PALEONTOLOGY

Hulking Dinosaurs Were Buoyant but Unseaworthy

ST. PAUL, MINNESOTA—Sauropod dinosaurs—the stout, four-footed, long-necked variety—have enjoyed an on-again, off-again relationship with water. Early dino artists showed them submerged in lakes, eating soft aquatic plants. When scientists realized that the water pressure would have collapsed the animals’ lungs, they moved sauropods onto dry land. Ever since, the big beasts have sturdily marched across the floodplains, taking dips only when absolutely necessary.

The landlubbers got their feet wet again here last week. At the annual meeting of the Society for Vertebrate Paleontology, paleontologists took a fresh look at how these gargantuan creatures would have fared if they did take the plunge. A computer model indicates that sauropods would have ridden high in the water and would likely have been very unstable. Another experiment also suggests that water would have shifted their balance even at shallow depths. The studies “give us a little window on some possible behaviors that we didn’t think about before because we were so against sauropods in the water,” says paleontologist Kristi Curry Rogers of the Science Museum of Minnesota in St. Paul.

One reason scientists plunked sauropods into lakes in the first place was to explain strange trackways that bore only the marks of the animals’ front feet. With its butt bobbing, the story went, a sauropod pulled itself along with its forelimbs. Decades later, Martin Lockley of the University of Colorado (UC), Denver, and colleagues argued that the dinosaurs had kept all fours squarely on land but that the narrower forefeet had simply sunk deeper into the sediment, causing the resulting “manus” tracks to stand up better to erosion. “Everyone was very pleased, because we didn’t have to float our sauropods,” says trackway specialist Joanna Wright of UC Denver.

But paleontologist Jeff Wilson of the University of Michigan (UM), Ann Arbor, wasn’t so sure. Most sauropods, he noted, had their centers of mass closer to their back feet. So Wilson and Dan Fisher of UM measured the stress exerted by the limbs of plastic models of various sauropods. When they added water, all four limbs stayed on the bottom of the tank, but the front limbs began to bear a greater share of the load—exerting up to 20 times more stress for a Brachiosaurus in shoulder-deep water (2 to 3 meters). That could explain the manus-only trackways, they say.

Don Henderson of the University of Calgary, Canada, went one better. Using a computer model that took into account the distribution of muscles, bone, and air spaces inside the dinosaurs’ bodies, he dunked virtual sauropods into virtual lakes. The lungs and relatively porous bones in Henderson’s 3D reconstructions made the animals float like “colossal corks,” he says—so high that a Brachiosaurus in shoulder-deep (4.7-meter) water couldn’t have touched bottom with its hind limbs, just as early interpretations of the trackways assumed. Other types of sauropods, such as Diplodocus and Apatosaurus, floated with their front limbs higher than their hind limbs; they could not have made the manus-only tracks, Henderson says.

Once all fours were off the bottom, sauropods were in for trouble, Henderson’s model indicates. Although the long neck and tail would have kept them relatively poised from front to back, the animals would have been prone to capsizing. “It’s on a knife edge,” Henderson says. “The slightest wave would tip it sideways.” To Henderson, that suggests sauropods would have had trouble swimming. Others think they probably could have managed, albeit awkwardly. No one, however, is planning to march sauropods back into the water for good.

—ERIK STOKSTAD

GENETICS

The Grand Canyon’s Cattalo

FLAGSTAFF, ARIZONA—A new genetic analysis may be bad news for a bison herd of dubious pedigree that’s been making trouble in the Grand Canyon. Early indications are that the animals are chock-full of cow DNA.

The herd, owned by the state of Arizona, has been straying from its normal range and venturing into Grand Canyon National Park, creating mud and dust wallows and trampling native vegetation. Park scientists would like to get rid of the beasts. They pushed for tests to determine whether the herd showed hybridization with cattle, noting that the park’s job is to protect native species—and cows are anything but native (Science, 21 March, p. 1835).

Preliminary results show that more than 90% of the animals sampled have cow genes. James Derr, a molecular geneticist at Texas A&M University in College Station, tested the first 13 samples and plans to analyze more of the 150-member herd in early November. So far, the results line up with other studies by Derr. He has documented pure bison genetics in the vast majority of herds on federal lands. But most private and state herds, including Arizona’s, originated with entrepreneurs such as Charles “Buffalo” Jones, whose “cattalo” experiments sought to cross bison and cows. Those herds almost always harbor cow genes.

Genetics may not be enough to condemn the Arizona herd, however. “It’s one thing to have the science,” says Jeffrey Cross, the park’s chief of natural resources, but “it’s another thing when that science leads to a management decision.” Arizona wants the bison to stay, with or without cow genes: An annual buffalo hunt brings in more than $40,000 a year.

—ANNE MINARD

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