BONEBED

NAME, LOCATION, & Fm.	GEOLOGIC AGE	Number of Skeletal Elements (NSE), dinosaurs	MNI dinosaurs	AGE STRUCTURE[2] dinosaurs	TAXONOMIC DIVERSITY[3]
Liscomb: Colville River, N.S. of Alaska Prince Creek Formation Gangloff, 1994 Fiorillo & Gangloff, 1999[1] Fiorillo & Gangloff, 2000	U. Camp.-L.Maast 68.0-72.9 MA	dinosaurs 3135	36	**E**arly **J**uvenile ? **to S**ub-**A**dult**, L**ate **J**uveniles dominant.	multitaxic: hadrosaurid, troodontid, dromaeosaur, & tyrannosaur. *Troodon* teeth the most abundant
Blacktail Creek North, NW Montana Two Medicine Formation Varricchio & Horner, 1993	Upper Campanian >74.0 MA	1450	18	**E**arly **N**estling(?) to **L**ate **N**estling, LN dominant	multitaxic; lambeosaurid & theropod
West Hadrosaur Bonebed, NW Montana Two Medicine Formation Varricchio & Horner, 1993	Upper Campanian >74.0 MA	194	9	LJ to **A**dult, LJ dominate	multitaxic; hadrosaurid & theropod
Jack's Birthday Site, NW Montana Two Medicine Formation Five quarries excavated Varricchio & Horner, 1993	Upper Campanian >74.0 MA	1660	40	LN(?) to SA, LJ & SA dominate	multitaxic; 15 dinosaurs, 12 other vertebrate taxa

COMPARISON

TAXONOMIC ABUNDANCE³	ASSOCIATED NON-DINO FAUNA	SKELETAL SPECIMEN DENSITY/M²	DEGREE OF ARTICULATION	VOORHIES GROUPS	WEATHER-ING INDEX³
low diversity, monodominant---*Edmontosaurus* sp., theropods almost exclusively repre-sented by teeth	rare teleost & chondricthian fish elements present.	specimen range: 23-114; element range: 25-82 moderate deg-ree of grading with most large bones near base	very rare, some related elements, such as pelvic, lower limb, & cau-dal vertebrae are closely associat.	all groups rep-resented;skul-ls disarticulated; group I overrep-resented	0-2; 0-1dom-inant
low diversity, monodominant-Ind lambeosaurid; theropod represen-by shed teeth	NONE ?	100 Comprised of skeletal elements that are complete or nearly so. No interval given	Predominantly disarticulated, with some articu-lation or degree of association	All groups pro-portionally rep-resented.	0-1
low diversity, mon-odominant--Maia-*saura peeblesorum* theropod repre-sented by shed teeth	some turtle, champsosaur, & croco-dilian elements present	5 Comprised of skeletal elements that are complete or nearly so. No interval given	Predominantly disarticulated with some deg-ree of associa-tion.	Group I is un-derrepresented	0-2or 3, only adult is 2-3
high diversity, mul-tidominant--hadro-saurids & thero-pods most diverse:	Fish, amphibia, turtles, champso-saur, pterosaur, crocodilian, mammal, lizard, & misc. verts present; a var-iety of freshwater & land gastopods	9-->45 no interval given; bed thick-ness 10-27 cm Skeletal speci-	Predominantly disarticulated with some deg-ree of associa-	All groups pro-portionally rep-resented. Stock-ier elements	0-3 varies widely be-tween quar-ries & within

