 22*

*Bulletins will be distributed to members in attendance.

PRESIDENT'S MESSAGE
by Percy Strong

What do you think of the Society? That was the question we asked in September. Here are the results of the questionnaire that 17 out of 45 members answered.

You are very satisfied with the general format of what we offer. The talks, field trips and the Bulletin are what you enjoyed most about the Society.

The major improvements that you want to see centred on organization of the monthly meetings. You felt that more effort should be given to starting on time and that the routine should be changed from time to time. More time for socializing at the meetings was another concern.

Most respondents have an interest in all areas of palaeontology. There is an equal interest in both vertebrates and invertebrates, with a minor interest in plants.

Setting up a special project was a popular idea. Compiling a faunal list and pictorial identification manual for Moose Mountain fossils was the only project suggested.

Most respondents regularly attend the field trips and find that they are easily structured to do so. Almost all felt that they would pay a fee to help defray the field trip costs.

The library is used by only a minority. Most people feel that a minimum of funds should be spent on the library. Suggestions for improvement were: buying specific books, compiling a bibliography of books in other libraries and providing a list of our own holdings. Most respondents would not be upset if we disposed of the library.

Everyone responded that they were in favour of having some courses taught. The suggestions for courses were: preparation, casting, identification, collection set-up, paleobotany, photography and microfossils. The majority are in favour of paying for an expert from outside the society to teach the classes if necessary. Three hours per week, on a week night, was considered the best schedule for classes.

To attract new members you felt that it is necessary to have a higher profile. The best ways to increase awareness of the society were to advertise, bring more guests to the meetings and have public displays. The majority thought that we should increase our presence at the annual Calgary Rock and Lapidary Show. Suggestions for doing so were: displaying some spectacular specimens, selling T-shirts and giving demonstrations.

Most respondents have never seen our collection, but all felt that it should be maintained. It was felt that the collection could be put to best use or displayed by setting it up in a prominent venue such as Mount Royal College or the University of Calgary; displaying it at the annual CRLC show, schools and craft fairs; for teaching; as reference material for identifying members' specimens, or as the basis for a research project.

There were numerous "other comments". Here are some of the more thought-provoking ones:

- Dues are too low—increase them.
- Make available lapidary equipment that could be used for a fee.
- Continue to push for chapters outside the Calgary area.
- Do a few things, but do them well.
- What has happened to the flow of information from the Tyrrell Museum?
- The "Friends of the Tyrrell" has died. Can we fill the niche?

As you can see, there is much grist for the mill. Our task then, is to set up a game-plan to tackle these issues. More importantly, the Society needs participation to carry out the plan. I invite you to step forward and help out.

ARTISTS!

Tired of seeing the same old logo on the cover of every Bulletin?
Then do something about it!

Submissions of original art in the form of sketches, pen-and-ink drawings or other black-and-white material (including good-quality photocopies of original work) are encouraged. Please send material to the Society's mailing address, Attn: Editor.

PROGRAM SUMMARY
by Heather Whitehead

November 15, 1991; Dr. Elisabeth McIver, Institute of Sedimentary and Petroleum Geology, Calgary: Early Paleocene-age Flora from the Cypress Hills Ravenscrag Formation

Plant fossils from Ravenscrag Butte in southern Saskatchewan were studied by Dr. McIver as part of her Ph.D. thesis. The Medicine Hat ceramic clay mine at one end of the butte provided fresh exposures and road access. Major coal seams exist in the Ravenscrag and a lower coal seam marks the Cretaceous-Tertiary boundary. Plant fossils for this study were collected from above the boundary. The fossils are well preserved and can be used to interpret climatic changes through time.

Fossils recovered include sycamore leaves; leaves and fruits of *Cercidiphyllum*, the Katsura tree, today found only in Japan and China; gingko leaves, important for paleobotany (well preserved gingko leaf fossils yield the waxy coating or "cuticle" that is studied under SEM, revealing pore arrangement that is diagnostic of the type of leaf); and saskatoon-type leaves, identical to today's. Conifers include the dawn redwood (*Metasequoia*), a swamp tree that is today found sparsely only in China. Ferns are exquisitely preserved, with both sterile and fertile fronds visible on a single slab. Water plants include duckweed, similar to today's but 2.5 times larger and aquatic leaves such as pond lilies that form a rosette on the surface of the water. If these are preserved parallel to the ancient water surface, the leaf arrangement shows the growth pattern, with the outer, largest leaves being the oldest. Preserved flower parts studied under SEM show abundant pollen grains.

One plant yields an assortment of different fossils: stems with long grooves, circles with "spikes," and rounded tubers — all parts of *Equisetum*, the horsetail plant. It is rare to find an assortment of various parts in one place and helps to reconstruct the whole plant. Horsetails appear to have changed little since the Ravenscrag specimens were preserved 65 million years ago.

The reconstructed environment shows redwood forest areas, intervening swamps with trees similar to today's bald cypress and understory ferns and horsetails. Ponds had common freshwater gastropods, aquatic insects, water lilies and other aquatic plants. Alligator remains have been found nearby, but not in the Ravenscrag itself. The environment bears almost no resemblance to that of southern Saskatchewan today, indicating a dramatic climatic change.

Plants are sensitive environmental indicators. If a plant can be identified to the nearest living relative at the species level, its environment of choice can be inferred.The comparison of ancient and modern plant *assemblages*, rather than individual species, lessens the chance of misinterpretation, in case one or two plant types have changed their environmental preferences. The conclusion of this analysis is that the Ravenscrag forests were similar to the forests of southern China today.

