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Book Reviews, Notes and Comments

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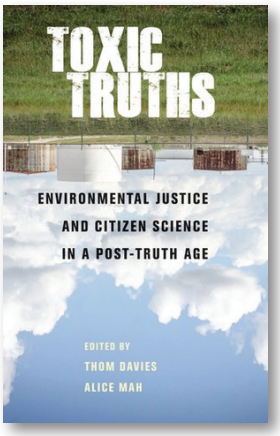

TOXIC TRUTHS
Environmental justice and citizen science in a post-truth age
Thom Davies and Alice Mah (Eds)
Manchester University Press, 2020. 350 p.
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We are used to the term "post-truth" when it comes to politics where the debate is often disconnected from facts and largely affected by appeals to emotion. In this book we understand how much the political culture of "alternative facts" and "fake news" has contaminated the nature of science, particularly the field of environmental science where science and expertise are increasingly under attack. Environmental justice (EJ), born in the 1980s, is one of the answers to this cultural trend. EJ is meant to guarantee to everyone "the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work" (https://www.epa.gov/environmentaljustice). From the reading of this book we learn that indeed EJ themes were evoked from hundreds of years prior. The Editors provide as an example the yellow fever epidemic of the late nineteenth century that killed thousands of people in Philadelphia. While White people fled the city en masse, the Black people were organized to keep the city functioning. Fewer Black people than White people were dying because Black people had a greater immunity to the disease but people misunderstood how the disease was transmitted and spread rumors that Black people caused the epidemic. In 1973 Absalom Jones and Richard Allen – leaders of the Free African Society that was founded only six years earlier – wrote a document responding to the charges: this is considered the first document of EJ.

The chapters of this book address the three versions of EJ: *distributive*, *procedural*, and *capabilities*. The first type, distributive, is concerned with the geographic distribution of goods and/or burdens among groups of individuals of environmental hazards in relation to marginalized communities. The second type, *procedural*, is centered around the "meaningful involvement of all people regardless of race, colour, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies." (Bullard and Johnson, 2000, *Journal of Social Issues*, 56(3), 555-578). The third version of justice is concentrated on *capabilities*, i.e. an approach that is meant to ensure the well-being of a population, where "justice is not about achieving an appropriate distribution of things between people, but rather about people being able to live lives that they consider worthwhile" (Edwards et al. 2016, *Progress in Human Geography*, 40(6), 754-769). The topics of citizen science with its pros and cons is widely analysed in this book that interrogates several ways that local communities, residents, and activists engage within EJ struggles.

The book is structured in four interconnected sections.

Part I, "Environmental Justice and Participatory Citizen Science", presents case studies of participatory EJ research. Among these I would like to mention the one concerning contamination by per- and polyfluorinated compounds (PFAS) by Phil Brown and coworkers (Chapter 1). PFAS contamination of drinking-water has been a relevant environmental and health problem in United States as well as in Italy in the Veneto Region. The Authors explore the important interconnections between scientific discovery, environmental justice activism, and the political, social, and economic components. They present as an example of success the Superfund Research Program Center established in 2017 at the University of Rhode Island that brings together scientists from various universities with communities on Cape Cod in a multi-project center with a strong community engagement core. The main goal of this Program is to learn more about the human and environmental impact of PFAS contamination, pushing for political action and disseminate lessons learned to help avoiding similar contamination problems in the future. Overall, this chapter as well as the others contained in Part I emphasize that, by remaining the need for a science-based approach, citizen science can contribute to change.

Part II, "Sensing and Witnessing Injustice", show how you can contribute making pollution visible without the aid of scientific knowledge and devices. Alternative tools of understanding pollution are presented. Examples are the Ecaudorian "toxic tours" (Chapter 5) where the observation of contaminated soil cores using an auger is a means of "sensing" injustice and the representation of pollution by e-waste in Ghana (Chapter 6) through participatory photography.

Part III, "Political Strategies for Seeking Environmental Justice", provides examples of citizen science projects and environmental inequalities that by mobilizing and politicizing communities can achieve EJ. Cases are presented that span from the tactics of "soft confrontation" against industrial pollution in China (Chapter 10) to utilizing top-down national data in Italy to

achieve EJ (Chapter 9). In particular, Chapter 9 is the contribution by Roberto Pasetto and Ivano Iavarone from the Department of Environment and Health of our Institute. With a focus on polluted sites in Italy they use an epidemiological surveillance approach to show how communities that are overburdened by the health impacts of environmentally hazardous industry are often also socially deprived.

