Dinosaur Art & Restoration Notes: Dicraeosaurs

By Gregory S. Paul

The dicraeosaur sauropods were a group of distinctive and rather small (Asian elephant-sized) sauropods from the Late Jurassic and the Cretaceous. Two fairly complete skeletons have been mounted: the long-known East African *Dicraeosaurus* from Tendaguru can be seen in Berlin, and the new Argentinean *Amargasaurus* from the La Amarga Formation is in Buenos Aires.

There is no complete dicraeosaur skull; just enough is known to conclude that the skulls of dicraeosaurs were rather like those of *Diplodocus* and *Nemegtosaurus* in form. One of my pet peeves is the deep bump that has been added to the restored lower jaw of dicraeosaurs. The only extant fragment of a lower jaw is the front end of a *Dicraeosaurus* dentary. It is similar to that of *Diplodocus*, and does not show a deep ventral projection. The jaw tip was mounted with the back end tilted too far downward, creating a false bump. When the lower jaw of *Amargasaurus* was modeled the bump was recreated, in a classic example of unsubstantiated repetition. (A word to the wise—never assume anything when restoring dinosaurs.) Rotating the jaw tip until it is positioned as in *Diplodocus* eliminates most or all of the ventral projection.

Dicraeosaur necks were short for sauropods, and in both genera the vertebrae articulated in a strong S-curve such that the neck could not have been elevated much above shoulder level (although lateral flexibility was much better). Because the skull articulated at a sharp angle with the neck, dicraeosaurs must have walked with a perpetual "hang-dog" look. In dicraeosaurs the double spines of the neck and anterior trunk vertebrae are elongated, extremely so in *Amargasaurus*. The hyper-elongated cervical spines of *Amargasaurus*, in fact, have been shown in restoration as supporting dorsal fins. This cannot be ruled out, but there are problems with the idea. Parallel skin sails would have been inefficient, and would have interfered with flexion of the neck. Moreover, the spines are not flattened from side to side, but are circular in cross-section and taper to points. This form suggests that the spines were spikes lengthened by horn coverings. Such spikes could have been used for display, for protection of the neck, and for combat against predators and rivals by curling the neck ventrally and pointing the front spikes forward. Sable antelope and oryx fight in this manner with their long, rear-projecting horn spikes. *Amargasaurus* might have even generated an auditory display by clattering the spikes against each other!

Low-shouldered, horizontal-necked dicraeosaurs could have fed easily on ground cover, and the big hips and long heavy tails suggest that they were also in the habit of rearing up to browse high. The *Dicraeosaurus* tail specimen is much more complete than that of *Amargasaurus*, but both appear to have ended in slender whips of uncertain length. As was usual for sauropods, the tail vertebrae emerged in a gentle horizontal arch from the sacrum rather than dragging along the ground. The arms were short, and the lower limbs of dicraeosaurs were short even for sauropods. Forefeet have not been found, but most of the hindfoot of *Dicraeosaurus* is known. It is possible that, as with *Diplodocus*, rows of iguana-like dorsal spines adorned the backs of dicraeosaurs.

So please, no more bumps on the jaws of dicraeosaurs.

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Upper skeleton is *Amargasaurus cazaui* MACN-N 15 (3.8 tonnes). Lower skeleton is *Dicraeosaurus hansemanni* HMN m (4.9 tonnes). Skull is *Dicraeosaurus hansemanni* HMN dd. Scale bar=2 m. (Illustrations by Gregory S. Paul)