Leaf form is also an environmental indicator: large leaves imply readily available water, "drip tips" indicate a wet climate, thin leaves are generally deciduous, indicating a seasonal climate, etc.

The Ravenscrag flora indicate a humid mesothermal climate, more or less frost-free, with temperature range of 16-25˚ (compared to the 70-80˚ range today); humid, high non-seasonal precipitation, and no serious dry period. The climate could have been somewhat seasonal, in the sense that Florida is today — plants had a dormant "winter" period, perhaps triggered by low light levels in the "fall."

Heather Whitehead, our former editor, is departing (temporarily, we hope) for the University of Western Ontario, in London, where she will pursue her master's degree in library science.We wish Heather all the best, and hope she stays in touch until her return.

— HA

Some Shark Teeth and Related Fossils from the Pakowki Formation (Cretaceous) of Southern Alberta

by Howard Allen

Introduction

Teeth and bony skin plates are usually the only elements preserved as fossils in the cartilaginous fishes: sharks, rays, skates, sawfishes etc. These fossils, though representing little of the original animal, are nonetheless often well preserved and diagnostic enough to identify.

Occurrences of these fossils are usually few and far between, but where they do occur, specimens may be locally abundant and quite diverse. Typical sites include marine and deltaic or estuarine sandstones with pebble bands and scoured bedding surfaces where the hard and relatively large teeth and bony fragments were swept up and concentrated by waves and/or currents. Many of Alberta's Cretaceous formations (Milk River, Pakowki, Judith River/Belly River, Bearpaw, St. Mary River, Horseshoe Canyon) have potential for cartilaginous fish remains. Many collectors are familiar with the teeth of the ray *Myledaphus bipartitus*, which are locally common in the Judith River, St. Mary River and Horseshoe Canyon formations.

The purpose of this article is to illustrate the potential diversity of fish remains from a small site, as well as to aid members in identifying similar fossils in their collections. To this end I have included an annotated bibliography which hopefully will assist members with their own identifications.

Terminology

Teeth of an individual shark may occur in a wide range of sizes and shapes, making identification somewhat tricky. Not only do the teeth vary along a single jaw, but upper and lower jaws frequently have different teeth. As well, there are often differences resulting from the sex of the animal, and its age. Unlike humans, who have a single row of teeth at the front of the jaw, sharks have several rows of teeth stacked behind one another in the mouth. As the front row of teeth eventually falls out during feeding and with age (the teeth are only loosely embedded in the skin, not rooted in the jaw), the back rows rotate forward to replace them. It has been estimated that in some species, a single shark may shed as many as *thirty thousand* teeth during its lifetime! (Springer and Gold, 1989, pg. 23). At this rate, it's no wonder that fossil teeth are abundant in some localities.

Several names are given to the teeth in a single row (figure 1): *Anterior* teeth are those closest to the front of the jaw. These are generally the largest teeth and are often longer and straighter than the rest. *Lateral* teeth are found toward the sides of the mouth, and are often curved away from the centre line of the jaw. *Posterior* teeth are smaller and often strongly curved, occurring behind the laterals, toward the corner of the jaw. Some sharks have additional types of teeth, whose names are sometimes encountered in the literature. *Symphyseals* are small teeth with often distorted roots that are found straddling the very midline of (usually) the lower jaw, between the two frontmost anteriors. If instead there are two of these small teeth on either side of the midline, they are called *Parasymphyseals*. *Intermediates* are similar small teeth in (usually) the upper jaw, inserted between the anteriors and the laterals. Cappetta (1987) discusses these terms, as well as other anatomical features in detail.

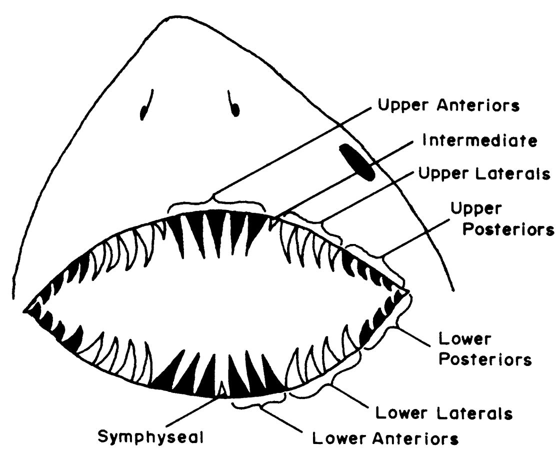

Fig. 1 Mouth of a 'typical' shark, showing relative positions of different tooth types.

It should be clear from the foregoing discussion that size and curvature of blades are often not diagnostic features of a particular species. Instead, features such as number and relative size of lateral cusps (small blades on either side of the main tooth blade), presence of grooves or ridges in the enamel, serrated edges, presence of pores or cavities in the root and other characteristics are important in identification.

As a final note, two additional terms relating to orientation are important in describing teeth: *labial* (Latin *labium* = lip) refers to the side of the tooth facing forward in the mouth, toward the lips; and *lingual* (Latin *lingua* = tongue), referring to the side facing backward.

Locality

The fossils illustrated in this article were all collected in 1982 from the upper part of the "Halfbreed Creek sandstone" of Russell and Landes (1940), one of two major sandstone members in the Upper Cretaceous Pakowki Formation of early to middle Campanian age. The collecting site was near the type section of the Halfbreed Creek sandstone (Russell and Landes, 1940, pg. 40) on Halfbreed Creek (labelled "Breed Creek" on recent topographic maps), a tributary of the Milk River in southern Alberta.

The fossils were recovered from a friable, reddish brown iron-stained, fine grained sandstone. Associated with the illustrated specimens was an assortment of small bone fragments, fish vertebrae and scales.

