Zootaxa 1965: 61–68 (2008)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

The Encyclopedia of Life *vs.* the Brochure of Life: Exploring the relationships between the extinction of species and the inventory of life on Earth

JOSÉ ANTONIO GONZÁLEZ-OREJA

Departamento de Agroecosistemas y Recursos Naturales; NEIKER-TECNALIA, Instituto Vasco de Investigación y Desarrollo Agrario; Parque Tecnológico Bizkaia, 812 L; 48160 Derio (Spain).
E-mail: jgonzalez@neiker.net, jgonzorj@hotmail.com

One of the most crucial questions of twenty-first century systematic biology deals with the determination of the real number of living species currently sharing the Earth with us (Cracraft 2002); answers vary widely, but commonly range between 3 and 100 million (see, for example, Stork 1997 or May 2002 and references therein). However, in terms of completeness and correctness, our current inventory of living species is certainly unsatisfactory (Dubois 2003), as the total number of species described so far is known to correspond to only a very small fraction of the Earth´s biodiversity. Indeed, large numbers of species remain to be discovered, primarily insects, small invertebrates and, above all, microorganisms (Chevalier et al. 1997). On the other hand, this gap of knowledge regarding the magnitude of the Earth´s biodiversity limits our capacity to properly manage the world´s biotic resources and conserve biological diversity in this so-called Century of Extinctions (Dubois 2003): the current biodiversity crisis is wiping out a significant fraction of living species at an alarming rate and, sadly, an unknown number of species is being forever lost before being discovered, described, and named. Likewise, conservation priorities are clearly constrained by our limited knowledge of the total biodiversity (Dubois 2003, Scotland et al. 2003).

Assuming that 1.5–2 million eukaryote species have been collected, studied and named from Linnaeus' work until now (Cracraft 2002, May 2002, Mace et al. 2005), and that the total figure might lie somewhere between 10–20 million, some authors (Wilson 2003b, 2005) consider feasible to discover, describe and name, in a limited time span, all eukaryote species roaming the Earth. To allow the completion of this Encyclopedia of Life, as it has been termed (Wilson 2003b; see also Wilson 2006), it is imperative to overcome the so-called taxonomic impediment (Dubois 2003, Wheeler et al. 2004, de Carvalho et al. 2005, Evenhuis 2007) which is currently obstructing much needed advancement in sound management of known species (Crisci 2006) and discovery of unknown ones (de Carvalho et al. 2007, Evenhuis 2007). In short, the taxonomic impediment results from (i) deep knowledge gaps in our taxonomic system, (ii) the lack of expert taxonomists and curators to handle the enormous, overwhelming task of classifying the unknown biodiversity and (iii) the impact of these two limitations on our ability to conserve, use and share the benefits of biological diversity. Although it is also questionable, for this paper I will assume that we can not enjoy and protect something if we don't know what is out there to enjoy and protect (Evenhuis 2007). On this matter, and based on his own museum experience, Wilson (2004) reckons that if we double the current number of practising taxonomists (at the moment, it is estimated to be *ca.* 6,000–7,000 taxonomists) (Schnack & López 2003, Wilson 2004), and provide each of them with the help of several technical assistants and novel technologies (*e.g.*, genomic maps, web publication, etc.), the global biodiversity survey could be completed within a single human generation, *i.e.* 25 years. Nonetheless, other authors (May 2004) have expressed doubts about the feasibility of this vast project, particularly taking into account the present rate of new species description, *i.e.,* around 10,000 species per year considering the synonymy load (May 2002, 2004, Dubois 2008).

Completing the Encyclopedia of Life in 25 years: numbers don't tally

In order to throw some light on this issue, I modelled the behaviour of the total number of species known at year *t* (Sk_t) as a linear function of the figure at year *t-1*, plus the net amount of new species described each year (*Nw* = 10,000). In order to be cautious, I considered only one value for the total number of species known at year 2000 (Sk_{2000}), *i.e.*, a low estimate

Accepted by Z.-Q. Zhang: 14 Nov. 2008; published: 17 Dec. 2008

complete the survey in 100 years, it would imply the net extinction of more than 10^5 species (actually, some 300,000), but it could be done at a slower rate of description of new species (close to 0.66 times the current rate).

