



***Long time coming:
the British Columbia
Paleontological Alliance's
advocacy for a provincial
fossil resource management
policy***

*Jim Haggart and Tom Cockburn
British Columbia Paleontological Alliance*



USES OF FOSSILS: Geologic Time



INTERNATIONAL STRATIGRAPHIC CHART

International Commission on Stratigraphy



Enothem Eon	Erathem Era	System Period	Series Epoch	Stage Age	Age Ma	GSSP
Phanerozoic	Cenozoic	Quaternary*	Holocene			
				Upper	0.0118	
		Pleistocene		Middle	0.126	
				Lower	0.781	
					1.806	
Phanerozoic	Cenozoic	Neogene		Gelasian	2.588	
				Piacenzian	3.600	
				Zanclean	5.332	
Phanerozoic	Cenozoic	Miocene		Messinian	7.246	
				Tortonian	11.608	
				Serravallian	13.82	
Phanerozoic	Cenozoic	Langhian		Burdigalian	15.97	
				Aquitanian	20.43	
					23.03	
Phanerozoic	Cenozoic	Oligocene		Chattian	28.4 ± 0.1	
				Rupelian	33.9 ± 0.1	
				Priabonian	37.2 ± 0.1	
Phanerozoic	Cenozoic	Eocene		Bartonian	40.4 ± 0.2	
				Lutetian	48.6 ± 0.2	
				Ypresian	55.8 ± 0.2	
Phanerozoic	Cenozoic	Paleocene		Thanetian	58.7 ± 0.2	
				Selandian	61.7 ± 0.2	
				Danian	65.5 ± 0.3	
Phanerozoic	Cenozoic	Maestrichtian		Campanian	70.6 ± 0.6	
				Santonian	83.5 ± 0.7	
				Coniacian	85.8 ± 0.7	
Phanerozoic	Cenozoic	Turonian		Cenomanian	89.3 ± 1.0	
					93.5 ± 0.8	
					99.6 ± 0.9	
Phanerozoic	Cenozoic	Albian		Aptian	112.0 ± 1.0	
				Barremian	125.0 ± 1.0	
				Hauterivian	130.0 ± 1.5	
Phanerozoic	Cenozoic	Valanginian			136.4 ± 2.0	
					140.2 ± 3.0	
				Berriasian	145.5 ± 4.0	

Enothem Eon	Erathem Era	System Period	Series Epoch	Stage Age	Age Ma	GSSP
Phanerozoic	Mesozoic	Jurassic		Tithonian	145.5 ± 4.0	
				Kimmeridgian	150.8 ± 4.0	
				Oxfordian	155.7 ± 4.0	
Phanerozoic	Mesozoic	Callovian			161.2 ± 4.0	
				Bathonian	164.7 ± 4.0	
				Bajocian	167.7 ± 3.5	
Phanerozoic	Mesozoic	Aalenian			171.6 ± 3.0	
				Toarcian	175.6 ± 2.0	
				Pliensbachian	183.0 ± 1.5	
Phanerozoic	Mesozoic	Sinemurian			189.6 ± 1.5	
				Hettangian	196.5 ± 1.0	
					199.6 ± 0.6	
Phanerozoic	Mesozoic	Triassic		Rhaetian	203.6 ± 1.5	
				Norian	216.5 ± 2.0	
				Carnian	228.0 ± 2.0	
Phanerozoic	Mesozoic	Ladinian			237.0 ± 2.0	
				Anisian	245.0 ± 1.5	
				Olenekian	249.7 ± 0.7	
Phanerozoic	Mesozoic	Induan			251.0 ± 0.4	
				Changhsingian	253.8 ± 0.7	
				Wuchiapingian	260.4 ± 0.7	
Phanerozoic	Mesozoic	Capitanian			265.8 ± 0.7	
				Wordian	268.0 ± 0.7	
				Roadian	270.6 ± 0.7	
Phanerozoic	Mesozoic	Kungurian			275.6 ± 0.7	
				Artinskian	284.4 ± 0.7	
				Sakmarian	294.6 ± 0.8	
Phanerozoic	Mesozoic	Asselian			299.0 ± 0.8	
				Gzhelian	303.9 ± 0.9	
				Kasimovian	306.5 ± 1.0	
Phanerozoic	Mesozoic	Moscovian			311.7 ± 1.1	
				Bashkirian	318.1 ± 1.3	
				Serpukhovian	326.4 ± 1.6	
Phanerozoic	Mesozoic	Visean			345.3 ± 2.1	
				Tournaisian	359.2 ± 2.5	

Enothem Eon	Erathem Era	System Period	Series Epoch	Stage Age	Age Ma	GSSP
Phanerozoic	Paleozoic	Devonian		Famennian	359.2 ± 2.5	
				Frasnian	374.5 ± 2.6	
				Givetian	385.3 ± 2.6	
Phanerozoic	Paleozoic	Middle		Eifelian	391.8 ± 2.7	
				Emsian	397.5 ± 2.7	
				Pragian	407.0 ± 2.8	
Phanerozoic	Paleozoic	Lower		Lochkovian	411.2 ± 2.8	
					416.0 ± 2.8	
					418.7 ± 2.7	
Phanerozoic	Paleozoic	Silurian		Ludfordian	421.3 ± 2.6	
				Gorstian	422.9 ± 2.5	
				Homerian	426.2 ± 2.4	
Phanerozoic	Paleozoic	Wenlock		Sheinwoodian	428.2 ± 2.3	
				Telychian	436.0 ± 1.9	
				Aeronian	439.0 ± 1.8	
Phanerozoic	Paleozoic	Llandovery		Rhuddanian	443.7 ± 1.5	
				Hirnantian	445.6 ± 1.5	
				Katian	455.8 ± 1.6	
Phanerozoic	Paleozoic	Upper		Sandbian	460.9 ± 1.6	
					468.1 ± 1.6	
					471.8 ± 1.6	
Phanerozoic	Paleozoic	Middle		Stage 3	478.6 ± 1.7	
				Floian	488.3 ± 1.7	
				Tremadocian	~ 492.0 *	
Phanerozoic	Paleozoic	Lower		Stage 10	~ 496.0 *	
				Furongian	~ 501.0 ± 2.0	
				Paibian	~ 503.0 *	
Phanerozoic	Paleozoic	Cambrian		Stage 7	~ 506.5 *	
				Series 3	~ 510.0 *	
				Drumian	~ 517.0 *	
Phanerozoic	Paleozoic	Series 2		Stage 5	~ 521.0 *	
				Stage 4	~ 534.6 *	
				Stage 3	542.0 ± 1.0	
Phanerozoic	Paleozoic	Series 1		Stage 2		
				Stage 1		

This chart was drafted by Gabi Ogg. Intra Cambrian unit ages with * are informal, and awaiting ratified definitions.

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Enothem Eon	Erathem Era	System Period	Age Ma	GSSP GSSA
Precambrian	Proterozoic	Ediacaran	542	
		Cryogenian	~630	
Precambrian	Proterozoic	Tonian	850	
		Stenian	1000	
Precambrian	Proterozoic	Ectasian	1200	
		Calymmnian	1400	
Precambrian	Proterozoic	Statherian	1600	
		Orosirian	1800	
Precambrian	Proterozoic	Rhyacian	2050	
		Siderian	2300	
Precambrian	Proterozoic	Neoproterozoic	2500	
		Neoproterozoic	2800	
Precambrian	Proterozoic	Mesoproterozoic	3200	
		Paleoproterozoic	3600	
Precambrian	Proterozoic	Lower limit is not defined		

Subdivisions of the global geologic record are formally defined by their lower boundary. Each unit of the Phanerozoic (~542 Ma to Present) and the base of Ediacaran are defined by a basal Global Standard Section and Point (GSSP), whereas Precambrian units are formally subdivided by absolute age (Global Standard Stratigraphic Age, GSSA). Details of each GSSP are posted on the ICS website (www.stratigraphy.org).