Material

Plicatolamna (=Cretodus?) sp., cf. ***P. arcuata* (Woodward)** (figure 2)

This is the lateral tooth of a small mackerel shark (figure 9a). As Case et al (1990, pg. 1087) point out, the status of the name *Plicatolamna* is currently in question, and this genus may be identical to *Cretodus.*

Plicatolamna arcuata is apparently a common and widespread form, occurring in several localities throughout North America (Case, 1978, Cappetta, 1975b, Case et al, 1990).

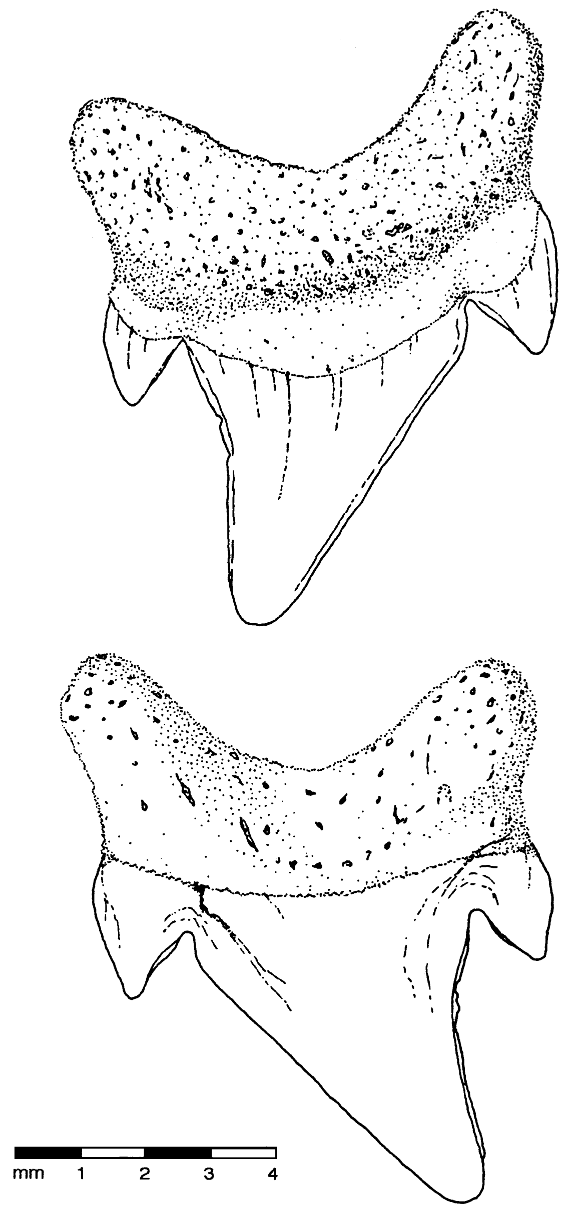

Fig. 2 *Plicatolamna (= Cretodus?)* sp., cf. *P. arcuata* (Woodward), lingual (top) and labial views of a lateral tooth. HBA211 (x 8.3)

Figure 3 shows a specimen resembling a posterior tooth of *Cretodus* sp. (cf. Case et al, 1990, Fig.8). The presence of strongly developed ridges in the enamel on the labial side of the lateral cusps makes the identification of this specimen uncertain. Some species of *Cretodus* do exhibit similar ridges (for example *C. semiplicatus*, Albian, of Texas– see Capetta, 1987, fig. 86).

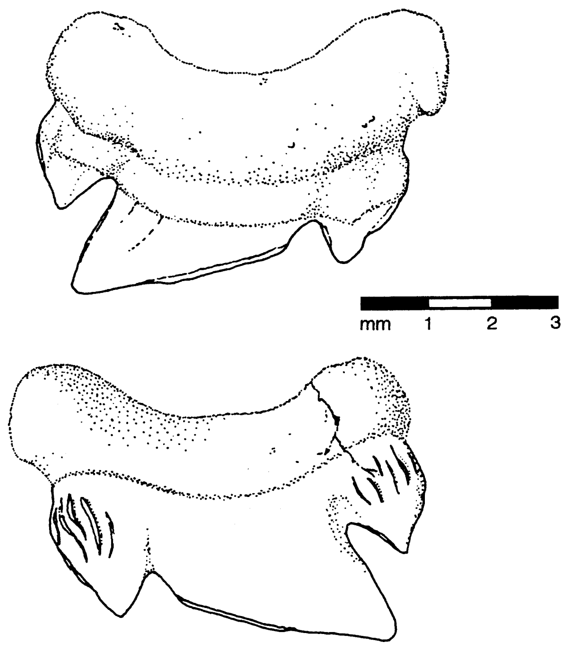

Fig. 3 *Plicatolamna (=Cretodus?)* sp.? lingual (top) and labial views of a posterior tooth. Note ridges on the lateral cusps. HBA211a (x 8.3)