Finally, part IV, "Expanding Citizen Science," explores the possibilities as well as limitations of citizen science for achieving EJ. To this regard I would like to mention the last chapter of this book by Nicolas Shapiro and coworkers (Chapter 14) who suggest that citizen scientists should look beyond the creation of exposure/toxicity data to combat pollution and concentrate on what they call "extra-numerical evidentiary projects" that are more centered on social and political change. In this last part we go back to the important question raised by Barbara Allen at the beginning of the book (Chapter 2) "What kind of science can serve as 'change-agent' knowledge – what are the ingredients that can facilitate action?". If you want to know the opinion of excellent scientists on this matter I encourage you to read this book.

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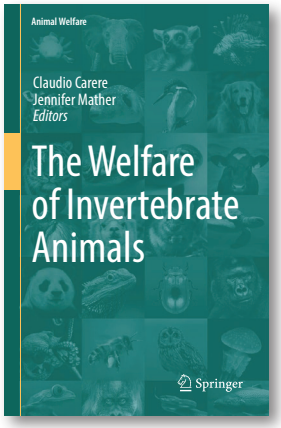

THE WELFARE OF INVERTEBRATE ANIMALS

Claudio Carere, Jennifer Mather (Eds)
Springer International Publishing (Animal Welfare, 18), 2019.
248 p. € 176,79
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Animal welfare issues are approached very differently among scientists. In particular, the composite universe of biomedical scientists, dealing more or less directly with animal behaviour, enlists very different professionals; often, e.g., neurophysiologists are much less sensitive to welfare than their colleagues more focused on subtle behavioural variables, including ethologists and zoologists carrying out extensive field work. Therefore, the very diverse research topics reflect as much diverse human and humane attitudes. This also includes the "inevitable bond", which enchains single scientists to their animal subjects [1]. It may also be a question of age. In fact, since a couple of decades, we are facing a progressively increasing level of awareness and susceptibility in the new generations (veterinary medicine seems especially attractive for undergraduates). For contemporary students, the psychophysical welfare of their animal subjects is becoming more and more a delicate issue, requiring novel skills and in many cases affecting experimental designs and settings. In parallel, and correlated to this, there is an ongoing change in the way the individual scientist empathizes with animal subjects. Some more "egoistic" component may play a role as well. In fact, "good welfare" is often reflected in the collection of better and sounder results, easy to replicate, since of course stressed or unhealthy subjects do not provide state-of-the-art behavioural and physiological results. As a consequence, welfare assessment is an important factor concerning data quality.

"Higher" vertebrates definitely include the most empathic animal species: dogs, cats and non-human primates which have a long and sometimes intricate history of "special protection", with specific guidelines. By contrast, "lower level" taxonomic groups have been somehow relegated to a level of non-problematic experimental concern. A kind of new era arose about thirty years ago. The European legislation on animal experimentation followed a precise trajectory. For many years (since 1993), the United Kingdom regulation put the octopus (*Octopus vulgaris*, belonging to Cephalopods, an evolutionarily very peculiar marine invertebrate taxon including also cuttlefish and squids) at about the same level of the vertebrate classes, the latter including since 1986 a strict general European legislation. The Canadian Council of Animal Care already mentioned Cephalopods in 1991, New Zealand in 1999, the Australian new regulation in 2004 [2].

In the last legislative revision [3] a major regulatory step occurred: all Cephalopod Molluscs became *ope legis* similar to vertebrates being eventually recognized as sentient species (similarly, the term "sentient" found a philosophical definition in St. Augustine's writings *Confessions*, a masterpiece of theological and epistemological thoughts) reviewing the matter of animal suffering in comparison with human suffering, an issue dating from Plato at least. Therefore, not only octopuses, but also cuttlefish and squids were assimilated to protected vertebrates and this prompted novel studies such as the recent curiosity to examine individual variability in stereotyped predatory behaviour of cuttlefish (*Sepia officinalis*) under laboratory conditions [4].

But what about all other invertebrates? In the Editors' words: "Invertebrates, like all the other animals, are an essential part of our lives. We eat them, we study them, and some of us keep them as "pets," for example, tarantulas and other spiders". In other words, not only they constitute about 99% of animal species, but they are also tremendously (and increasingly) exploited by humans, including research.

The present book focuses specifically on invertebrate psychophysical welfare. The starting question is "Why invertebrate welfare?" (chapter 1, signed by the co-editors themselves), summarizing the texture and the rationale of the book, its possibly hidden zoo-anthropological vo-

cation, while outlining its logical structure, contents and primary and secondary goals. This, in our view, is a true novelty for animal welfare science and community.

