Arguing for a Pluralistic Species Concept in the Assessment of Biodiversity

The first step needed to establish plans for the preservation of biodiversity is biodiversity evaluation, i.e. the process of measuring the value (ideally quantitatively) of biodiversity components. Among these a leading role is traditionally played by species (Magurran 1988; Hill *et al.* 2005): biodiversity hotspots (i.e. those regions of the Earth considered extremely biologically diverse), for instance, are selected on the basis of the species they possess (Kartesz 1994). In particular, *species diversity* is commonly considered an important measure or indicator of biodiversity, and maximizing it is often the goal of conservation strategies (Gotelli & Colwell 2001; May 1988). But calculating species diversity––that is a function of species richness (the number of species present in a certain area) and evenness (a measure of the relative abundance of these different species)––clearly depends on our ability to delimitate and to count species. Unfortunately, identifying and counting species is far less easy than it might seem at a first glance. Apart from disparities due to count creep and to lumper/splitter tendencies (Hey 2001), the disagreement about species count is due to the fact that different researchers often use different species concepts. Because of such and similar difficulties, several alternative proposals have been advanced to assess biodiversity without resorting to the species concept, such as measuring higher taxa (Williams & Gaston 1994), phylogenetic diversity (Faith 1994), or genetic diversity (Crozier 1997).

In this talk I will argue that although species are not the (only) units of biodiversity, a pluralistic species concept is nonetheless a useful tool to assess biodiversity. My strategy will be the following. (i) After having enlighten the difference between units of biodiversity and indicators of biodiversity, (ii) I take as a case study the shift from a non phylogenetic species concept to a phylogenetic species concept and I argue that disagreement on species counting is not an insuperable problem and (iii) that there are at least three good reasons that speak against dismissing species in biodiversity assessment.

(i) Talking of biodiversity as if it were a single property that we may measure or a unique type of units we may consider is probably a pie in the sky. As a matter of facts, in conservation biology the strategy is rather that of looking for good surrogates, that is reliable indicators of biodiversity properties. Just as we do not measure temperature by directly measuring the kinetic energy but rather using mercury––namely a substance that is a sensitive indicator of changes in temperature––in an analogous way, we use parts or properties of biological systems as thermometers of their diversity. I agree with (Maclaurin & Sterelny 2008: chap. 7) that there is more, in biodiversity, than just the species number. Nonetheless, even if species are dismissed as 'the' units of biodiversity, they can nonetheless being maintained as indicators or surrogates of biodiversity. I support this point by mean of an analysis of the genesis of the term 'biodiversity'.

(ii) Depending on the taxonomic school they belong to, and on the types of organisms under consideration, different researchers often use different species concepts (26 species concepts in the modern literature––Wilkins 2009). The plurality of species concepts results in different and often inconsistent ways of partitioning the natural world. In particular, it has been calculated that the shift from a non-phylogenetic species concept to a phylogenetic species concept would lead to an "increase" of the number of species of 48.7%, and consequently to a considerable increase in the number of endangered species (Agapow *et al.* 2004). Analyzing the mechanism of nested reclassification by mean of which this 48.7% is mainly generated, I argue that disagreement about species counts stemming from the multiplicity of species concepts is not a practically insurmountable obstacle; rather, it could provide conservation

plans with useful criteria for making better choices, and hence that––as far as an indicator of biodiversity is concerned––a pluralistic species concept can do the job.

(iii) Finally, I claim that there are at least three good reasons that speak in favor of species (and against the majority of alternative proposals), in spite of the difficulties. (a) Theoretical salience: there is a widespread agreement that species are the units of evolution; (b) Practical convenience: we already possess good (even if not complete or fully coherent) species inventories and some fairly reliable ways to recognize species in practice; (c) Public accessibility: phrasing the issues in terms of species is comprehensible to the general public (and public concern has a great influence over the allocation of resources for conservation).

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