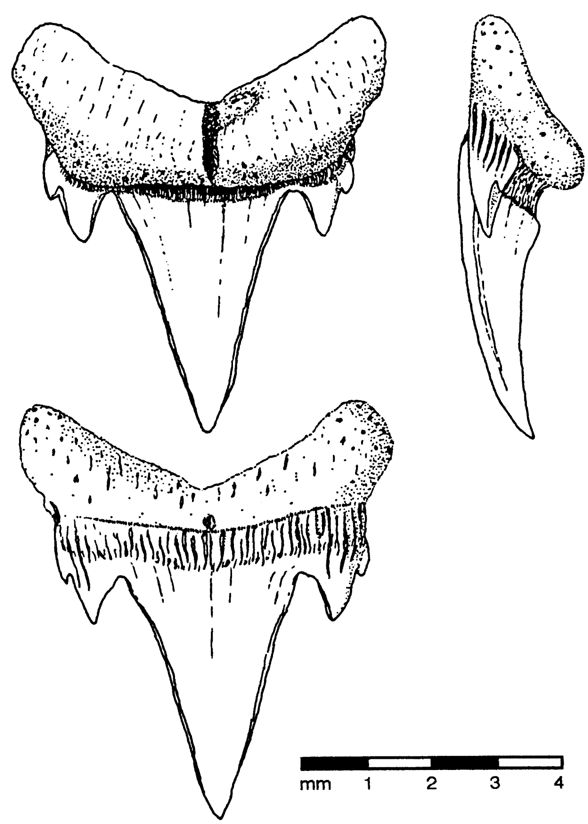

Fig. 4 *Hypotodus* sp., cf. *H. grandis* Case; lingual (top), lateral (top right) and labial views of an anterior tooth. HBA210 (x 8.3)

Hypotodus **sp., cf.** ***H. grandis*** **Case**

Case's (1978) original description of this species from the upper Judith River beds of northern Montana refers to its size as being one of the largest in the genus *Hypotodus.* The specimen shown here (figure 4) is even larger than Case's illustrated type specimens. Important features are the double lateral cusps, the broad, sloping root with its central fissure and the presence of numerous short ridges in the enamel on the lingual side of the tooth. *Hypotodus* belongs to the family Odontaspidae, represented by the modern sand tiger sharks (figure 9b).

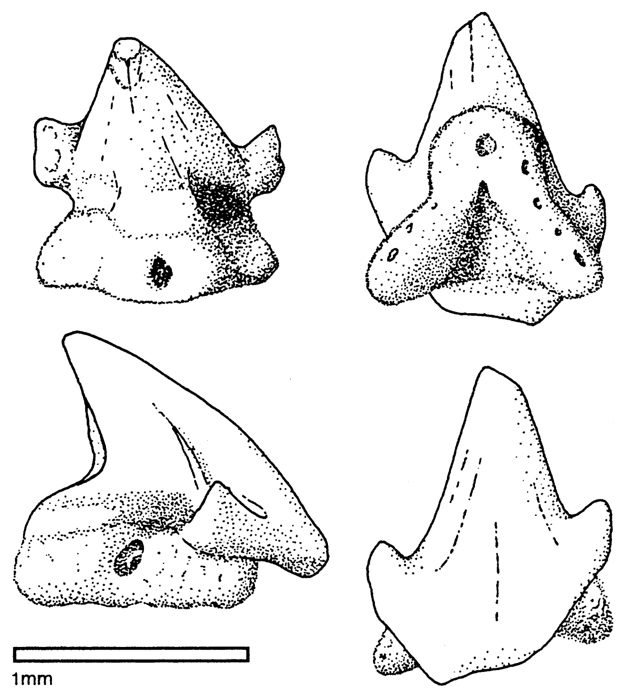

Fig. 5 *Chiloscyllium* sp., cf. *C. greeni* (Cappetta); various views of a single tiny shark tooth. HBA214 (x 30)

Chiloscyllium **sp., cf.** ***C. greeni*** **(Cappetta)**

This tiny tooth (figure 5), little bigger than a grain of sand, is nearly identical to specimens from the Carlile shale (middle Turonian) of South Dakota (Cappetta, 1973, fig. 2; plate I, figs. 36-41. Note: this species is referred to the genus *Brachaelurus* in this paper: Cappetta (1987) subsequently reassigned the species to *Chiloscyllium*). Astonishingly, *Chiloscyllium* belongs to the order Orectolobiformes, which includes the giant whale shark, growing to a length of more than 12 metres. Obviously, *Chiloscyllium* was in a different league altogether.

Ischyrhiza **sp., cf.** ***I. mira*** **Leidy**

The sawfishes (figure 9c) belong to the order Batoidea, which also includes the skates, rays and guitarfishes. The single tiny tooth illustrated here (figure 6) is very similar to specimens of oral teeth of *Ischyrhiza mira* from the Judith River Formation of northern Montana (Case, 1978, Pl. 3, figs. 4, 6).

Rostral 'teeth' or denticles (see below) of this species have been found in the upper Foremost Formation (= middle Judith River) at several locations in southern Alberta (Storer and Johnson, 1974). These are much larger and completely different in form from the oral tooth shown here. These rostral 'teeth' are illustrated in Storer and Johnson (1974) and in Johnson and Storer (1974).

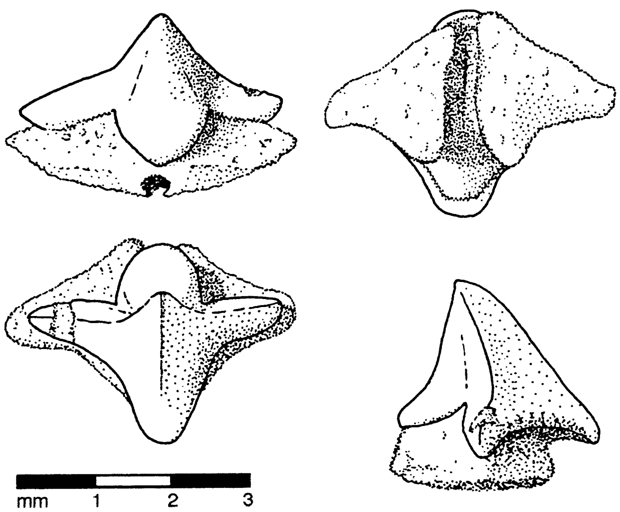

Fig. 6 *Ischyrhiza* sp., cf *I. mira* Leidy; various views of an oral tooth of a sawfish. HBA207 (x 10)