International chronostratigraphic units, rank, names and formal status are approved by the International Commission on Stratigraphy (ICS) and ratified by the International Union of Geological Sciences (IUGS).

Numerical ages of the unit boundaries in the Phanerozoic are subject to revision. Some stages within the Ordovician and Cambrian will be formally named upon international agreement on their GSSP limits. Most sub-Series boundaries (e.g., Middle and Upper Aptian) are not formally defined.

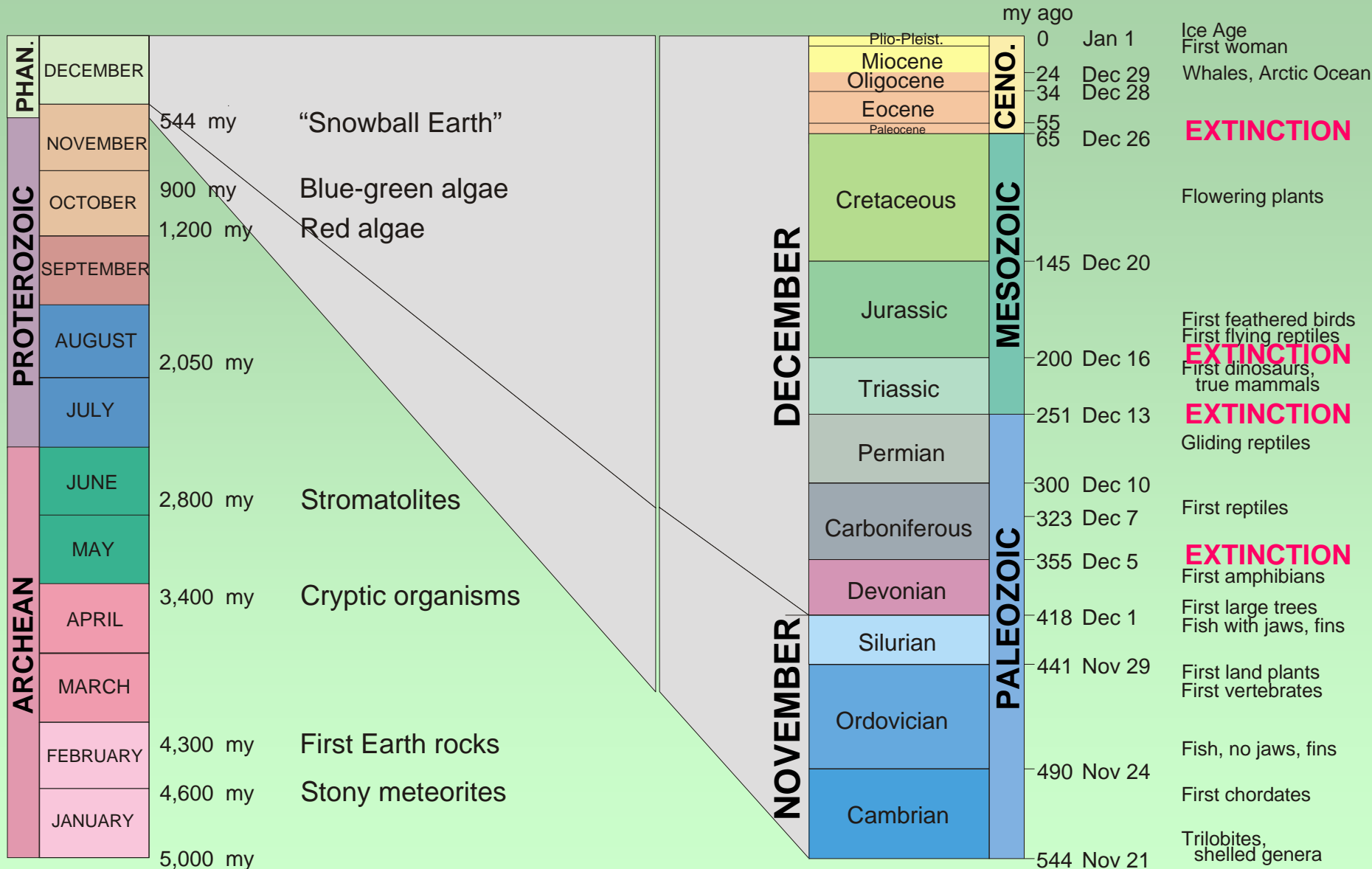
Colors are according to the Commission for the Geological Map of the World (www.cgmw.org).

The listed numerical ages are from 'A Geologic Time Scale 2004', by F.M. Gradstein, J.G. Ogg, A.G. Smith, et al. (2004; Cambridge University Press).

The time units are based on fossil assemblages!

GEOLOGIC TIME IN A YEAR...

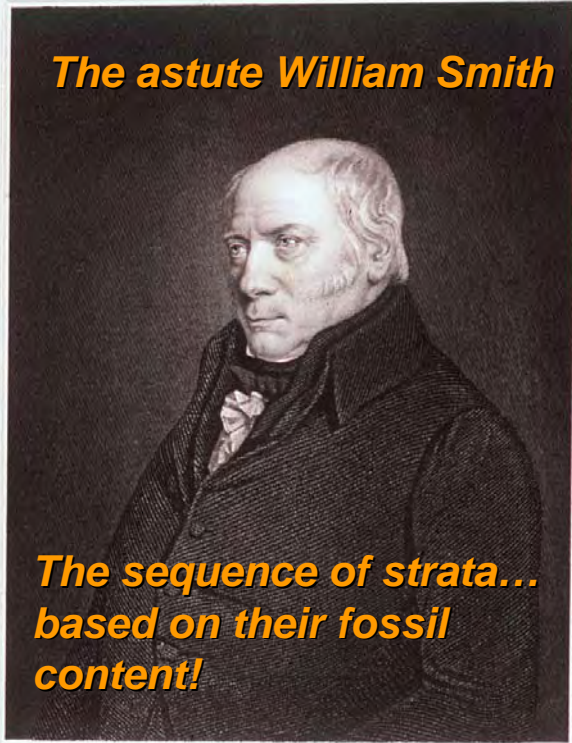
...BUT OH, WHAT A YEAR!