CHART

ABRASION INDEX	HOST LITHOTOPE	PALEOENVIRONMENT	ICHNO FOSSILS
0-2; 0-1 dominant	organic-rich course to med siltstone, clay & sand fractions vary; TOC of 6.85 -10.55 wt% Calcareous cement with minor chalcedony, pyrite, hematite, mica & glass shards. Clay-rich siltstone exhibits fair to moderate parting. Permineralized wood rare, stem fragments very abundant	Crevasse-splays formed ephemeral floodplain ponds and wet soils formed due to high summer rains. Low (2-8°MAT) produced low diversity flora & retarded decay. Abundant influx of overbank sediments inhibited coal formation except for fusain and other low-grade types. Bonebed the result of two events. First a mass-death event was followed by transport onto the floodplain by a crevasse-splay with dense skeletal accumulations near splay terminus. Splays & associated deposits part of anastomosing fluvial system.	Skin impressions very rare. Bite-marks on % of a range of skeletal elements. Paleopathology: healed breaks and osteochondrosis and some other lesions present.
0-1	silty mudstone	Crevasse-splay that was part of prograding coastal plain & alluvial apron that formed a clastic wedge between Rocky Mtns & GWIS. Warm semi-arid climate with short periods of seasonal rainfall. Splays part of anastomosing fluvial system.	bite-marks ~1% trackways?
0-1 for juveniles, adult unclear	silty mudstone	Overbank pond or alluvial wetland--see above for regional context.	bite-marks ~1% trackways?
0-3 with 0 being dominant, 3-16% of bones	calcic, poorly sorted mudstone (clayey siltstone) massive to weakly fissile silt & sand (mostly angu-	Overbank pond, shallow small ephemeral lake, to wet alluvial plain separated by fluctuating shoreline. Possible trampling of skeletons on saturated soils modifying breakage patterns. Region-	bite-marks ~1%

Varricchio, 1995

Edmontosaurus Bonebed, E. Wyoming Lance Formation Main quarry & six test quarries Chadwick et al, 2006	U. Maastrichtian	none reported thus far	none reported thus far Estimate of 10,000 to 25,000 over 40 hectares	not reported thus far	multitaxic, three taxa thus far
Bleriot Ferry Day Digs Bone Bed lower Horseshoe Canyon Formation Drumheller Valley, S. Alberta, Canada Lam & Ryan, 2001 Sullivan, 2003	Upper Campanian 71-72 MA	>2000 elements	not reported	adults dominate, ~80%	multitaxic, three taxa
Fox Coluee Quarry, Drumheller Valley S. Alberta, Canada lower Horseshoe Canyon Formation	Upper Campanian 71-72 MA	~350	not reported	juveniles & subadults dominate	multitaxic, two taxa

Troodon & tyrannosaurids.	along with a few bivalves and ostracods.	mens concentrated in lower 3/5 of bed. Most lie along base.	tion.	more common, gracile elements underrepresented.	50m.
low diversity, monodominant---Edmon*tosaurus sp., Triceratops, & Tyrranosaurus*	None reported thus far	Large bones at base grading up to vertebrae & phalanges	Predominantly disarticulated with some partially disarticulated groupings	not reported	0-1
low diversity, monodominant--*Edmontosaurus, Pachyrhinosaurus canadensis, & Albertosaurus*, this theropod comprises ~14% of skeletal totals	Ampibians Opisthotriton & Scapher*peton,the ray Myledaphus, a fish Lepisosteus, and an Ind. Turtle*	2000 elements from 100 m² Bed is 1m thick.	Articulated & disarticulated, first almost complete *Pachyrhinosaurus* skull taken here	All groups represented, but some underrepresented vertebrae & ribs, >80%, pectoral & pelvic, ~5%, limb elements, ~5%	unreported
low diversity, monodominant--Edmonto*saurus & Alberto-*	not specified	not reported	not reported	not reported	unreported

show wear	lar quartz) make up 10% by wt., coalified wood and organic-rich laminae found at some quarries	al context as above. Pond or lake may have been site of seasonal water source drawing groups of specific taxa that were killed by toxic events.	
0-1	poorly consolidated clay-stone or mudstone	reported as a nearshore freshwater environment then remobilized and redeposited in deeper water. Unclear as to whether it was an overbank lake on a floodplain or was marginal to an ocean shore---paralic.	none reported
most elements were complete prior to recent weathering	organic-rich mudstone with coalified plant fragments & amber.	Overbank pond on floodplain, paralic environment, foreshore of GWIS. Associated taxa derived from inland terrestrial and local freshwater communities.	Bite-marks abun-dant, attributed to *Albertosaurus.* 150 isolated teeth & post-cranial ele-ments collected
unreported	mudstone	See above---the BFDD bonebed	bite-marks rare de-spite abundance of large theropod