Ptychotrygon **sp? cf.** ***P. blainensis*** **Case**

Figure 7 shows a rostral denticle of another species of sawfish. Rostral denticles are the 'saw teeth' on the edges of the sawfish's rostrum, or snout. The structure and composition of these denticles is very similar to that of teeth, having a porous, bony base and an enamel 'crown'. Indeed, the teeth, rostral denticles and dermal denticles (tiny plates or spines embedded in the skin) of sharks and rays all share a common origin. The teeth of these animals apparently evolved through specialization of dermal denticles in the mouth region.

Modern sawfishes use their 'saws' for grubbing in the mud and for slashing about in schools of fishes to stun or wound prey. They live in subtropical, near-shore environments, including estuaries, river mouths and the lower, freshwater reaches of rivers (Jones, 1967, pg. 233).

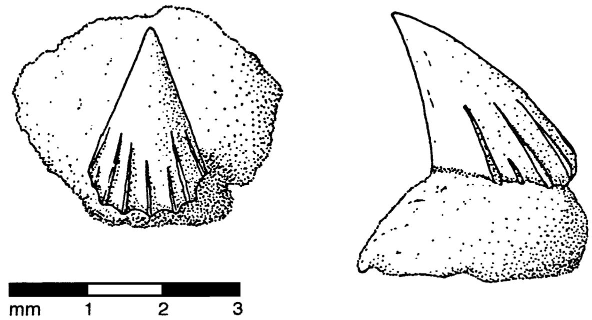

Fig. 7 *Ptychotrygon* sp?, cf. *P. blainensis* Case; two views of a rostral denticle ('tooth') of a sawfish. HBA209 (x 10)

Ptychotrygon blainensis rostral denticles are figured in Case (1978, Pl. 4, fig. 7) from the Judith River beds of Montana, where they are listed as uncommon. Cappetta (1975b, Pl. 8, fig. 20) includes a tiny, fuzzy photograph of a rostral denticle 'from the base of the rostrum' (translation) of *Ischyrhiza mira* from New Jersey, which also compares to the specimen shown here.

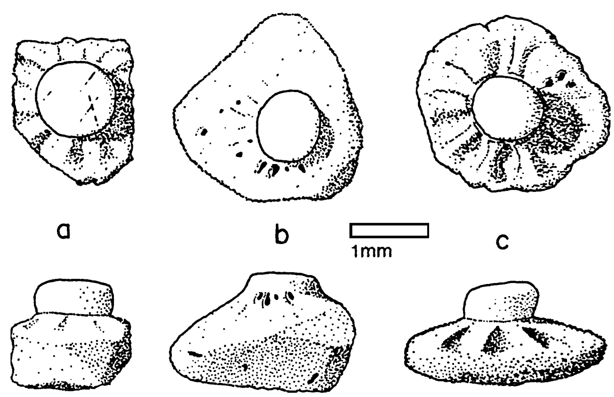

Fig. 8 a,b,c *Protoplatyrhina* sp?, cf. *P. renae* Case; vertical and profile views of three dermal denticles of a guitarfish. HBA206, HBA206a, HBA 206b (all x 10)

Protoplatyrhina**?** **sp., cf.** ***P. renae*** **Case**

Three tiny, irregular dermal denticles (figure 8) were recovered from this locality. The only common feature besides their size is the presence of a circular boss in the centre of each, which in at least two specimens is polished and lightly scratched on the surface, indicating abrasive wear. A dermal denticle