- Many thanks to Jim Roddick

USES OF FOSSILS: Geologic Maps

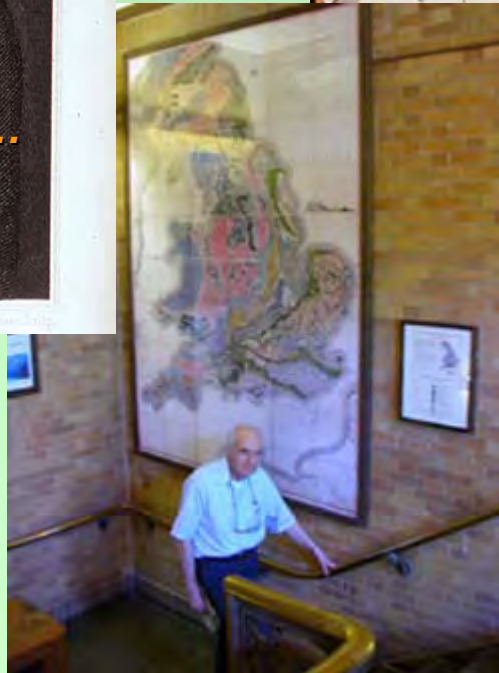
The astute William Smith



*The sequence of strata...
based on their fossil
content!*



Smith's map - 1815



USES OF FOSSILS: Interpreting Ancient Environments, Climate, and Ecology



Coastal swamps

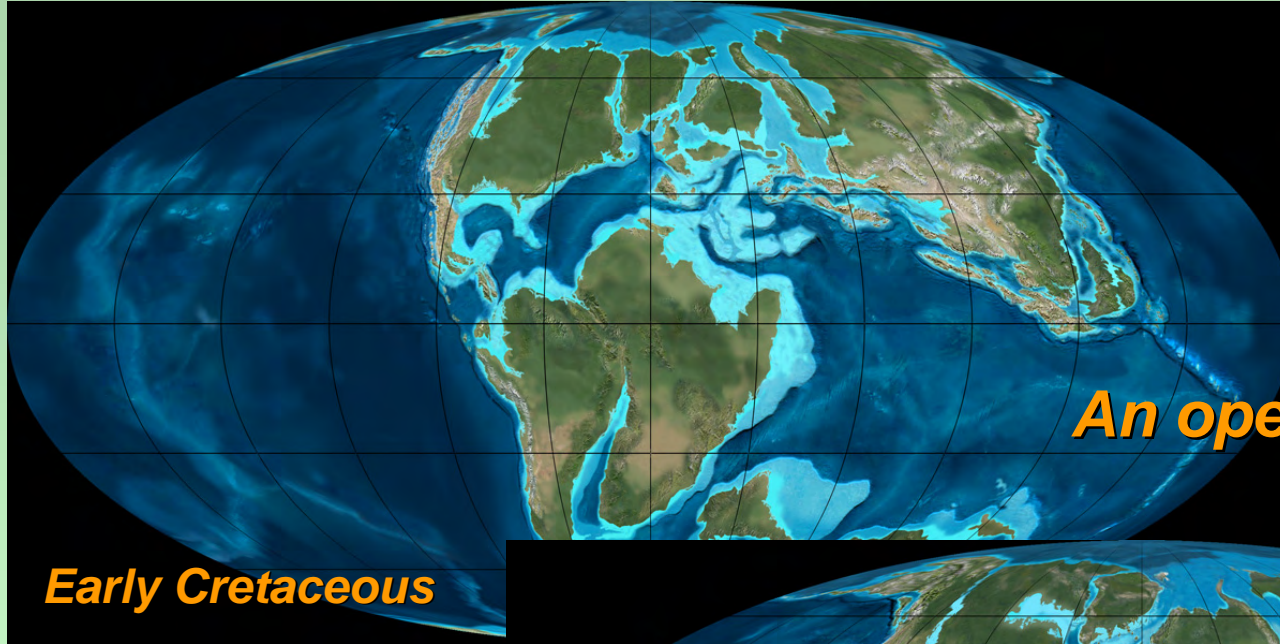


Marine seas



Deserts

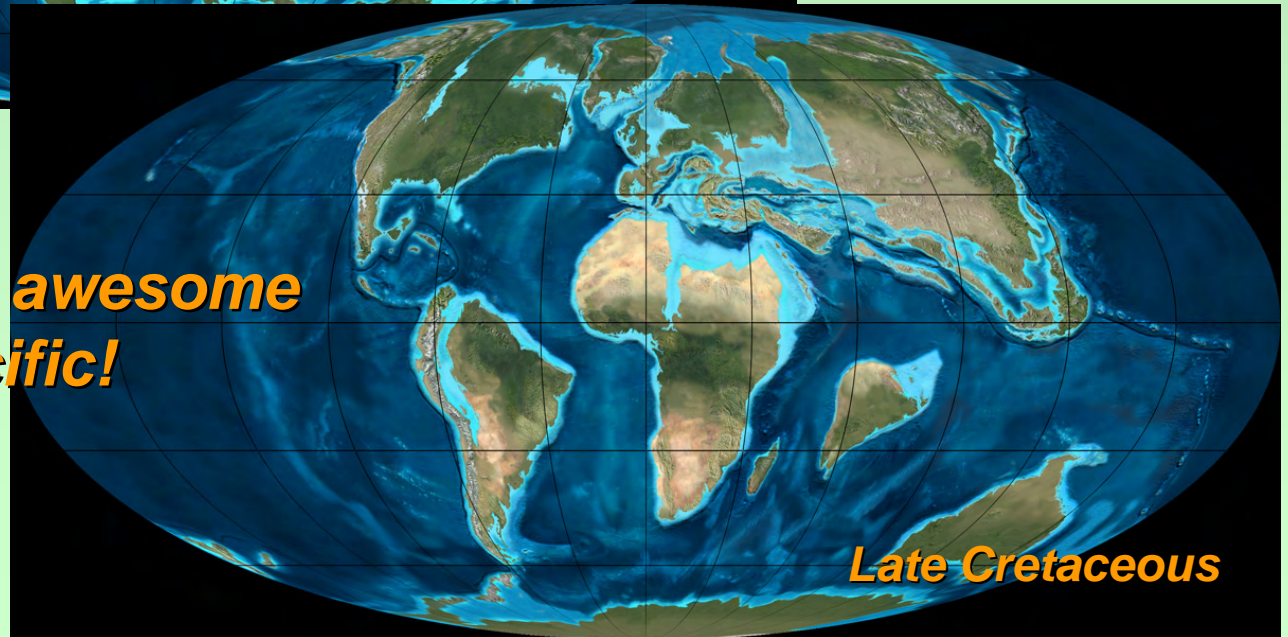
USES OF FOSSILS: Understanding Earth's Ancient Paleogeography



Early Cretaceous

An opening Atlantic...

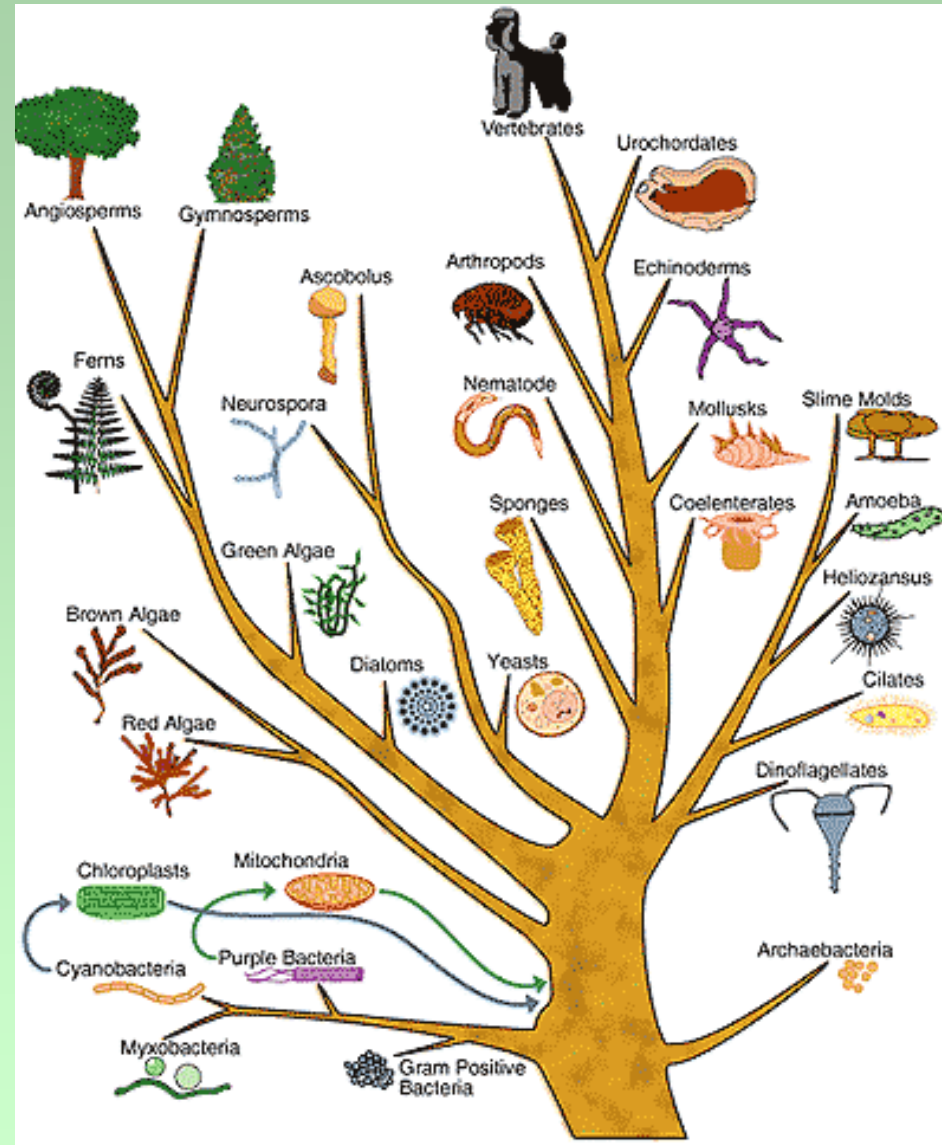
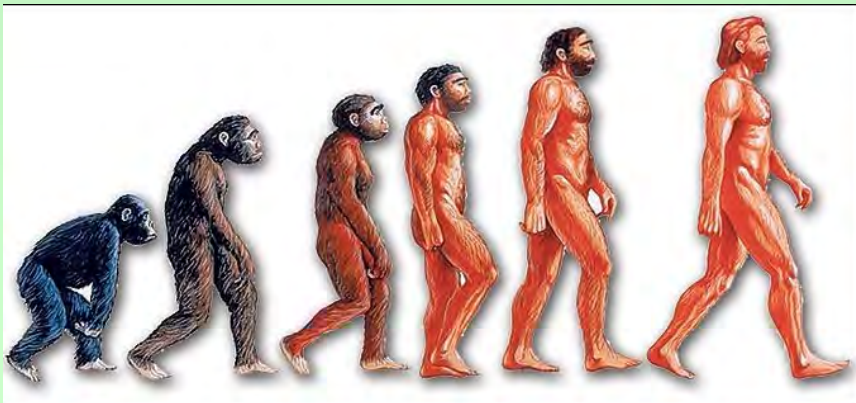
... and an awesome Pacific!



