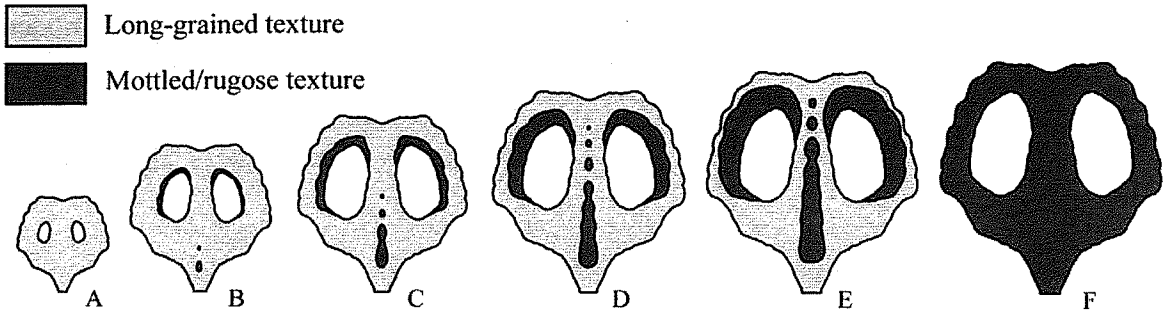

Fig 2. Diagrammatic size series of generalized centrosaurine parietals showing texture distribution and pattern. Parietals represent generalized centrosaurine morphology only and do not show diagnostic ornamentation.

Was Triceratops Like a Bison, Rhino or Hippo? Implications for Lifestyle and Habitat.

Richard Bykowski[1] and Gregory Retallack[2]

[1]Department of Geological Sciences, University of Oregon, Eugene, Oregon. 97401, rbykowsk@uoregon.edu.[1]
[2]Department of Geological Sciences, University of Oregon, Eugene, Oregon. 97401. gregr@uoregon.edu.

Reconstructions of *Triceratops* have changed several times since its initial discovery by Marsh in the 1880's. Most concepts of this dinosaur came from assigning an environment and habitat analogous to that of extant rhinos and American bison. To accommodate this image, *Triceratops* was depicted with parasagittally-oriented limbs. Bakker and Paul advocated erect posture and hypothesized that *Triceratops* was capable of galloping at high speeds across open range habitat. However, recent discoveries of complete *Triceratops* indicate different locomotion and lifestyle. For example, Dodson envisages *Triceratops* in sprawling posture, with the humerus held sub-horizontal, and indicates shoulder and elbow anatomy preventing *Triceratops* from moving in the manner of a cursorial galloper. Measurement of the distal and proximal limb bones of *Triceratops horridus*, *Hippopotamus amphibius, Bison bison* and several species of rhinos yield significant data that ordinate *Triceratops* closer to hippo than bison or rhino in cursorial habit. Proportion of the eye orbit above the skull table in *Triceratops* is also more like a hippo than bison or rhino. Correlations within fossil faunal zones across Western North America link *Triceratops* specimens within a lowland, coastal floodplain zone and not with the dry, arid upland zone as would traditionally been expected. Retallack suggests that *Triceratops* might have been more like the modern hippo than bison or rhino, based on the discoveries of fossils in wetland paleosols within this lowland, coastal floodplain zone. Given this paleosol preference along with limb proportions and eye orbit measurements of this

[1] Currently transitioning to Masters Program, Department of Geoscience, University of Iowa, Iowa City, IA 52242. Contact (773) 484-0060 or at bykoric@aol.com.

dinosaur, it is likely that *Triceratops* occupied a niche comparable with that of the modern hippopotamus.

