The discovery that placoderm claspers were not part of the pelvic skeleton led to a re-examination of the antiarch systems of reproductive structures. Newly discovered pelvic and reproductive structures in antiarchs (sister-group of all other gnathostomes), pyctodonts and arthrodes (more crownward members of the stem gnathostomes) challenge established ideas regarding the origin and development of complex, pivotal pelvic structures and function, and place the pelvic fin and the function of the male claspers to the pelvic girdle.

Reconstructing joint anatomy and function is critical to understanding posture, locomotor behavior, ecology, and evolution of extinct vertebrates. Saurischian dinosaurs evolved a wide diversity of hip joint morphology and locomotor postures, as well as similarities with the two large ichnotaxa. The latter is a common ichnotaxon – Michael, Staatliches Naturhistorisches Museum, Braunschweig, Germany; WINGS, Oliver, Museum für Naturkunde Berlin, Berlin, Germany

Camarasaurus is considered one of the best known sauropods from the Upper Jurassic Morrison Formation of the USA. Numerous finds are referred to four species, Camarasaurus sp. and Camarasaurus indet. The study of the geology of the type locality of Camarasaurus shows that the variety of sauropods experienced congruent hip joints in which the subcondral surfaces differ in shape and size, suggesting that large volumes of soft tissues mediate hip articulation during locomotion. This study tested the relationship between hip joint dimensions, morphological characters, body mass, and locomotor postures of saurapodomorph and theropod dinosaurs. Femora and pelvis of 84 taxa were digitized using 3D imaging techniques. Discrete and continuous characters were tested using phylogenetically corrected correlation, and reveal trends in body size evolution. Unlike sauropods, theropods evolved heavy bony hip joints by reducing supraacetabular ossifications and medially deflecting the proximal femur, such that only the femoral head region inserted within the acetabulum. In sauropod femora, the head and antitrochanter possess irregularly-rugose subchondral surfaces for thick hyaline cartilage whereas the neck has a transversely-striated surface for thin fibrocartilage. In contrast, ornithopod correlations suggest only the head and neck of thinner hyaline cartilage whereas the antitrochanter was instead covered in fibrocartilage. These findings indicate that the femoral articular cartilages of giant sauropods were built to handle heavy compression loads whereas those of giant theropods experienced compression and shear forces. Additionally, sauropods used thick hyaline cartilage for maintaining joint congruence, whereas theropods relied primarily on articular soft tissue with ligaments and cartilages rather than femailtional cartilages. These data indicate that sauropians and theropods evolved convergent trends in soft tissue morphology reflective of body size, locomotor posture, and joint loading.

The final cladogram shows the classical type specimens of Camarasaurus as sister- to the clade to a group with the Chinotus type specimen, and the specimens GMMH-PV 101 and SMA 0002. In order to assess taxonomic issues, two earlier proposed numerical approaches were tested: raptorial counts between eleven-clades (proposed in diplodocids), and character dissimilarity (proposed plesiosaur). Additional, homoplastic rates for the diverging characters were incorporated in the apomorphy phylogenetic signal in both character and character dissimilarity due to common ancestry. Such a link is then pilot study. Our findings indicate that despite strong phylogenetic signal in both character and character dissimilarity, the rate of change may vary significantly. As such, intrageneric variation is excluded a priori, and the possibility that some specimens were used for scoring might be erroneously referred to the genus is ignored.

In order to assess the species taxonomy of Camarasaurus, a specimen-level cladistic analysis was performed with all holotype specimens formerly proposed to belong to Camarasaurus and the most recently-revised skeletons. Theingroup taxa cover early euauropods, Diplodocoidea and titanosauriforms.

The ability to capture and process prey is critical to the survival of predatory species, and therefore is thought to represent a main locus of selection in their craniodental evolution. A complex link between the morphology of the masticatory apparatus and its mechanical properties and performance is widely documented in living vertebrates, but the generality of such form-function relationships is still unclear and poorly explored. Here we introduce an integrated approach to studying form, function, and evolution in theropod dinosaurs. We describe craniodental form using 3-D geometric morphometric analyses and reconstruct craniodental function using 3-D finite element analysis within a phylogenetic context. A prototype dataset of craniodental characters from fossil carnivores and their living relatives was used in this pilot study. Our findings indicate that despite strong phylogenetic signal in both craniodental form and function, a link between extant dietary groups and cranial morphological properties is necessary to evaluate cranial and postcranial function. We find a phylogenetically conservative similarity due to common ancestry. Such a link is then applied to interpreting diet in two extant species. In addition, analyses of reconstructed ancestral cranial models at internal nodes of the phylogeny of Carnivora shows a decoupling of the mechanical properties that characterize inferred evolutionary pathways at internal nodes versus known dietary groupings of terminal taxa. Taken together, the results derived from these new analyses provide a refined basis for identifying optimal dietary niche.