Late Cretaceous

USES OF FOSSILS: Understanding Biological Evolution

The 'evolutionary tree'





Protodipleurosoma sp.

Ediacaran Fauna

Ca. 560 My

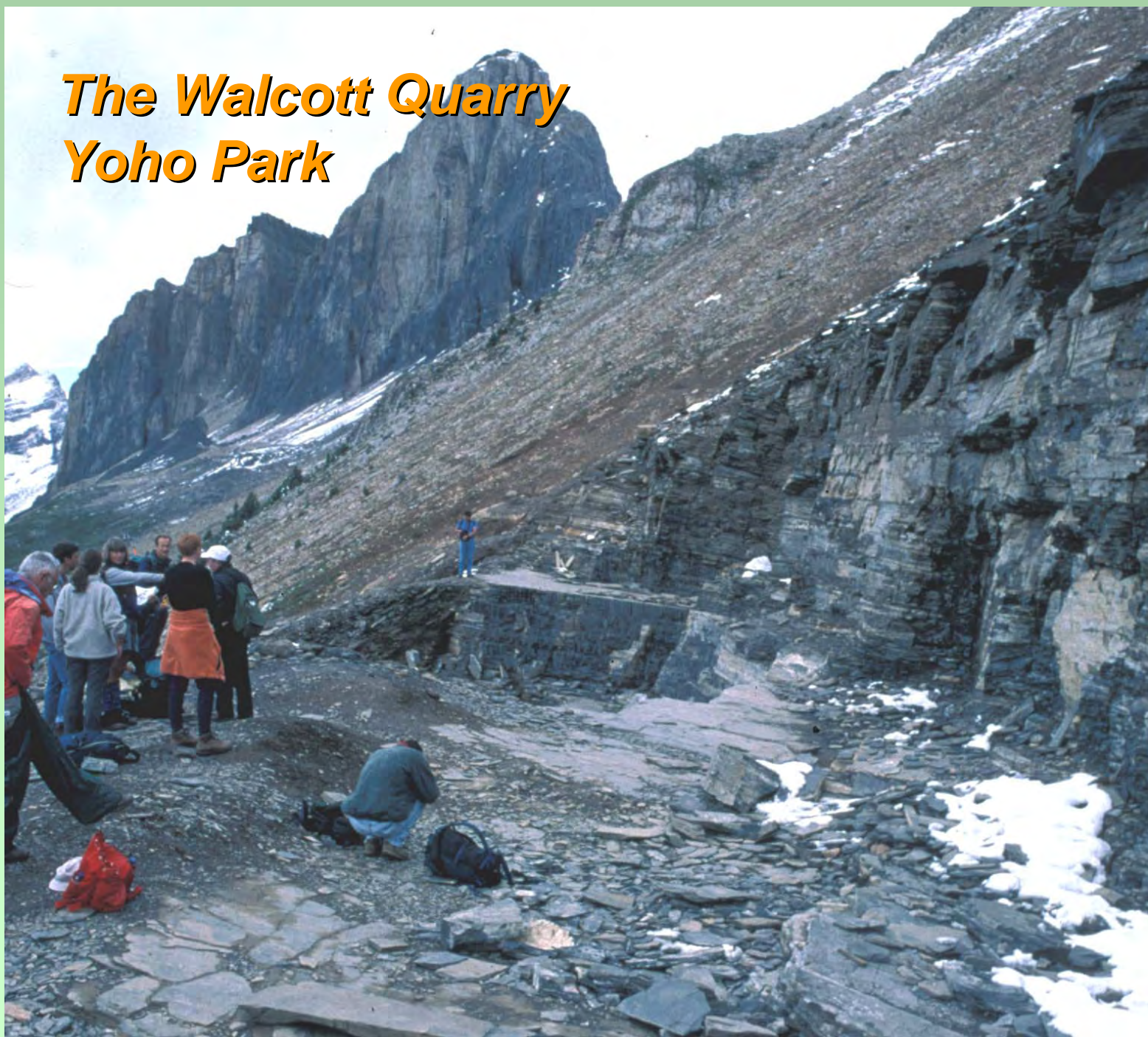
*First discovered at
Ediacara, Australia*

Hofmann et al. (1985)



Irridinitus sp.

The Walcott Quarry Yoho Park



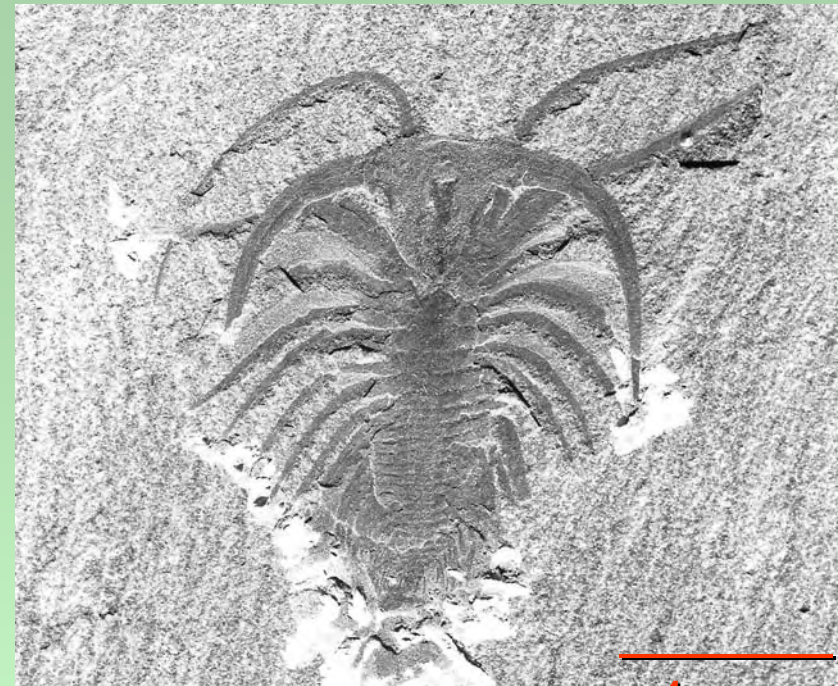
Fossils of the Burgess Shale

A National Treasure in
Yoho National Park,
British Columbia

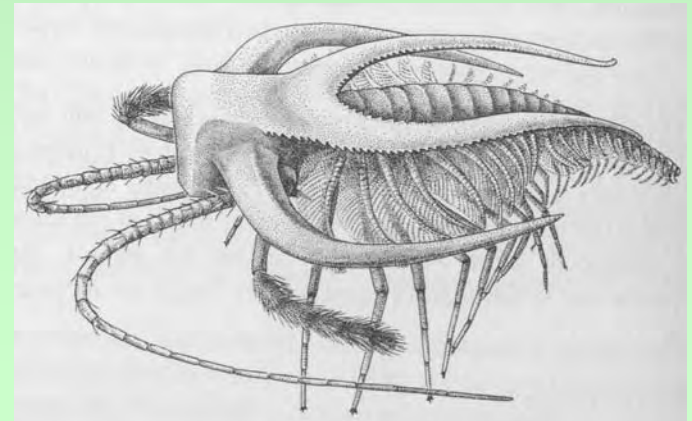


Canada

Marella, the “lace crab”



