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The Importance of Earthworms

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Opinion

Darwin's last book, "Earthworms", was published on 10 October 1881 only six months before he died. It virtually inventing the study of an aspect of soil science of incalculable importance to horticulture, agriculture and the global economy. That book demonstrates Darwin's fascination at how millions of small creatures such as coral polyps and earthworms can slowly change the face of the Earth quite significantly. Darwin emphasized how important earthworms are by fertilsing soil by eating fallen leaves or soil and any other live and dead organic matter that adds nutrients such as Potassium and nitrogen to the soil. The first widely accepted evidence of burrowing dates to the Ediacaran (Vendian) geological period that began around 560 million years ago (Wikipedia, 19/11/17). Ever since than burrowing by worm have loosened, overturned and aerated their substrates on the way healthy soils with smooth horizontal top surfaces (a natural process partially replicated by man much later as ploughing).

In his enthusiastically review of Earthworms in the times of the publication date, 10 October 1881, Romans marvelled at Darwin's astounding and totally original proofs of the intelligence of worms, while at the same time demonstrating that they were deaf and blind. Among many comments, Romans cited Darwin's experiments proving that worms selected which part of a leaf to pull down first into their burrows. He also explained Darwin use of his 'worm stone' to measure the rate at which worms bury stones on the surface by digesting the soil and depositing it above ground as worm casts, he also illustrated giant examples of worms and their casts from around the world. Earthworms can be defined as: a tube-shaped, segmented worm found in the phylum Annelida (Wikipedia, 10/11/2-17) but, most people are more likely to recognize "Shiny, wigging, pinkish-brownish tubular life forms, that thrash in hasty retreat into the comforting, moist darkness of the soil when exposed by digging.

There are 6,000 species of earthworms worldwide. Instead of lungs, worms breathe through their skin which exudes a lubricating fluid to keep themselves moist and ease burrowing underground. To find how many and what type of worms inhabit any patch of soil, a standard practice is to flood the area of interest with water to a depth of a few cm and count those that surface to escape drowning within about 10 minutes. Every earthworm is a hermaphrodite so that every individual carries both male and female sex organs. Worms have a double transport system composed of coelomic fluid that moves within the fluid-filled coelom and a simple, closed blood circulatory system. Worms have both central and peripheral nervous systems. The central nervous system consists of two ganglia above the mouth, one on either side, connected to a nerve cord running back along its length joining motor neurons and sensory cells in each segment.

Instead of a rigid internal- or exoskeleton, earthworms maintain their structures and shapes with fluid-filled coelom chambers that function as a hydrostatic skeleton. Large numbers of chemo receptors are concentrated near its mouth. The earthworm's digestive system is a tube running through the length of its body, straight from the mouth at their front end, to the rear anus that expels digested material. Species vary in what they eat, but most devour fallen leaves and/or soil that to move nutrients such as potassium and nitrogen into the soil. Worms also improve soil fertility by burrowing that loosens and aeriates the soil. Circumferential and longitudinal muscles on the periphery of each segment enable the worm to move. Similar sets of muscles line the gut, and their actions move the digesting food toward the worm's anus.

Of the more than 180 earthworm species found in the U.S. and Canada, 60 are invasive species, brought over from the Old World. Apart from a few tropical versions that can reach ten feet long, most earthworms are up to 14" long. The last global glaciation ~10,000 years ago wiped out earthworms in areas covered by ice. The northern forests evolved after the glaciers retreated, and so developed an ecosystem that does not benefit from earthworms. Those forests are characterized by a deep layer of slowly decomposing leaves, needles and other organic matter called "duff" above the soil. When earthworms invade these forests (or are mistakenly introduced), they quickly eat the duff, with the result that nutrients become less available to young, growing plants because the soil compacts.

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