Lam & Ryan, 2001

Spring Creek Hadrosaur Bonebed, near Grand Prairie, Alberta, Canada Wapiti Formation Tanke, 2004 Only preliminary results thus far	Upper Campanian 73-74 MA	~50 total, no NISP reported	not reported	Dominated by subadults could be late juveniles, but this is unclear. "suggestive of a "bachelor" herd" (Tanke, 2004)	monotaxic, hadrosaur
Concordia Hadrosaur Site, NW South Dakota lower Hell Creek Formation, Little Beaver Creek Member Colson, et al, 2004	L. Maastrichtian 69-70 MA Sampson & Loewen, 2007	not reported	not reported	Ranges from lJ to A. A & SA dominant based on femur lengths	multitaxic, hadrosaur & tyrannosaurid.
Blagoveschensk Bonebed, Amur Region Russian Far East Udurchukan Lauters et al, 2008	Mid to Upper Maastrichtian	Nearly 1,000	not reported	LJ to adults, dominated by LJ with SA the next most common; based on size of various bones, a few reach 1M	multitaxic: hadrosaurine & lambeo- th saurine, theropod, & sauropod

saurus. The latter is represented by shed teeth, 50 collected.					
low diversity, mono-dominant, ind. Hadro-saurine based on post cranial elements	non reported	not reported	disarticulated	not reported	0?
low diversity, mono-dominant--Edmonto-*saurus,* tyrannosaurid represented by teeth	fresh water bivalves, unionids & Sph-aerium; snails: Lioplacodes,Campe-*loma, Viviarus; ind. Bird bones; fish* scales, turtle, crocodilians, champ-sosaur bones.	reported as dens-ly packed	disarticulated	not reported	0
low diversity, mono-dominant--*Amuro-saurus riabinini* ac-counts for 90%; *Ker-erosaurus manakini* Theropod, & sauropod represented by a few bones and teeth	Turtle fragments reported	0--18 no interval; Most elements con-centrated near base of bed--den-sity sorting high, size sorting poor. Density deter-mined from quar-	disarticulation dominant, some articulation--one skull, sacrum, tibia-fibula, verts, & two ischia	All groups pres-ent, limb & girdles overrepresented, verts, manus & pes underrepre-sented.	0-1

			teeth
0? Most bones complete & well preserved	soft fissile carbonaceous shale	not reported	not reported
0	organic-rich claystone to shale & siltstone with coalified plant debris but no coal, organic content 5-60% by volume; up to 70%clay Claystone characterized as being "peaty." Amber present.	paralic, at the transition from an extensive coastal swamp, or low mire, to a fluvially dominated, environment. This was part of upper shoreface to foreshore environments that occurred during progradation of sediments into the Fox Hills seaway.	not reported
1-2?	Claystone diamicts with dispersed coarse clasts conglomerate lenses, but stratification poor to absent Skeletal elements in main bonbed concentrated near base	Gravity flows along uplifted margin of the Zeya-Bureya Basin.	<2% of bones exhibit tooth-marks

Westside Quarry NW Montana Two Medicine Formation Rogers, 1990	Mid to Upper Campanian	378	5	4 adults & one juvenile	multitaxic: hadrosaur, theropod, & ankylosaur
Pipestone Creek Pachyrhinosaur bonebed Grand Prairie, N. Alberta, Canada Wapiti Formation Tanke, 2004 Currie, et al., 2008 Ralrick and Tanke, 2008	Upper Campanian >73 MA	1,395	minimum of 5	EJ to A, all age classes except neonates	multitaxic: ceratopsid & theropods
Careless Creek Quarry, SC. Montana Judith River Formation Fiorillo, 1991a	Mid-Upper Campanian, >78 MA	595/1500 Total number of specimens includes 26 vertebrate families	73, 6 being standard MNI	LJ to SA & Adults; juvenile ceratopsid: Avaceratops *lammersi;* juvenile lambeosaur	multitaxic: ceratopsids, theropods, ankylosaur, & a pachycephalosaur
Overbank-Hosted Ceratopsian Bonebeds SC Alberta, Canada Dinosaur Park Formation, BBO30 & O91	Upper Campanian 74-76 MA	172/714 elements/ specimens	3 to 4	J to SA & Adults, based on Ryan et al, 2001 and most likely would equal	multitaxic; ceratopsids, theropods & hadrosaurs

