Animal families with the most diversity also have widest range of size

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Size comparison of (L-R) Blue Whale, human, Brachiosaurus, Giraffe. | Jomegat, Wikimedia Commons

(PhysOrg.com) -- Somewhere out there in the ocean, SpongeBob SquarePants has a teeny-tiny cousin and a humongous uncle.

That's just what one would expect from a new analysis of body sizes across all orders of animal life that was conducted by researchers at the National Evolutionary Synthesis Center (NESCent), in Durham, N.C. and the University of North Carolina, Chapel Hill.

Researchers Craig McClain and Alison Boyer created a giant database on body sizes across all orders of animal life and found that phyla -- families of animals grouped together by a similar body plan -- with the greatest diversity of species were also those with the largest range of body sizes.

The sponges, Poriferans, were found to have some of the greatest diversity of both body size and species, ranging from microscopic to the

size of an automobile. Molluscs (snails, squid, clams, chitons), and Arthropods (crabs, insects, lobsters, copepods) also showed great diversity. So did our family, the Chordates, which ranges from a half-inch fish in the swamps of Borneo to the truly leviathan 100-ton Blue Whale, with all the fishes, birds and mammals in between.

On the one hand, it may seem obvious that diversity in size and diversity in species go together, acknowledges marine biologist McClain, assistant director of science at NESCent. But it also says something a little more subtle about how new species arise and adapt to all the available niches in the environment.

"This really comes down to understanding the diversity of life on Earth," McClain said.

The group's findings appear online in Proceedings of the Royal Society B. The research was conducted in part at the Monterrey Bay Aquarium Research Institute, funded by the David and Lucile Packard Foundation, and the Smithsonian National Museum of Natural History. NESCent is a National Science Foundation collaboration of Duke, UNC and N.C. State that is housed in buildings Duke leases.

The Blue Whale, incidentally, is the largest animal ever, but the Chordate group doesn't boast the smallest. That distinction belongs to animals with names like mud dragons, brush heads, jaw worms, stomach hair worms and water bears that are so small they live between individual grains of sediment in the ocean. But this smallest group's range doesn't reach up to the largest body size.

This is a pattern that repeated itself several times in the data, McClain said. There are apparently physical limits to the range of sizes that can work for some body plans. In worms, for example, it is impossible to slither along if the girth and weight become too large. (The largest worm,

Riftia pachyptila, from deep-sea vents, doesn't move.)

Within the range of sizes that works for a given body plan, evolution creates new species and new sizes, McClain said. What this sweeping analysis hasn't solved is the riddle about how different body sizes emerge. One theory says that body sizes arise through random natural variation. A second says that size diversity is driven by the availability of unused niches in the environment.

The finding also points to areas where more species might be waiting to be discovered. For example, the little-studied priapulid worms (aka "penis worms") have only 16 species on the books, but with a very large range in size. McClain's guess is that there may be more undiscovered species within that range of sizes. "There are groups that definitely don't have a lot of people studying them," he said.

Knowing something about a body plan's size constraints also might allow for a ballpark estimate of its number of species, McClain said.

Source: Duke University (news : web)