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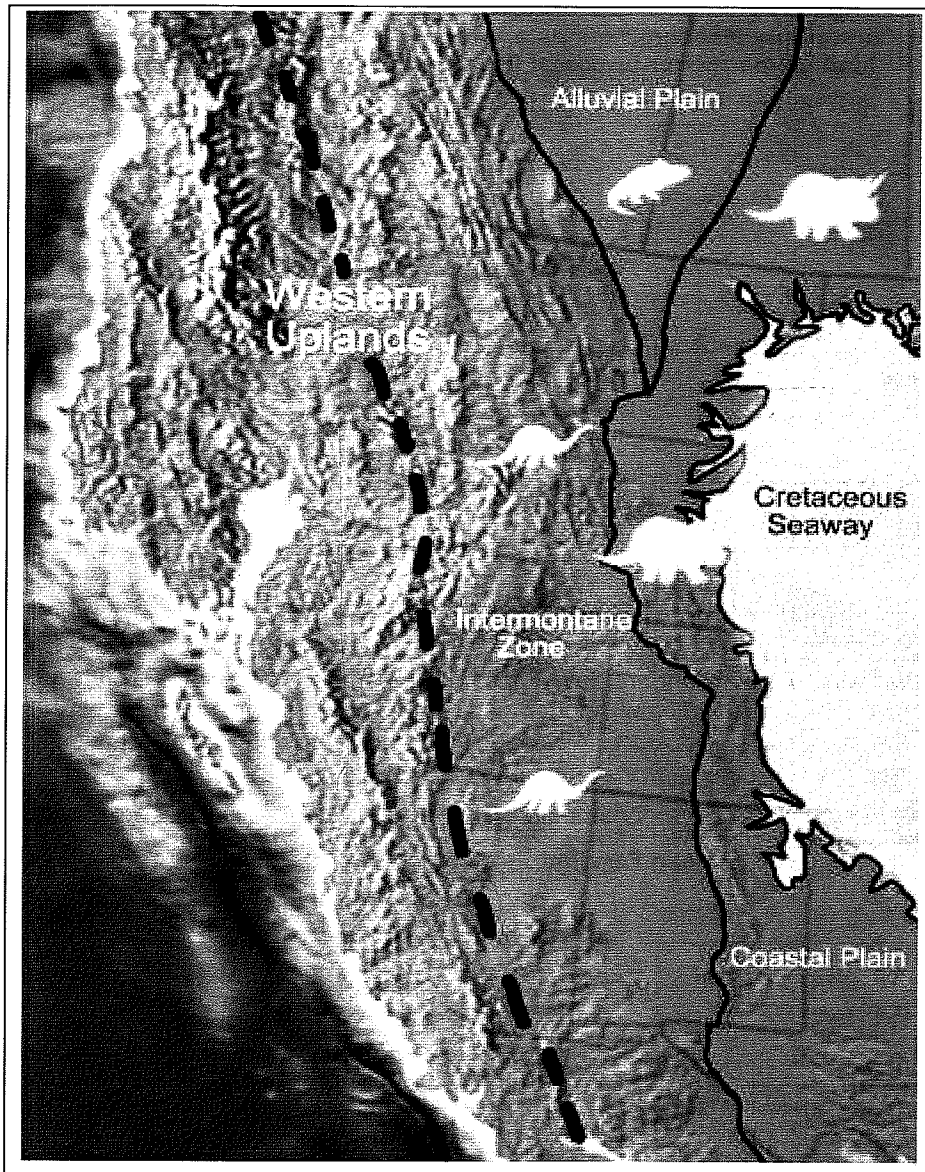