1 cm



***Wapiti Lake,
Ganoid Ridge anticline***

Ichthyosaur

10 cm



Haida Gwaii (Queen Charlotte Islands)



discovery *BC's giant – the Nahanni ichthyosaurus!*

streamlined and looked like a dolphin.

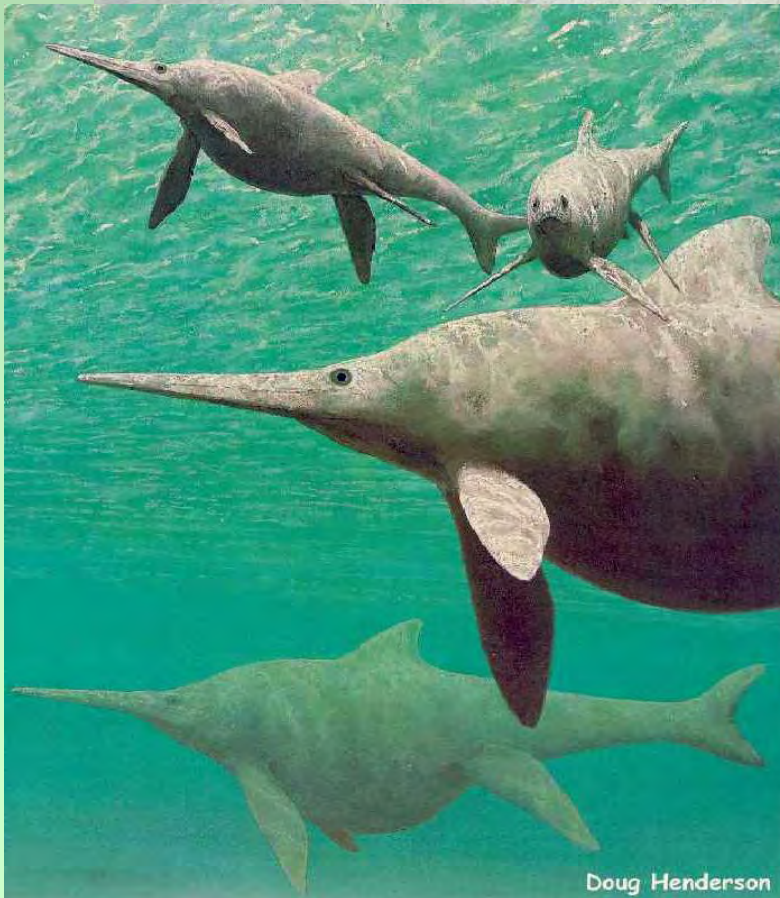
...n, they were ... of acrobat- ... out of the

■ They had long jaws with sharp teeth designed to go after fast-swimming fish, octopuses and other swimming animals. They had large eyes and breathed air through their nostrils.

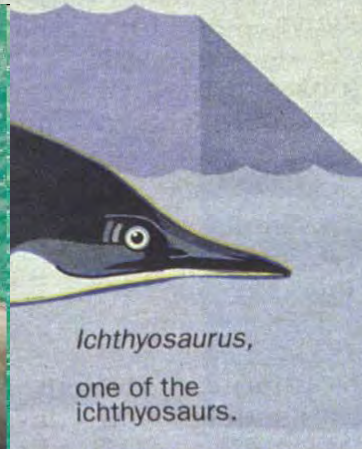
■ Ichthyosaurs gave birth to their live young in the water, unlike other reptiles, which lay eggs.

■ They lived during the Age of Reptiles, the Mesozoic Era, and appeared during the Triassic. They disappeared during the Cretaceous period, about 95 million years ago.

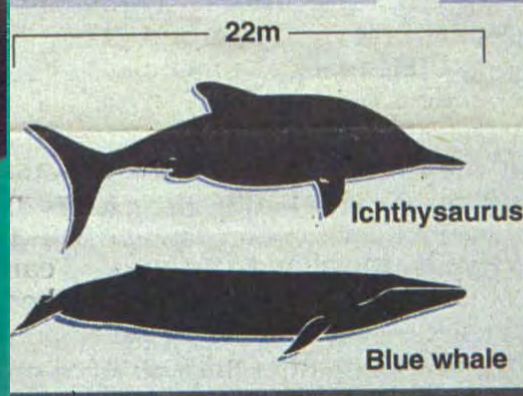
■ Their remains have been discovered in Europe and North America.



Doug Henderson



Ichthyosaurus, one of the ichthyosaurs.



FRANK MYRSKO
SOURCE: THE D

Source: Vancouver Sun newspaper

Excavated in early 2000s...



Preppin



the lift...

There she/he goes!



*And then, the real
work begins...*

*One-half, the back
half, of the skull...*

*That's right, one-
HALF!*

The Holberg ichthyosaur



... hidden in the RBC Museum

Inspired amateurs!