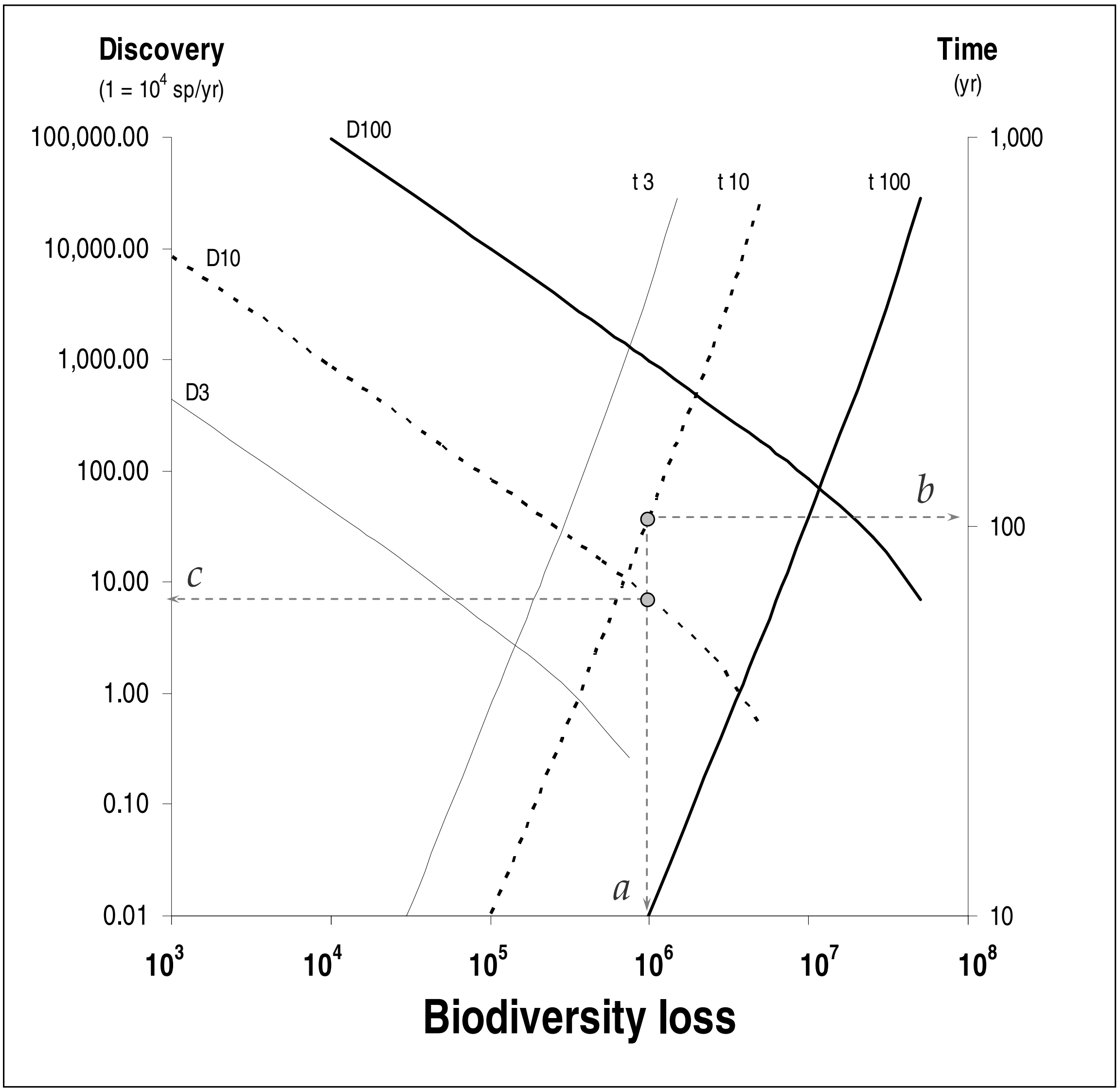

FIGURE 2. Relationships between the rate of description of new species ('Discovery', *left axis*; current values, 1 = 10,000 species/year; logarithmic scale), the time needed to describe all the species at that rate ('Time', *right axis*; in years; logarithmic scale), and the number of species that are lost to extinction during this time ('Biodiversity loss', *horizontal axis*; logarithmic scale). Three estimates of the total number of species living in year 2000 are considered: a very low estimate, 3 million (*thin curves*); a middle estimate, 10 million (*dotted curves*), and a high estimate, 100 million (*thick curves*). For each case, two curves are shown: discovery rates (*D* curves, like, D3 for 3 million species or D100 for 100 million) and time to complete the Encyclopedia of Life (*i.e.*, time to extinction of the species indicated in the horizontal axis; *t* curves, like t10 for 10 million).

Vertical and horizontal dotted lines are used in the figure as an example and evidence that, if the total number of species existing in year 2000 is estimated in 10 million (*dotted curves*), *ca.* 10^6 species (point ***a***) will be lost during the completion of the Encyclopedia (in a time span above 100 years, point ***b***) if we work at a rate of discovery close to 7 times the current one (point ***c***).

Concluding remarks: who will assemble the Encyclopedia of Life (if we are lucky) or the Brochure of Life (if we are not)?

As evidenced throughout this paper, and as noted previously by May (2004), it is unrealistic to think that the completion of the Linnaean enterprise (to use the name proposed by Wilson 2005) could take only one generation, unless the total number of species on Earth is much smaller than thought. In the same sense, Scotland et al. (2003) observed that the pace