



The weight of all life on Earth

Of the total weight of this massive planet, how much of it is the weight of the life it harbors?

Atlas was a god in Greek mythology who was doomed to hold up the sky forever. If I wanted to annoy Atlas, I would tell him that he should thank his curse-giver for asking him to hold up just the sky and not the Earth, because the Earth is much more massive.

Thanks to an extremely shy but focused and determined British scientist in the 18th century named Henry Cavendish who spent most of his energy doing experiments, we know how much the Earth weighs. He did this with a contraption made up of interconnected parts that were so sensitive that he had to observe it with a telescope through a peephole in the next room. Haunted by Newton's idea of a gravitational constant, Cavendish labored over computations for a year and his final number came 1% close to what we know now. The earth weighs 5.9725 billion trillion metric tons. That translates to 6570×10^9 gigatons, or 6,570,000,000 gigatons.

But Cavendish weighed the Earth while he was on Earth and not from outer space. This means the Earth's atmosphere did not bear on the mass that Cavendish weighed. The earth's atmosphere is about 5.5 quadrillion tons, or only about a millionth of our planet's mass. But our planet and life on it would not be what it is without its atmosphere. So if we were to weigh the planet as we know it and including what makes it work, the atmosphere is a vital part of it.

But of the total weight of this massive planet, how much of it is the weight of the earth's biosphere, that is, the weight of the life it harbors? Professional descendants of Cavendish who were determined to weigh the mass of lifeforms recently published a study in the [Proceedings of the National Academy of Sciences of the US](#), giving us a report on life's weight, including a breakdown.

What should we really measure when we want to come up with the weight of life? Scientists usually measure biomass, which is all living matter minus the water content. Take plants for instance. It starts out as a seed and then it finds a way to capture the energy from the sun and turn it into its own "body." Same goes for other organisms when they first start out as cells and grow into organisms. These life forms are put together by a mosaic of stuff made up of carbon, as it is the element which is the basis of life on Earth. This is because carbon is a naturally "flirty" element, with its 4 electrons that are gnawing to connect to other elements. This locking with other elements like hydrogen and oxygen form our DNA, proteins, fats, tissues – the make-up of life. Thus for the study, biomass was measured for all life in terms of carbon.

The grand total that the group came up with for the biomass of all living things on Earth is about 550 gigatons of carbon (Gt C). The "heaviest" of all are plants, mostly the ones on land – about 450 Gt C. This is followed by bacteria at about 70 GtC. Bacteria are everywhere, and the study yielded that bacteria, with protists, dominate the biomass of marine life at 70%. Fungi follow bacteria at about 12 Gt C. Archaea are at about 7 Gt C, and are primarily located in the deep belly of the Earth which holds about 15% of the total biomass in the biosphere. Protists are at 4 Gt C.

The weight of all animals is only about 2 Gt C, and most of these are marine animals, arthropods (1 Gt C) and fish (0.7 Gt C). And note this: there are more livestock at 0.1 Gt C than wild birds (0.002 Gt C) and wild mammals (0.007 Gt C) combined! We have more animals for food for humans, than wild birds and mammals that belong to the planet as much as we do.

The study also found that in terms of biomass, there are 5 times more consumers than producers in the marine environment. So while our seas and oceans seem all powerful and uncountable, the last scientific count yielded evidence that the balance may not be in favor of quick replenishment once pushed to the edge, as we are doing now.

The most alarming confirmation in the study was that the mass of humans is an order of magnitude higher than that of all wild mammals combined. So it has been confirmed once again that we have really taken to heart the religious mandate to "have dominion over all things."

Knowing the biomass of one life group as compared to others will tell us much about the state of our natural environment – which life forms are encouraged to propagate, and which ones are pushed to their limits. It tells us about the natural cycles that will be altered by the shifts in biomass. And because we have already established that this is the Anthropocene Age – when humans have altered the natural environment in scales that would not have happened had nature been left to its own rhythm – we would know based on the level of biomass the concrete impact of human activities on other life forms.

This study really brought it home for me, that humans, the most elemental level of life in terms of carbon and whose group makes up only 0.06 Gt C of the biosphere's 500 Gt C, can shift all of life's balance. That is a curse disguised as a gift. I think we should recruit Atlas to hold up the Earth as well. Or if he knew what is happening now that we are in charge and in power, maybe he would volunteer, since humans are not doing what is needed to hold life up.