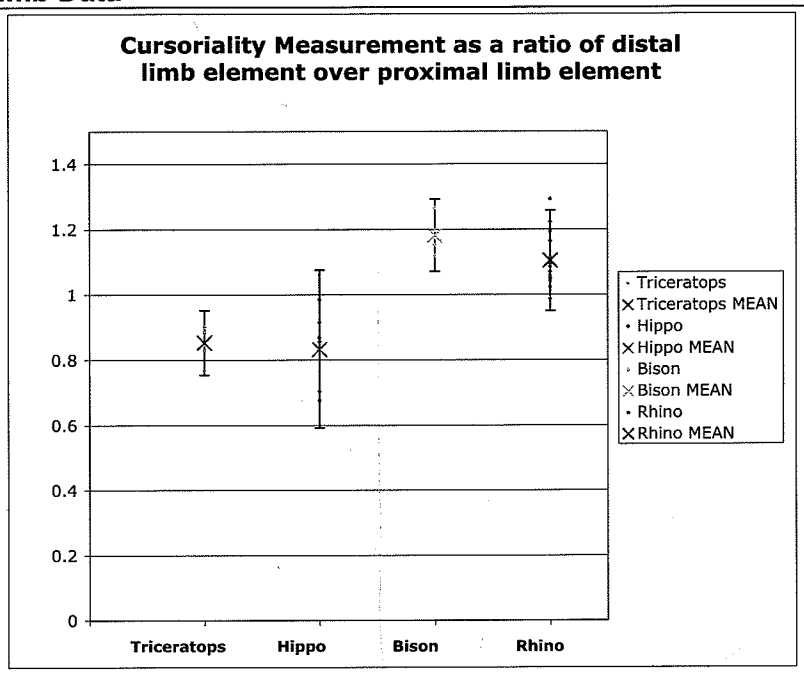
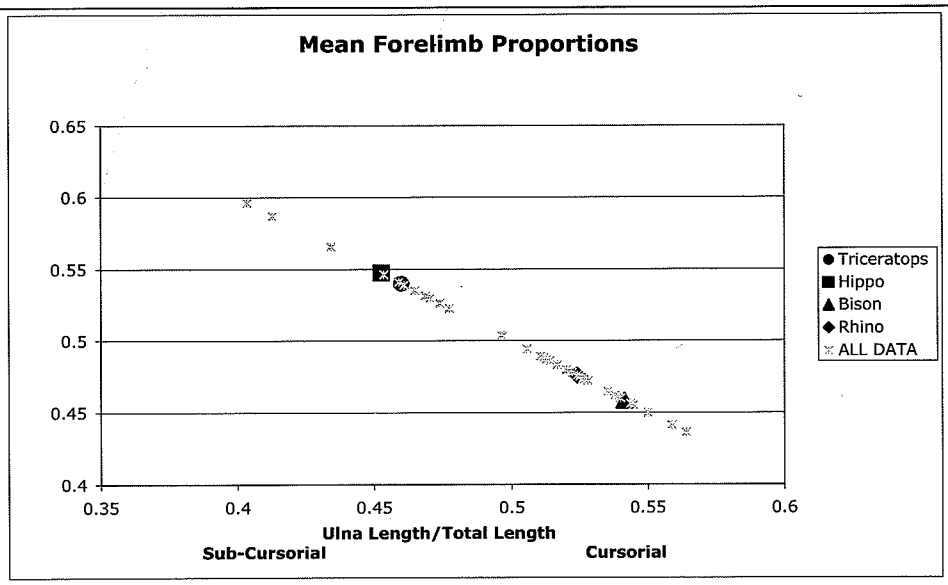