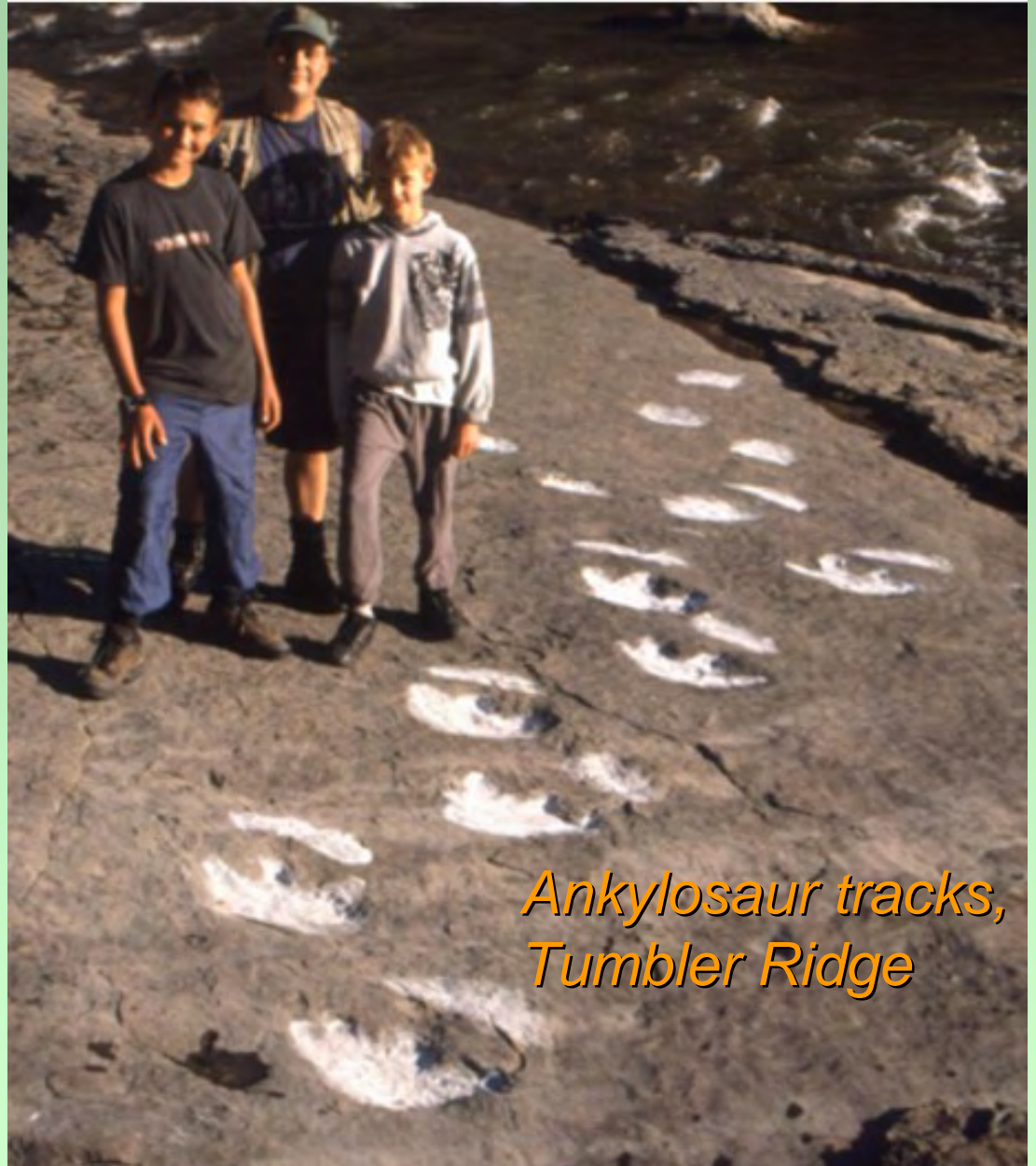


A job well done!



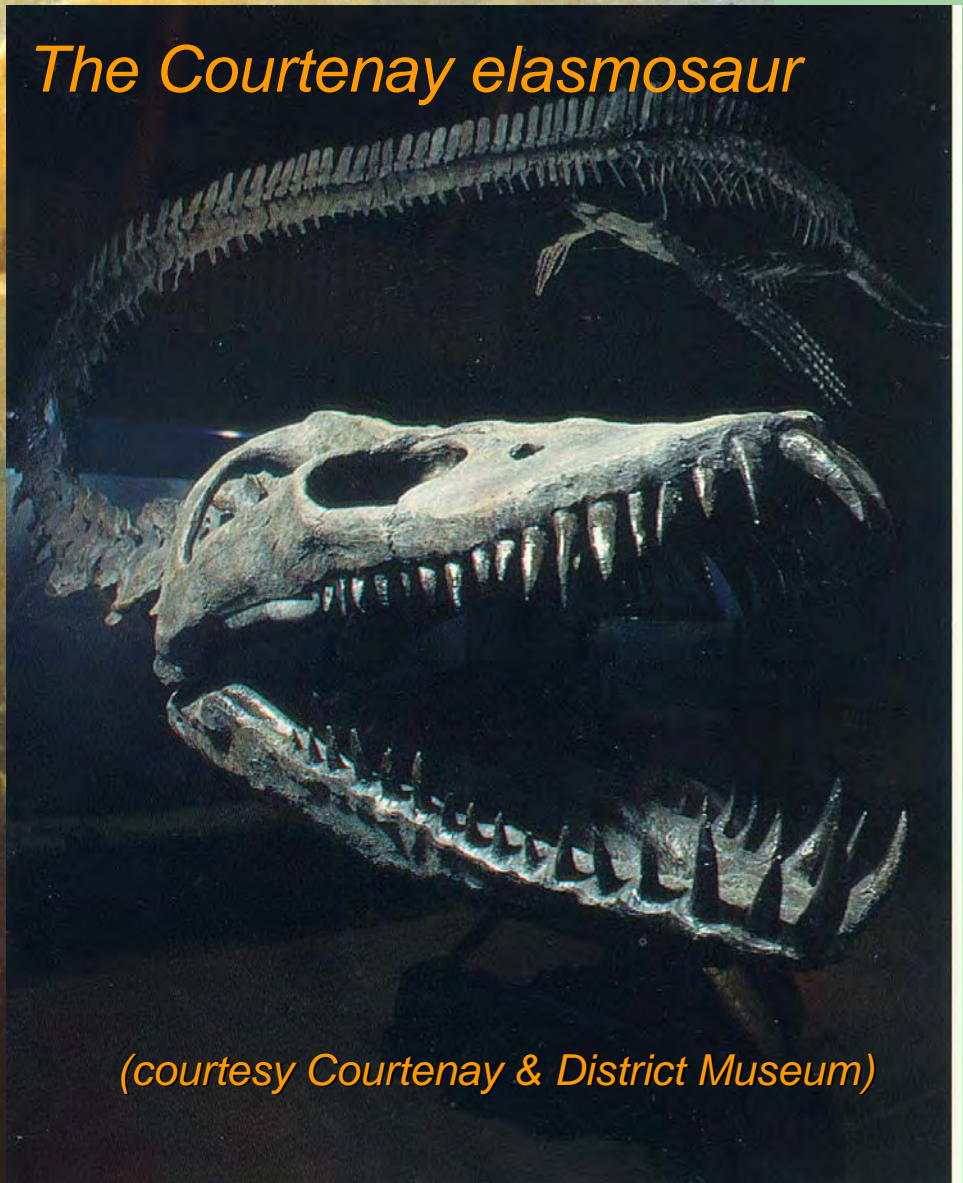
*Peace River
dinosaur
tracks...*

*... now
under
water*



*Ankylosaur tracks,
Tumbler Ridge*

The Courtenay elasmosaur



(courtesy Courtenay & District Museum)

A Late Cretaceous seascape, Vancouver Island

(courtesy Rob Lundquist)



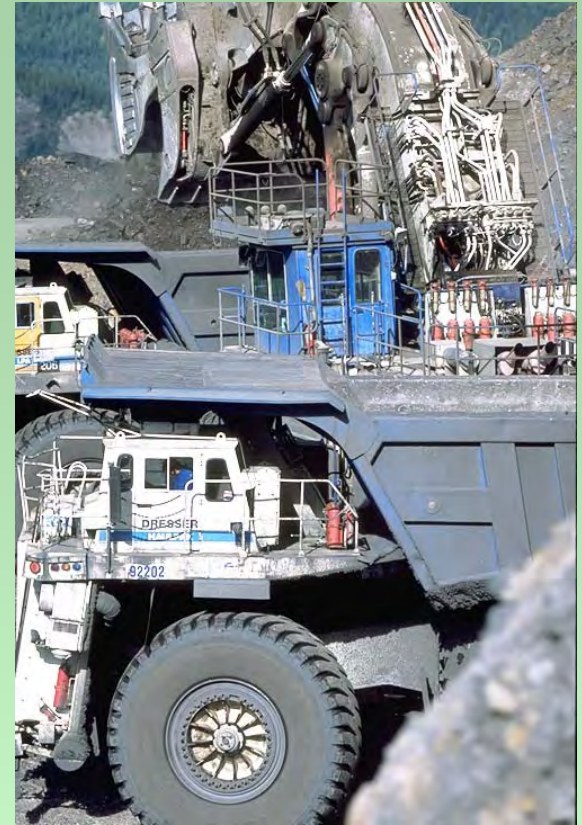
Stauranderaster sp.

(Dan Bowen photo)



Longusorbis sp.