		ry map.			
low diversity, mono-dominant--Prosauro-*lophus n.sp. Alberto-saurus? Known from* teeth. Nodosaurid tooth collected.	One lizard vertebra collected.	400 elements within ~47m² elements ran-domly scattered, most subhori-zontal, some near vertical	primarily disarti-culated, some vertebrae articu-lated	Groups I-III, dom-inated by II & III	0
low diversity, mono-dominant--pachyrhino-saurine, Troodon, & *Albertosaurus.* >99% of bones repre-sent *Pachyrhinosaurus lakustai (Currie,et al.,* 2008)	Fish, turtle, and crocodilian bones collected	200/m² No vertical inter-val given;elements randomely scat-tered & concen-trated near base of 23-25 cm (ave.) thick bonebed	primaily disar-ticulated, unus-ual number of ar-ticulated skulls, 50-75% comp-lete found every 1.5-2.0 m²; bones commonly in con-tact	Groups I-III pre-sent, I 70.7%; II 23.7%; III 5.6%	0.1?
high diversity, multi-dominant---Dromaeo-sauridae, Hadrosaur-idae, & Ceratopsidae among dinosaurs; Crocodylinae, Trio-nychidae and Chi-maridae among other vertebrates	Chondrichthyes, Osteichthyes, tur-tles, crocodilians, champsosaur, & mammal; should be noted that most of the diversity is related to the use of screening for microvertebrates.	closely associ-ated with concen-trations of carbon-ized tree limbs that are interpre-ted as a "log jam"	primarily disar-ticuled with a subset of assoc-iated elements;	Groups I & II, I overrepresented	0-1
low diversity, mono-dominant--Ceratopsids including Centro-	Crocodilians, champsosaurs, turtles, and amphibians based on NSIP.	49-129/m² using only NISP & nonrepeating	primarily disar-ticulated with rare articulated	Groups I to III present, but II & III overrepresented	0-1

0 abrasion, but fragmentation common, possibly due to trampling	blocky, poorly indurated, silty mudstone. More than 60% of matrix composed of clay. Most abundant is smectite & only traces of kaolinite & illite. Pedogenic relics common including incipient caliche nodules	Floodplain waterhole or ephemeral pond overbank pond, wetland;	no tooth-marks
0-1?	soft carbonaceous siltstone that is easily removed upon drying; insect-bering amber found	Continuous terrestrial-fluvial sequence that is paralic and part of prograding clastic wedges along western margin of GWIS. Lacks the estuarine wedge (Drumheller Marine Tongue) of the Horseshoe Canyon Fm.	bones with tooth-marks rare; evidence for scavenging by both Tro*odon & Albertosaurus implied,* not stated
0, transverse fractures account for>98%, 1.8% spiral	3m thick fine to coarse-grained sandstone with interbeds of mudstone & pebble conglomerate; mudstone interbeds discontinuous to locally continuous; underlain by organic-rich shale	Stream channel in a meadering fluvial system; part of aggrading coastal plain dominated by fluviatile sedimentation, coastal plain lay between alluvial fans to the west and the GWIS to the east; bones represent two distinct origins, one being bloat & float carcasses damed by a log jam, the other being unassociated & sorted remains carried as bed & suspended load	1.5% of elements show bite-marks
1, breakage common	30-40cm thick beds of organic-rich sandy claystone & siltstone--mudrock;	Overbank deposits that were part of low to high sinuosity, alluvial to tidally-influenced fluvial system with wide to deep channels developed on the	<5% of elemets show bite-marks

Eberth & Getty, 2005

Horner et al, 2000 LJ

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1. Complete reference citations are found in the text of the paper
2. Age profile categories follow Horner et al, 2000.
3. Taxonomic abundance and diversity nomenclature after Eberth et al., 2007

saurus apertus make up 91-96% of the NISP Tyrannosauridae are the next most abundant with Hadrosauridae and Dromaeosaur idea next	elements yielded 20-50/m²; normally graded with smaller fragments higher than larger ones	sections such as sacra.	vertebral elements= <5%; phalanges ~5%

dominant matrix is very fine sandstone with large proportion of siltstone & claystone	eastern edge of a broad, low-gradient coastal plain along the western shoreline of the GWIS.