Re-defining the Concept of Model Species:

An Experimental Approach on a Range of Marine Animals

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ABSTRACT

Scientific research extensively uses model organisms to address biological, ecological and evolutionary issues. Research employs a limited variety of organisms, ranging from bacteria to complex metazoans, to answer scientific questions and investigate natural aspects. We define “Model Organisms” this small fraction of the biological biodiversity. Generally, they are a simplified tractable system used to study larger scientific questions and to answer complex problems. Researchers expect that results obtained through experiments on these MOs will be applicable to other, more complex, organisms, or to complex communities and ecosystems. Model organisms are sometimes a scarcely representative sample of the global physiological, biochemical and genetic biodiversity and the answers that they can provide could not be easily applicable and transferred to other species. This Ph.D. thesis aims at redefining the concept of “model species” on an objective point of view. I analysed a standard range of common characteristics that can describe and rank selected model organisms on the basis of their unique features, advantages and disadvantages. I have taken into consideration various “practical” features, such as size and feeding, their reproduction and the optimization of the culture techniques, their use in some scientific fields, such as chemical ecology, stress responses and apoptosis, and the availability of molecular tools and sequenced genomes. A set of laboratory analyses was applied to test the power of selected species to answer our questions and an arbitrary score was assigned to each species for each parameter according to our results and to the data available in scientific literature. The information collected was used to objectively rank the considered model organisms, for improving future experimental approaches and indicate a possible strategy to choose adequate models for selected research.