Late Cretaceous Western North America Fossil Faunal Zones. The zones are depicted with their dominant herbivorous dinosaur; extent is conjecture. *Triceratops* is concentrated along the coastal flood plain along the Cretaceous Seaway, not within the dry intermontane zone (After Sampson, et al., 2005 and Lehman, 1987). Map courtesy of Blakey, 2005.

Forelimb Data

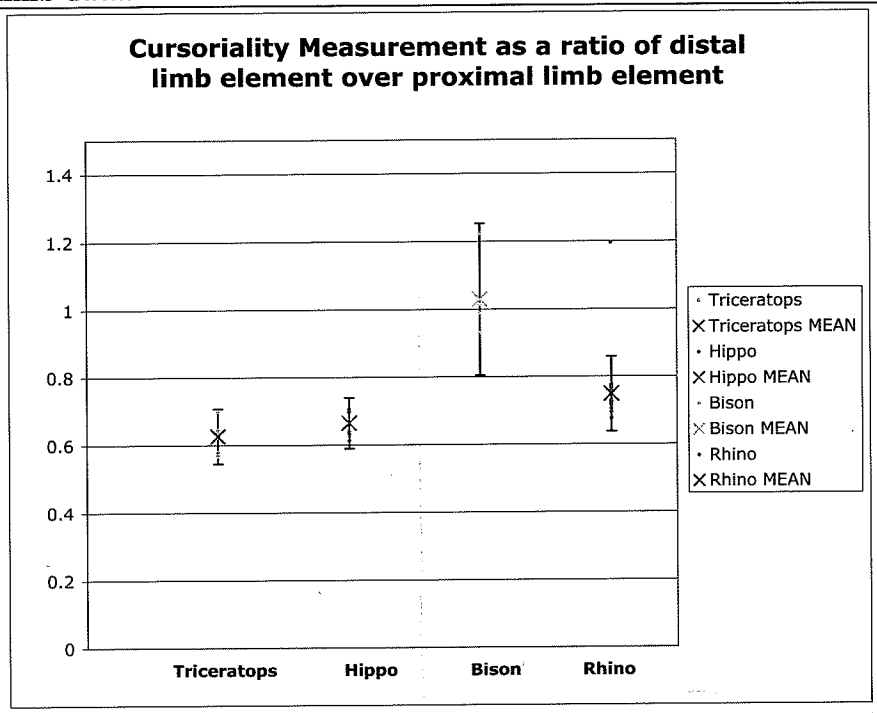


Illustrated are the data sets ± 2 standard deviations from the mean proportional length. Cursorial animals will have proportionally longer distal limb elements and should display a ratio >1. For the purposes of this study, 4 all species of rhinoceros were labeled under the common name "rhino". *Triceratops* and hippos plotted with ratios <1, while the bison and rhinos exhibited ratios >1.

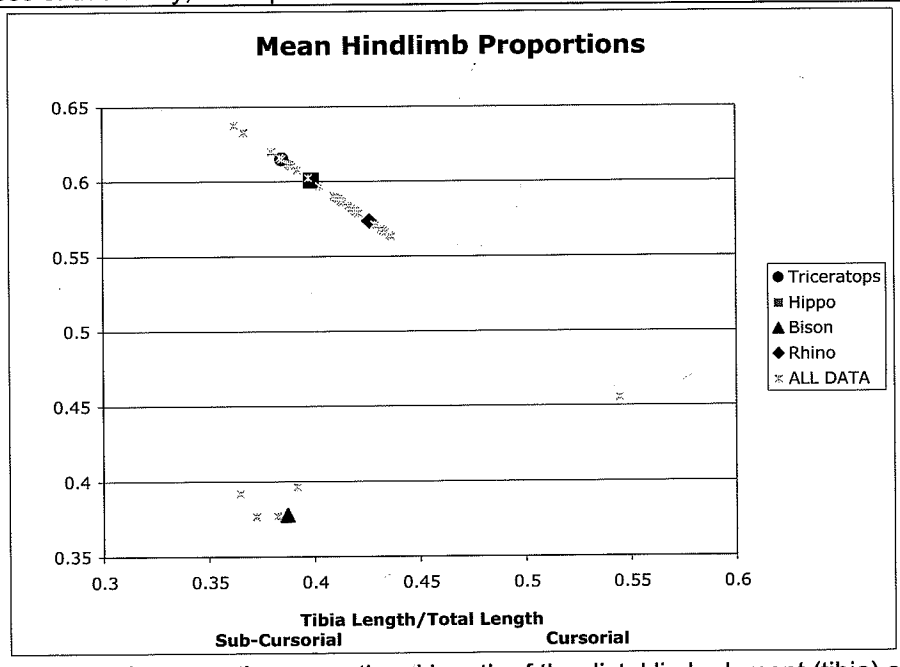


Comparison between the proportional length of the distal limb element (ulna) over the total columnar limb length (humerus + ulna) compared against the proportional length of the proximal limb element (humerus) over the total columnar length ± 2 standard deviations. The bison and rhino data plots within an area that places the two organisms within the cursorial range (proportionally larger distal elements) while the Triceratops and the hippo plot within the sub-cursorial range (proportionally larger proximal element). For the purposes of this study, all species of rhinoceros were labeled under the common name "rhino".

Hindlimb data.