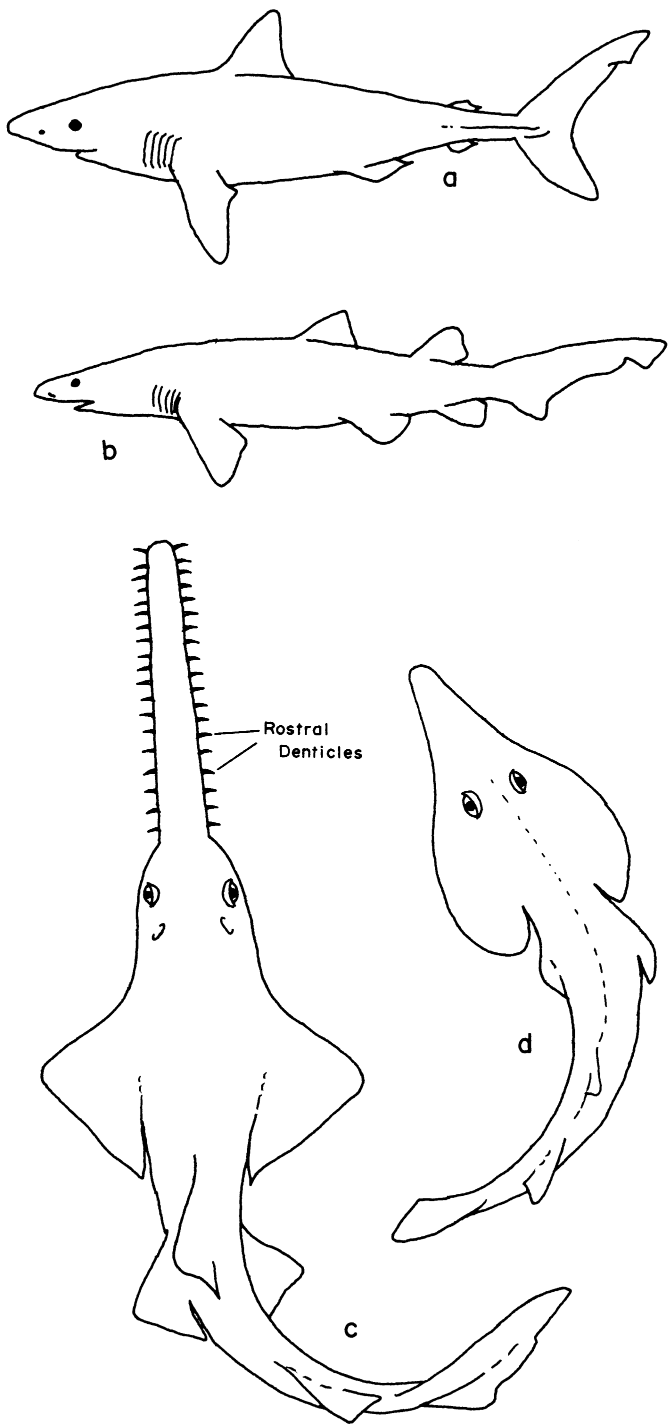

Fig. 9 (drawings not to scale) **a)** A modern mackerel shark, *Lamna nasus*, generally <3m. **b)** The modern sand tiger shark, *Odontaspis taurus*, up to 5m. **c)** A modern sawfish, family Pristoidae, to 5m or more **d)** A modern guitarfish, family Rhinobatoidae, up to 2m. (**a** and **b** redrawn from Dingerkus, 1985; **c** and **d** redrawn from Springer and Gold, 1989)

very similar to figure 8c is illustrated in Case (1978, pl. 6, fig.8), from the Judith River Formation of Montana. This denticle was assigned to *Protoplatyrhina renae*, a guitarfish. The guitarfishes (family Rhinobatoidae) are skates or rays of medium size with a flat, ray-like head combined with the narrow, streamlined body of a shark (figure 9d). Guitarfishes often have dermal denticles such as these surrounding and protecting sensitive areas of the body, such as eyes, nose, mouth and genital regions (Case, 1978, pg. 194).

Acknowledgements

The author thanks Mr. George Griffiths for generously granting permission to collect on his property in 1982. Darren Tanke pointed me toward some references on the subject. Figures, unless credited otherwise, are by the author.

Annotated Bibliography

The notation in square brackets following each reference is mainly for the benefit of Calgary members, indicating where to find the references:

UCG = University of Calgary, Gallagher Library of Geology
UCB3 = University of Calgary, Library Block, 3rd floor.
UCT3 = University of Calgary, Library Tower, 3rd floor.
ISPG = Institute of Sedimentary and Petroleum Geology Library
CPL = Calgary Public Library

Following these codes, in italics, are the library call numbers, if applicable. References with no location code are from the author's library. (Note: the Royal Tyrrell Museum of Palaeontology apparently has an extensive library as well).

CAPPETTA, H. 1973. Selachians from the Carlile Shale (Turonian) of South Dakota. Journal of Paleontology, vol. 47, pp. 504-514; Illustrations and descriptions of 12 species of sharks and rays. [UCG, ISPG: *QE701 J6*]

CAPPETTA, H. 1987. Chondrichthyes II: Mesozoic and Cenozoic Elasmobranchii *in* Handbook of Paleoichthyology, Vol. 3B. Gustav Fisher Verlag, Stuttgart, New York. 193 pp.; An excellent, up-to-date, very comprehensive book; profusely illustrated, covering the known genera of sharks and their allies of the eras in question. Good discussions of morphology and associated terminology. Probably the best single reference on the subject. Would make a fine addition to any collector's library; too bad it costs 200 bucks! [ISPG: *QE852 H35 v.3B*]

CAPPETTA, H. and CASE, G.R. 1975a. Sélaciens Nouveaux du Crétacé du Texas. Geobios, Vol. 8, No. 4, pp. 303-307; (in French) A short article on 6 new species of sharks and sawfishes. Simple line drawings. [ISPG]

_____ 1975b. Contribution a l'étude des Sélaciens du Groupe Monmouth (Campanian-Maastrichtian) du New Jersey. Palaeontographica, Abteilung A, vol. 151, pp. 1-46; (in French) Descriptions and illustrations of 28 species of sharks, rays and sawfishes. [ISPG]

CASE, G. R. 1978. A New Selachian Fauna from the Judith River Formation (Campanian) of Montana. Palaeontographica, Abteilung A, vol. 160, pp. 176-205; Illustrations and descriptions of various remains of 16 species of sharks, rays, sawfishes and guitarfishes. [ISPG]

CASE, G.R., TOKARYK, T.T. and BAIRD, D. 1990. Selachians from the Niobrara Formation of the Upper Cretaceous (Coniacian) of Carrot River, Saskatchewan, Canada. Canadian Journal of Earth Sciences, vol. 27, pp. 1084-1094; Illustrations and descriptions of 8 species of sharks and rays. [UCG, UCB3, ISPG: *QE1 C34*]

DINGERKUS, G. 1985. The Shark Watcher's Guide. Wanderer Books, Simon & Schuster, New York. 144 pp.; A popular guide to modern sharks and aspects of their biology; well illustrated, general reading. [CPL: *597.31 DIN* or *QL638.9 D56*]