The Italian National Institute of Health (Istituto Superiore di Sanità, ISS) scientist Augusto Vitale and philosopher Simone Pollo (Rome University "Sapienza") contributed to the writing of the second chapter, entitled "Invertebrates and humans: science, ethics and policy". It provides a vivid reflection on the moral status of invertebrates, their rather peculiar "sentience" and the philosophical weapons to critically argue whether adequate protection to these animals is actually deserved.

The formulation of the next insect welfare chapter is entrusted to entomologists Michael Bopprè and Richard I. Vane-Wright. In particular, in chapter 3, they attempt to solve the dilemmas due to the increasingly widespread practice to keep insects in captivity, considering the huge variety of species and the still poor knowledge about their commercial breeding. Moreover, in the last years the proposal to exploit protein food of insect origin gained global attention due to the exploding increase of human population and associated food needs. The following chapter "Welfare of managed honey bees", by Claudia Garrido and Antonio Nanetti, is focused on the management of honey bee colonies with particular regard to their ecological "superpowers" and the relationship between honeybees and agriculture.

Chapters 5 and 6, "Spider welfare" and "Coral and cnidarian welfare in a changing sea", cover very original, relevant and timely issues, representing vivid and creative points for discussion for animal behaviourists. Economic and marketing stakeholders may well represent counterparts endowed by divergent feelings. Importantly, the former chapter bridges animal welfare with conservation and global-change biology, a link that is not yet fully realised by both students of animal welfare and biodiversity management and conservation, despite being a real need for the environmental challenges of the new millennium.

In chapter 7 Robert W. Elwood's contribution is structured in a detailed analysis regarding the physiological and behavioural responses to pain in crustaceans, nicely updating with the most recent results an issue that was previously brought to attention in this same journal *Annali dell'Istituto Superiore di Sanità* [5]. The mass of scientific evidence supports the active discussion about the need for some kind of special protection for crustacean Decapods since the last European Directive. This was, we believe, mostly due to the raising public awareness in relation to the use of lobsters, for example, as food. For a more strictly scientific point of view, it is a chapter full of comparative references among vertebrates, including humans. In fact, most of the emerging trends, i.e. the enhanced sensitivity of the general public, are also reflected in the way scientists performing animal experiments are evolving from the use of a variety of rodent models towards zebrafish or invertebrate models.

The chapters 8 and 9 are signed by both volume co-editor Jennifer Mather (Canada), a pioneer in Cephalopod behaviour and welfare, and a team partly belonging to the Stazione Zoologica "Anton Dohrn" in Naples, Italy, where most of the extraordinary behavioural and neural complexities of Cephalopods have been described even in past times. Specifically, the authors debated regarding the consciousness of Cephalopods, emphasizing their cognitive abilities and the regulatory aspects around issues linked to their welfare.

The authors conclude the book by expressing in the last chapter the need to focus attention on the individual personality for the provisions of animal welfare, which might appear weird for a butterfly or an earthworm. Yet, recent evidence shows that even ants may possess individual personalities, i.e. consistent clusters of behavioural traits shaped by genetic and epigenetic factors. This previously overlooked inter-individual variation is a topic at the frontiers of behavioural biology and stress physiology, including implications in translational medicine [6] because different personalities might react differently to experimental treatments and/or captive conditions and handling-even in an invertebrate. Therefore, tailoring welfare care and actions to the individual, rather than to the species-specific needs only, is a crucial refinement.

In some readers this book will provoke some skepticism, while triggering variable doses of cultural antibodies, e.g. raising the criticism that any ameliorative effort in the maintenance of experimental animals will inevitably result in higher costs, therefore making even invertebrate research less affordable. Nevertheless, still far from representing an exhaustive manual, this precisely-focussed compilation of essays represents the first useful and accurate outline on why and how the welfare and care management of invertebrates should be taken into consideration.

It is worth mentioning, since the present book review is published in this institutional journal, that the ISS played a major and pivotal role in governing the problem of animal experimentation in Italy. This Institute was historically committed in both promoting the 3R culture and in providing, since 1992, expert opinions to approve single scientific and/or industrial projects exploiting animal subjects. ISS veterinarian and animal experimentation expert Rodolfo Lorenzini, a lifelong supervisor of Italian activities carried out on vertebrates, reports in his accurate review [7] the history of the implementation of the European regulations at the national level, with the progressive steps in which ISS always played a pivotal role. Even the translation into Italian of the 1986 European Directive [8] was sketched by one of us (EA), despite its rather delayed implementation, six years later.

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