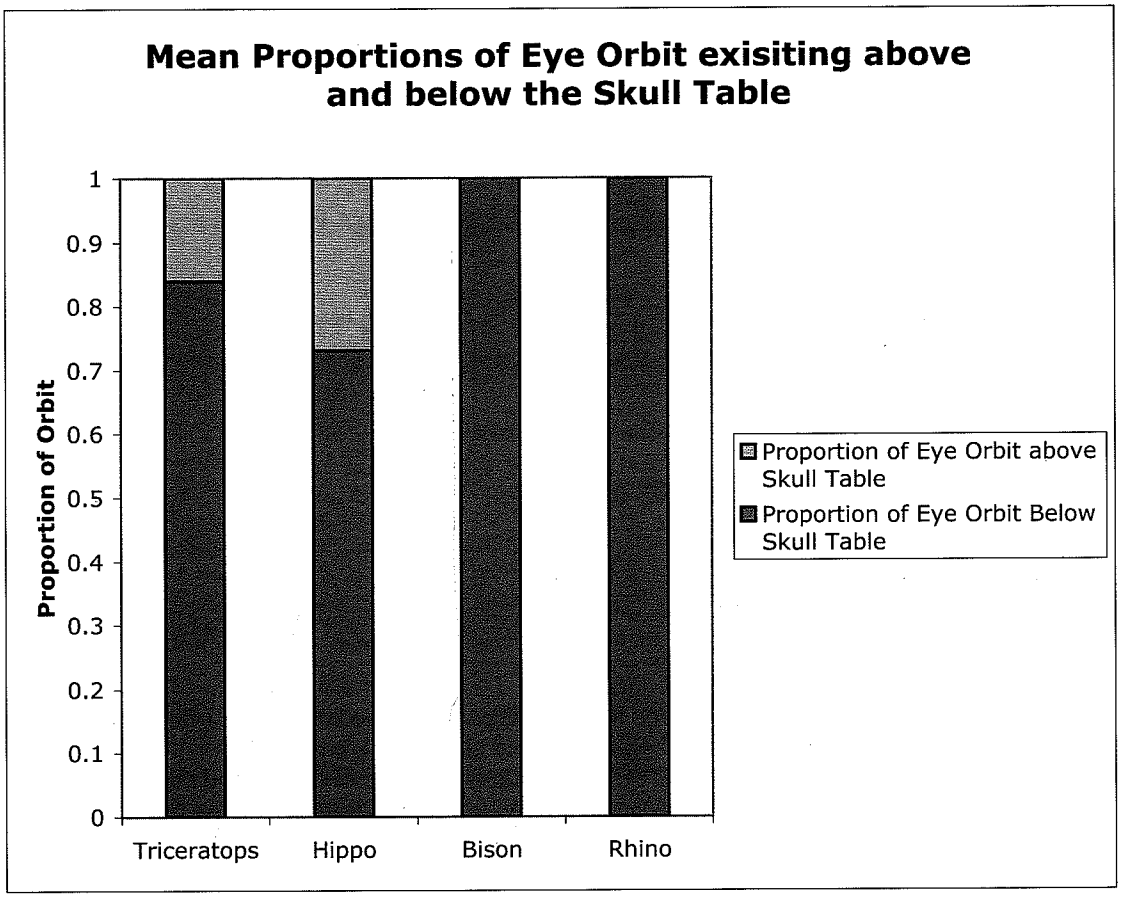


Illustrated are the data sets ± 2 standard deviations from the mean proportional length. Cursorial animals will have proportionally longer distal limb elements and should display a ratio >1. However, it appears the organisms have hindlimb behavior that is sub-cursorial in habit. For the purposes of this study, all 4 species of rhinoceros were labeled under the common name "rhino".



The comparison between the proportional length of the distal limb element (tibia) over the total columnar limb length (femur + all distal long bones) compared against the proportional length of the proximal limb element (femur) over the total columnar length ± 2 standard deviations. Under this scenario, the hindlimbs of all four organisms have adapted sub-cursorial habit, potentially for bearing weight. For the purposes of this study, all species of rhinoceros were labeled under the common name "rhino".

Skull Data



Mean proportion of the eye orbit of each organism that exists above the plane of the skull table. For the purposes of this study, all species of rhinoceros were labeled under the common name "rhino". *Triceratops* and the hippo exhibited significant proportions of the eye orbit above the skull table.

Variation in the syncervical of Ceratopsia

Nicolas E. Campione[1] and Darren H. Tanke[2]

[1]Department of Ecology and Evolutionary Biology, University of Toronto at Mississauga, 3359 Mississauga Rd. N., Mississauga, Ontario, Canada L5L 1C6
[2]Royal Tyrrell Museum, Box 7500 Drumheller, Alberta, Canada T0J 0Y0

The two cranial-most vertebrae (the atlas-axis complex) are among the most specialized elements in the vertebral column, and represent the only contact between the postcranial skeleton and the cranium. Arguably the most peculiar complex is the syncervical of neoceratopsian dinosaurs (Figure 1). In this group the cranial-most cervical vertebrae are fused into a robust element variably described as the "cervical bar" (Langston 1975), or the more widely used "syncervical" (Ostrom and Wellnhofer 1986). The homologies of the syncervical, in