ESTES, R. 1964. Fossil Vertebrates from the Late Cretaceous Lance Formation, Eastern Wyoming. University of California Publications in Geological Science. Vol. 49, 180pp.; Illustrations and descriptions of several microvertebrate fossils, including sharks, rays, bony fishes and some amphibian bones. Good discussion of the ray *Myledaphus bipartitus*. [UCB3: *QE1 C3*]

JOHNSON, H. and STORER, J.E. 1974. A Guide to Alberta Vertebrate Fossils from the Age of Dinosaurs. Provincial Museum of Alberta, publication no. 4, 129 pages; A popular, illustrated guide, mainly dealing with dinosaur bones. Some fish teeth and bones as well (see also Storer and Johnson, 1974). [UCB3: *QE841 J64*]

JONES, J.W. 1967. Fishes *in* Larousse Encyclopedia of Animal Life. The Hamlyn Publishing Group Limited, London, New York, Sydney, Toronto. pp. 229-235; A brief overview of the sharks and their allies, in a fat, coffee-table encyclopedia.

McKENZIE, M.A. and BAMBER, E.W. 1979. An Occurrence of Lower Carboniferous Fish Remains from Alberta, Canada. Canadian Journal of Earth Sciences. Vol. 16, pp. 1628-1631; Illustrations and descriptions of several plate-like shark teeth from the Mississippian Livingstone Formation. [UCG, UCB3, ISPG: *QE1 C34*]

RUSSELL, L.S. and LANDES, R.W. 1940. Geology of the Southern Alberta Plains. Geological Survey of Canada, Memoir 221; General geology & biostratigraphy of southern Alberta (nothing on sharks). [UCT3, UCG, ISPG: *CA1 MS30 40M221*]

SPRINGER, V.G. and GOLD, J.P. 1989. Sharks in Question: The Smithsonian Answer Book. Smithsonian Institution Press, Washington D.C., London. 187 pp.; One of the best popular books dealing with sharks and their allies. Good explanations of anatomy, teeth, dermal denticles and general biology; profusely illustrated (great pictures of sawfish & guitarfish). [*597.31* or *QL638.9 S67*]

STORER, J.E. and JOHNSON, H. 1974. *Ischyrhiza* (Chondrichthyes: Pristidae) from the Upper Cretaceous Foremost Formation (Campanian) of Alberta. Canadian Journal of Earth Sciences, vol. 11, no. 5, pp. 712-715; Illustrations and descriptions of rostral teeth (denticles) of a sawfish (same illustrations in Johnson & Storer, 1974). [UCG, UCB3, ISPG: *QE1 C34*]

REVIEWS

from Les Adler

On the Mammoth's Dusty Trail, by R.D. Guthrie and M.L. Guthrie. Natural History, July 1990, pp. 34-41.

This article is accompanied by two paintings by Donna Braginetz, one depicting an interior Alaskan valley 18,000 years ago with a woolly mammoth matriarch leading her herd across a flood plain, watched by saiga antelope and horses, and the other a bull bison being brought down by an Alaskan Pleistocene lion 36,000 years ago.

One sub-section, "Why the Ice Age?," provides two sets of possible causes for the Ice Age: (1) mountain uplifts, occurring in irregular pulses, restricted atmospheric circulation and caused irregularities in weather patterns, bringing rapid changes from hot to cold, and (2) astronomical forces such as gravitational effects when planets line up; wobbles in the Earth's rotational axis; and possibly the effects of sunspots.

Another sub-section, "Blue Babe," describes a 36,000 year old steppe bison found in a placer gold mine near Fairbanks, Alaska. It was coloured blue by vivianite, a mineral produced by the reaction of phosphate in the animal's tissues and iron in the soil. A lion or lions had attacked Blue Babe. The legs, head and hide were intact, and the mummy has been reconstructed at the University of Alaska museum at Fairbanks.

The main article is accompanied by a map of Eurasia and western North America show-ing the distribution of "mammoth steppe" and glaciers 18,000 years ago. A diverse flora can be deduced from the buttercups and grasses found between the teeth and in the stomachs of the animal fossils. Teeth are also important and provide clues to diet, etc. The climate and the types and distribution of plants changed quickly, causing a change in the distribution of the fauna: each mammal species required different species of grasses. The current fauna is a hodgepodge of earlier distributions. The Ice Age fossils give a unique perspective on the possible results of global warming.

Human migrants from Asia to North America and their hunting dogs probably walked along mammoth trails that were still being used by the mammoths, and were often very dusty. Humans were only able to survive in this region as long as there was enough wood for fire and shelter.

<u>New Theories and Old Bones Reveal the Lifestyles of the Dinosaur</u> by Sharon Begley with Emily Yoffe. Newsweek, Oct. 28, 1991, pages 52-58.

This article, written for the layman, updates interpretations and gives news of the latest finds. Each year about six new species are described and in 1991 dinosaur remains were found in the Arabian peninsula and in Antarctica for the first time. Items include:

- *Maiasaura* rookeries in Montana indicate herds of 10,000 animals.
- Trackways in South Korea indicate that baby *Apatosaurus* were cared for by herds of 20 to 40 animals near their birth-place.
- Horned ceratopsians from Alberta often stamped their big feet on the ground.
- *Deinonychus* from Montana hunted in gangs of four, ripping out the entrails of dinosaurs 10 times larger.
- Stegosaurs and brachiosaurs were much more intelligent than previously thought.
- Duckbilled dinosaurs trampled on the tails of other duckbills when in huge herds.
- Sauropods suffered bone injuries during copulation.
- Dinosaur skulls are now being examined by CAT scans to improve interpretation of skull structures.
- *Nanotyrannus*, the smallest of the tyrannosaurs, had a brain size double the expected size and had excellent ability to sniff out prey.
- Ground-penetrating radar is now being used to locate large buried fossils.
- The largest dinosaur ever found, from New Mexico—*Seismosaurus*, was 140 feet in length, weighed 60 to 90 tons and used stomach stones instead of teeth to grind food, 154 million years ago.
- *Protoceratops* in Mongolia laid their eggs in communal nests.
- The American Museum of Natural History is unveiling a *Barosaurus* display in December, 1991, in which this dinosaur is fending off an *Allosaurus*.
- Lambeosaurs of Alberta didn't grow crests until adulthood. An exact replica of a crest was built to learn what noises were possible; it was hypothesized that the crest was also a sexual display.
- Duckbilled dinosaurs had very rapid rates of growth.
- Bakker may have been right about small two-legged dinosaurs being warm-blooded, but it is unlikely that this applies to large dinosaurs.
- Why did the dinosaur cross the continent? To get to safety on the other side. Not many predators followed the herbivores, which migrated with the seasonal growth of plants.
- Dinamation® of Irvine, California is continuing to prosper with moving dinosaur robots that roar, swing their tails and nuzzle hatchlings [the models will appear at Drumheller in 1992 –pers. comm.].
- Dino sitcom *Dinosaurs* is airing on television [including Calgary station].
- *Jurassic Park* – Universal Pictures movie about dinosaurs cloned back to life is slated for the summer of 1993.
- The Dinosaur Society (P.O. Box 171, Newton Lower Falls, Mass. 02162, USA) issues a monthly broadsheet *Dino Times* about the latest finds and theories— US$16 per year.
- *Triceratops* skulls sell for $150,000 in the USA.
- Dinosaur extinction is discussed, the asteroid theory being given a minor role in the extinction, as 96% of species were already extinct prior to the alleged asteroid impact at the end of the Cretaceous period.
- The possibility of birds being descended from dinosaurs is discussed: be kind to your fine feathered friends!
- Inferred colour and skin decoration is illustrated in recent work by artists.

REVIEWS
from Les Adler

Bob Dylan and Moas' Ghosts, by J. Diamond. *Natural History*, Oct. 1990, pp. 26-32.

This article has a sub-heading "If you don't know the past you can't understand the present—for humans or plants or animals." The title refers to the situation that today's young people are not familiar with the music, ideas and events of the 1960s. Each generation is stamped by its own events, which linger like ghosts to shape the next generation's world. In order to prove the point, the author discusses the history of recent biota in New Zealand, which is not far removed from a previous biota made extinct by two successive waves of humans.

Today, all the native land and freshwater bird species of New Zealand are fairly small, whereas in most other parts of the world local birds include medium and large as well as small species. In New Zealand, there are no small omnivores in the half-ounce to three-ounce size— the most common size in other countries— even on surrounding islands. The birds of New Zealand are nocturnal, camouflaged, or both. Plants show features that elsewhere serve to protect plants from animals, such as spines, tough fibrous leaves, poisons and mimicry of poisonous plants by non-poisonous species.

The answer to these puzzles is that the survivors have succeeded 28 species of birds that became extinct before the Europeans came, and another 7 species since. There were 12 species of moa – large, flightless birds ranging from 3 to 10 feet tall, weighing up to 500 pounds. These birds ate dozens of different plant species, as revealed by study of preserved gizzards. There were also giant geese, pelicans, ravens, and a 30-pound eagle — the biggest and most powerful bird of prey in the world. All these and others have been found fossilized in New Zealand.

It was first thought that moas became extinct because of climate change, but it was later found that the Maoris exterminated them, partly by direct killing, and partly by clearing the forests where moas lived. Moas were easily caught and killed, as they were unfamiliar with humans; they were also vulnerable to the rats that arrived in Maori boats. The local biota collapsed within a few centuries of the arrival of the Maoris, and the process of destruction was continued by the Europeans.

New Zealand's moas are no longer alive, but they molded the anatomy and behaviour of New Zealand's surviving species. You cannot make sense of modern New Zealand biology if you don't understand moas, known by their fossil remains.

Arctic Eden, by Jane E. Francis. *Natural History*, Jan. 1991, pp. 56-63.

Jane Francis describes the material found in Eocene fossil forests on Ellesmere Island and across Axel Heiberg Island in the Canadian high arctic, close to the present north pole. There are leaves and needles from swamp cypress, cedar, pine, fir, spruce, birch, alder and katsura; seeds of hickory; mosses and fern leaves. The plant material has remained remarkably fresh due to the fact that these forests were never covered by more than several hundred feet of sediments, preventing heating and compression.

An associated fauna contains representatives of alligators, crocodiles, turtles, snakes, salamanders, giant land tortoises, tapirs and cranes, indicating a warm, swampy, subtropical environment. The early Eocene, about 55 million years ago, was one of the warmest phases during the past 100 million years. About 15 million years ago, boreal forests appeared where Axel Heiberg Islands' subtropical forests once grew. During the last two million years there have been glacial advances and retreats. At this location we have strong evidence of the extreme changes in the earth's past climates, providing unexpected fossils.

Coming in a future Bulletin:

Pentremites?!

Schizoblastus?!

Just what *are* those Canyon Creek Blastoids?

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Dear Member:

This is a first reminder that 1992 membership dues should be paid. We appreciate your prompt remittance, so that our programs can be properly funded.

If, as a paid member, you failed to receive any issues of the bulletin during 1991, please indicate the missing issues on the back of this pull-out sheet.

Do you have any comments or suggestions that would help our Society? If so, please include them on the back of this sheet.

Alberta Palaeontological Society
Peter Meyer,
Membership Director

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