(Rod Bartlett photo)

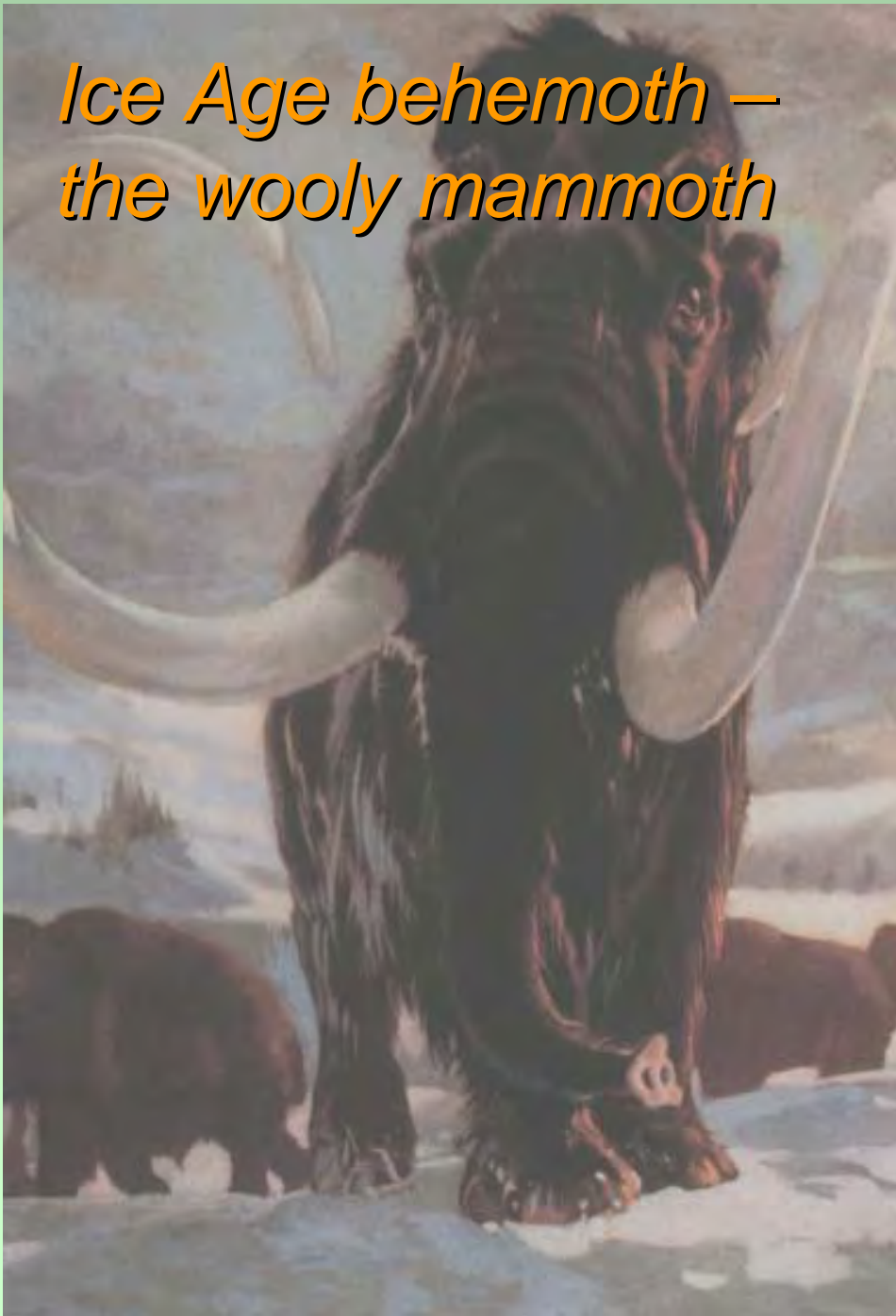


*A new Titanites, a giant ammonite,
comes to light...*

And then goes to Courtenay!

(Courtesy of Elk Valley Coal)

*Ice Age behemoth –
the woolly mammoth*



Mammoth molar
(RBCM specimen)

PALEONTOLOGICAL SOCIETIES OF BRITISH COLUMBIA



Organized under the BC Paleontological Alliance

BCPA



Victoria Palaeo Society

University of BC

Geological Survey of Canada

Professional Institutions

Thompson-Nicola Paleo Society

Royal BC Museum

Vancouver Paleo Society

Local Paleo Societies

BCPA ORGANIZATION



Board of Directors meets 3-4 times per year

BCPA CODE OF ETHICS

Determine the status of the land prior to collecting. Ensure that appropriate permission and/or permits have been obtained from landowners or governmental authorities before venturing to a fossil site. Leave each site as found with respect to gates, fences or constructions on the property.

Practice sound environmental etiquette. Ensure that the size of field groups, as well as collecting methods employed, minimize the impact of collection on the outcrop.

Take appropriate safety precautions while collecting and carry a first aid kit in each field group.

Members will not collect from Paleontological Research Sites.

Collectors must record and maintain documentation of all relevant geographic and stratigraphic information for each fossil in their collections. Every effort should be made to ensure that this information is accessible to interested professional researchers.

Fossil collections must be properly curated. Each specimen should normally have a unique identifying number related to a documented fossil locality. Specimens should be stored in a manner consistent with their long-term preservation. Important specimens should be housed in a recognized paleontological repository.

Sale of fossils for personal or corporate profit by any member of the Alliance is unacceptable.

Members who fail to adhere to these standards may have their membership in the Alliance revoked.

PROFESSIONAL INVOLVEMENT

- Serve on Executive of local societies
- Give popular lectures
- Participate in field trips
- Identify fossils
- Provide scientific expertise

AMATEUR INVOLVEMENT

- Lead meetings and field trips
- Produce periodic newsletter
- Provide local paleo expertise to professional community
- Collect and donate scientifically important specimens

BCPA Field Trips (Hudson Bay Mtn, Smithers)





In this issue:

Late Cretaceous pearls from Vancouver Island
Off-the-grid fossil collecting in Oregon
Dinosaur tracks at Monroe Site - Part 2
Cretaceous marine vertebrates - Chondrichthyes



BCPA Newsletter

3 issues per year

*Produced / edited by
local societies*

*Amateur / professional
contributions*

BC Paleontology Symposium



*Photos courtesy
of Dan Bowen*

AMATEUR CONTRIBUTIONS

The Rene Savenye Award



Photo courtesy of Rod Bartlett

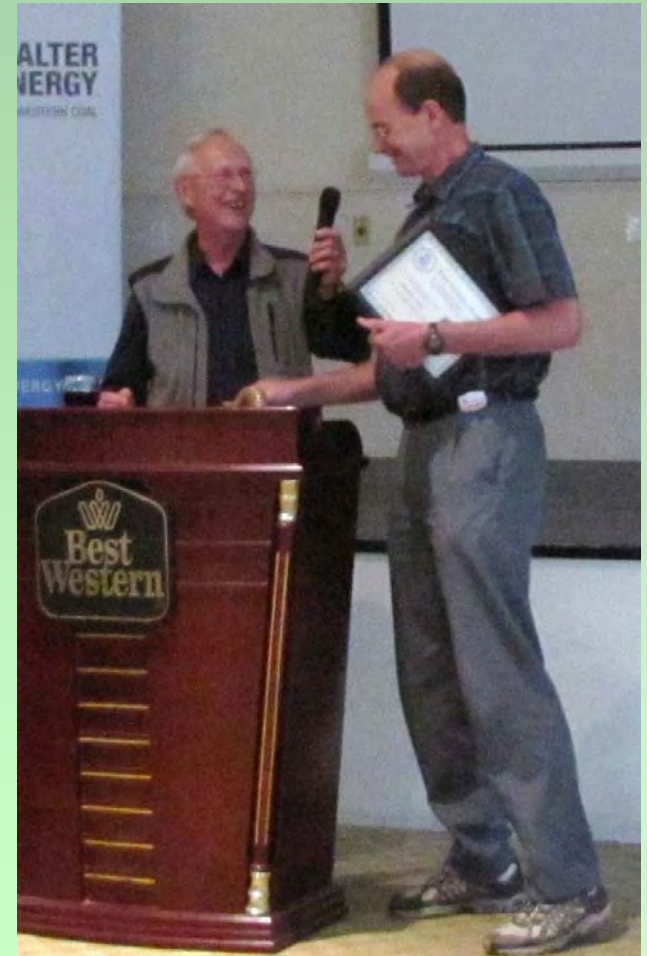


Photo courtesy of Dan Bowen



A CRITICAL ISSUE

British Columbia fossils have been and continue to be threatened from exploitation and loss, due to lack of appropriate government oversight

Since 1997, the BCPA has worked to influence government to better manage paleontological resources, especially with respect to preservation of specific fossil sites and individual specimens

The BCPA has attempted to influence government in this regard through educational efforts, providing scientific expertise, and lobbying for enhanced protected status

Wieder: *Deutsche 1933-1945*

Wagyu Lake, situated in westernmost Oregon, Columbia near the Alberta border, is one of the world's (and) only known examples of the Early to Middle Triassic Pangea, representing the last before the dinosaurs were the land. Wagyu Lake is known for its abundant fossil record, including the earliest known land mammals, which are found in the western edge of the present-day Pangea.



