

Division 4. The Role of Soils in Sustaining Society and the Environment

Commission 4.5 - History, Philosophy, and Sociology of Soil Science

During the 2015 International Year of Soils, the IUSS Division 4 will illustrate its main topics through articles written by Division 4 officers or their colleagues. These will each be highlighted every week from October to mid December 2015.

For this ninth week, we are displaying an article from C. Feller the presently Division 4 chair, E. Blanchart and George G. Brown concerning the popularity of earthworms.

Description of Commission 4.5

This commission deals with our past; it links the study of what has happened in history and how soils can be used to help explain the past changes. This commission is not just a record of the history but the use and understanding of soils information and its relationship to human development and history.

Popularity of earthworms before and after Darwin¹

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The importance of earthworms for soils and society has undergone various phases, from profound recognition to utter ignorance and disdain. In fact, the perception of earthworms by modern humans was completely modified by Darwin's book published in 1881 (Feller et al., 2003). Historically, three periods can be distinguished regarding the popularity of earthworms: Antiquity, before Darwin, and after Darwin.

In classical Greek times, the mode of life and use of earthworms were well recognized and Aristotle called them the “earth’s entrails” (or intestines), probably because they lived in and moved inside the soil,

¹ Main information given in this article comes from Brown et al., 2003. The detailed bibliography can be seen in this review article.

churning it up. In Babylonian times they were used in medicines against lumbago (lower back pains), and in the Egyptian Empire they served as meteorological indicators (to predict weather phenomena). Furthermore, the importance of earthworms for soil fertility in the Nilotic valley was recognized to such an extent that Cleopatra (69-30 BC) decreed the earthworm a sacred animal, to be revered and protected by all her subjects. Egyptians were forbidden to remove them from the land, and farmers were not to trouble the worms for fear of stunting the renowned fertility of the Nilotic valley's soil.

From Antiquity to Darwin's time, not much information is available on earthworms, excepting a few anecdotal descriptions of uses, activity, and taxonomic aspects. One notable exception is that of Vincenzo Tanara, an Italian agronomist who declared in his famous book *L'economia del cittadino in villa* (Tanara, 1651), that earthworms were important indicators of fertile soil, and that this could be easily observed by the flocks of birds that appeared after soil seedbed preparation. However, throughout much of the 19th century and even the beginning of the 20th century, most persons considered earthworms garden pests, undesirable animals that needed elimination from the soil. For instance, in Rozier's (1805) *Complete Course of Agriculture* (Vol. 11, supplement, p. 53), representing the synthesis of knowledge on the subject at the time, the category "worm" presents a long article dealing mostly with the pest aspect of earthworms, and the means to eliminate these noxious animals: "Every cultivator ... knows the damage that worms do to seeds... it is thus advantageous to know the means to destroy them."

And he thus provides a list of ways in which earthworms can be removed from the soil (and destroyed). In the same article, however, Rozier also mentions some beneficial uses of earthworms, such as for certain medicines, food for certain Indian peoples and, of course, their role as fish-bait.

Before Darwin, the importance of earthworms in soil fertility was thus not considered, except by very few naturalists. One of them was Gilbert White who, over thirty years before Darwin's birth (1789) published *The natural history of Selborne* and wrote:

"Worms seem to be the great promoters of vegetation, which would proceed but lamely without them, by boring, perforating, and loosening the soil and rendering it pervious to rains and the fibers of plants, by throwing up such infinite numbers of lumps of earth called worm-casts which, being their excrement, is a manure for grain and grass... Gardeners and farmers express their detestation of worms; the former because they render their walks unsightly, and make them much work; and the latter because, as they think, worms eat their green corn. But these men would find that the earth without worms would soon become cold, hard-bound, and void of fermentation, and consequently sterile" (*in* Letter to the Honorable Daines Barrington, May 20, 1777).

But this passage seems to have been overlooked by Darwin, who did not mention it in his book. Darwin did not know also of the work published by P.E. Müller in 1878, which also attributed earthworm's importance for soil fertility and humus formation.

Nonetheless, following the publication of 'Worms' by Darwin, several scientists such as the famous soil physicist, the German E. Wollny, were quick (in 1882) to criticize it and promptly began research to disprove Darwin's statements. However (fortunately) Wollny's results (published in 1890) proved Darwin was correct, showing positive effects of earthworms on yields of various plant species grown in pots. Since then, thousands of papers have been published on the topic, and the number continues to increase exponentially. These papers confirm many of the main Darwin's statements, although in a few cases they also show some of the shortcomings of his work (Feller et al. 2003).

Today it is well recognized that earthworms are important agents for the maintenance of important soil properties (chemical, physical and biological ones) and for the provision of ecosystem services.

The resurgence of interest in organic farming and more generally in “agroecology agriculture” (in which earthworms play a more important role influencing soil fertility) in recent years has brought Darwin’s book and earthworms back into the limelight. The ideas expressed in Darwin's book, such as

“Worms have played a more important part in the history of the world than most persons would at first suppose” (p. 145),

have even been used in popular comic strips (see e.g., cartoons of Richer de Forges et al. 2010, 2012 and Larson, 1998) and in science fiction as the famous ecological novel *Dune* by Frank Herbert in 1965.

To most people, especially in Darwin’s day (and even to many people today), earthworms were merely unpleasant, slimy, ugly, blind, deaf and senseless animals, of little use except for fish-bait, and a general nuisance, particularly because of their ‘unsightly’ surface castings (Feller et al. 2003). Darwin restored a noble and useful character to earthworms, attributing to them intelligence and benevolence.

References

- Brown G.G., Feller C., Blanchart E., Deleporte P., Chernyanskii S.S., 2003. With Darwin, earthworms turn intelligent and become human friends. *Pedobiologia*, 47: 924-933.
- Darwin C., 1881. The formation of vegetable mould through the action of worms with some observations on their habits. John Murray, London.
- Feller C., Brown G.G., Blanchart E., Deleporte P., Chernyanskii S.S., 2003. Charles Darwin, earthworms and the natural sciences: various lessons from past to future. *Agriculture, Ecosystems and Environment*, 99: 29-49.
- Larson G., 1998. There’s a hair in my dirt! A worm’s story. Harper Collins, New York.
- Richer de Forges A., Arrouays D., Blanchart E., Bernoux M., 2010 and 2012. *Les aventures de Childéric le lombric. 1. Les prisonniers de Darwin ; and 2. Le trésor de Rakkam le ver.* TheBookEdition, A.C. Richer de Forges ed., 45 p. and 49 p.