The **rice eel** or **fluke** *Leptocephali* is a group of eels, with a distinctive, elongated, ribbon-like body. They are found in the coastal waters of the Pacific and Atlantic Oceans. The rice eel is a small, slender eel, typically 10-15 cm long. It has a long, thin body with a slightly flattened head. The body is covered in small, dark spots. The rice eel is a common food source for larger fish, including sharks. It is also a popular food item for humans in some parts of the world.

51 Ma Triassic
Mesozoic Era

Fossil Pollen and Climate Change

[illegible]

Neogene	Quaternary
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- *Funded by Geological Survey of Canada, Geological Association of Canada, and Canadian Geological Foundation*
- *Distributed to every school in British Columbia*

EDUCATION - BC Provincial Fossil

The BCPA has urged the British Columbia Provincial Government to establish a Provincial Fossil, as a symbol of British Columbia's extraordinary paleontological wealth.

In this regard, the BCPA has provided scientific expertise and advice on possible candidate fossils.



Establishment of a Provincial Fossil would provide a significant opportunity to highlight British Columbia's fossil resources and to improve public awareness of those resources.

SCIENTIFIC EXPERTISE

*BCPA brings together
necessary site-specific
paleontological
resource expertise to
make the case for
preservation*

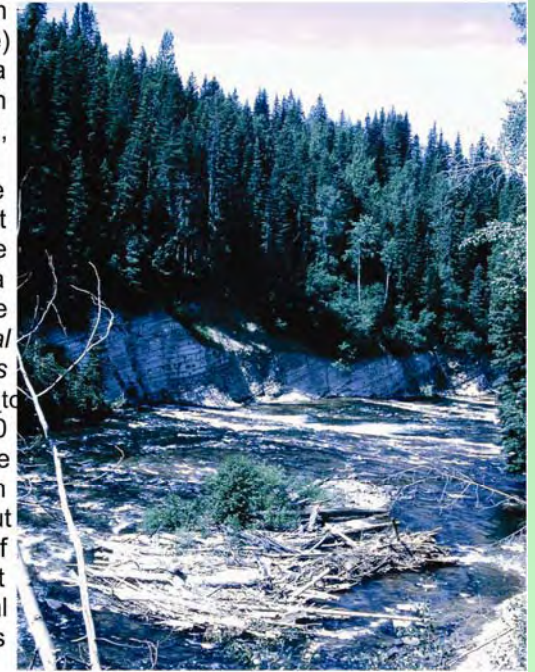


Significance of the Horsefly Fossil Site, British Columbia

Compiled by the British Columbia Paleontological Alliance

Based on Contributions from S.B. Archibald, J.F. Basinger, D.R. Greenwood, R.W. Mathewes and M.V.H. Wilson

The Horsefly fossil locality in British Columbia is a preserved lacustrine (lake) sedimentary succession that provides a significant record of life in British Columbia during the Eocene Epoch, some 50 million years ago. The importance of the site is reflected in the enormous amount of discussion about the site that has appeared in the scientific literature over the years. As a good example, the recent issue (February 2005) of the *Canadian Journal of Earth Sciences* (http://pubs.nrc-cnrc.gc.ca/cgi-bin/rp/rp2_to_cs_e?cjes_cjes2-05_42) contains 10 scientific papers analyzing the Eocene fossils, rocks and environments of British Columbia, and detailed information about the Horsefly site can be found in 6 of those papers. An appendix to this report provides a partial listing of additional scientific papers in which the site and its fossil biota have been discussed.



Specifically, the Horsefly site is considered of high paleontological significance because:

- The site records evidence of life during the Eocene, a geological epoch when the world was substantially warmer than today, in part due to a naturally-enhanced greenhouse effect caused by higher than present-day levels of greenhouse gases such as carbon dioxide.
- The quality of preservation of the macrofossils (mainly fish, insects and plants) and the microfossils (mainly pollen and diatoms) found at the site is simply

SCIENTIFIC EXPERTISE

*LRMP reports, covering
paleontological resources*

*Kamloops
Okanagan-Shuswap
Lillooet
Dawson Creek
Lakes District*

Paleontological Resources of the Lillooet Land Resource Management Plan (LRMP) Area, British Columbia

Prepared by the
British Columbia Paleontological Alliance

J. W. Haggart, Chair and Compiler

R. L. Richstad, Compiler



Geological Survey of Canada
Open File 3588
1998



Natural Resources
Canada

Resources naturelles
Canada

Canada

SCIENTIFIC EXPERTISE

20 No-Staking Reserves established around BC

*Designed to prevent staking
for fossil resources*

*Resulted in formal
designation that staking for
fossils was not allowed*

PROPOSED NO-STAKING RESERVE

Browns River

Location: Approx. 3 km West of the City of Courtenay, Vancouver Island, British Columbia.

NTS Map: 92F/11 (Forbidden Plateau)

Commencing at:

UTM Zone 10 349 630E 5506 240N Lat. 49°41'35"N Long. 125°05'05"W

This is the location of the contact between the Haslam Formation and the underlying Comox Formation.

Terminating at:

UTM Zone 10 352 256E 5505 935N Lat. 49°41'24"N Long. 125°02'54"W

This is the location of the confluence of Browns River with Puntledge River.

Description: River exposure. Distance of approx. 2.5 km from contact with underlying Comox Formation to confluence with Puntledge River. Semi-continuous outcrop in riverbed and eroded embankment. A reserve width of 100 metres above river centre (50 metres either side) will encompass embankment.

Lithography: Shale, mudstone and siltstone, Haslam Formation, Nanaimo Group

Significance: Upper Cretaceous (Santonian-Campanian) marine fossils, diverse assemblage of invertebrates, with high probability for significant marine vertebrate fossils.



Map of Browns River showing area of proposed No-Staking Reserve outlined in yellow

SUCCESS!

Land Tenures Branch - Ministry of Forests, Lands and Natural Resource Operations - Mozilla Firefox

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http://www.for.gov.bc.ca/Land_Tenures/fossil_management/index.html

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BRITISH COLUMBIA

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Ministry of Forests, Lands and Natural Resource Operations

Land Tenures Branch


Fossil Management in British Columbia

Introduction

The Land Tenure Branch is leading the implementation of the fossil management framework for British Columbia.

The development and implementation of the framework are guided by the following fossil management principles:


- Fossils and fossil sites are important to British Columbia as heritage resources.
- The order of priority for fossil management is science, natural heritage, education and, where appropriate, commercial use.



94% of the land in British Columbia is Provincial Crown Land

5% is privately owned

1% is Federal Crown land



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SUMMARY

- *The British Columbia Paleontological Alliance (BCPA) brings amateurs and professionals together in working towards an enhanced public understanding of the importance of paleontology*
- *The BCPA has a strong record of providing scientifically-based fossil resource information for land planners*
- *The BCPA has advocated for a strong Fossil Resource Management Policy within British Columbia*
- *The BCPA will continue to work with land planners on behalf to protect paleontological resources of British Columbia*
- *Be sure and vote for your favourite for the British Columbia Provincial Fossil!*