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What animal species should we study next?

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Research on wild animals has produced more than 1,308,244 papers between 1978 and 1998 (Biological Abstracts, 1999). Wildlife research should be popular, since the current mass extinction of species constitutes a problem with far more enduring impact than any other environmental problem (Myers *et al.*, 2000). How is this research effort distributed among taxa? Although the vast majority of publications about even the "well known" groups actually concern a rather small proportion of species, it would be very interesting to show whether there is a direct relationship between the number of papers and the number of animal species of main taxonomic groups. We have looked for this result in the literature and, to our knowledge, there is no such explicit analysis on very large groups, and no documentation of the number of papers per taxon.

We estimated the research productivity as the number of papers published between 1978 and 1998 indexed in the Zoological Records on CD (Biological Abstracts, 1999), and correlated productivity with the number of animal species of 16 main taxonomic groups (Wilson, 1988). For the purposes of this study, we assumed that the number of publications on a given group of species was directly related to how much we know about them.

Not surprisingly, we found that birds and mammals are the most studied animal groups, because they are more conspicuous to human beings than are any other groups of animals; they are excellent subjects in many areas of biological research (Entwistle & Dunstone, 2000; Konishi *et al.*, 1989; Nicholson & Crick, 1994); and they are high in the food chain, and therefore represent good umbrella, flagship and keystone species for conservation. It is surprising that fishes, even though they share most of these characteristics, are one of the animal groups which are the subject of proportionally less literature.

In many habitat conservation plans, crucial and basic information on species other than birds or mammals is unavailable (Reichhardt, 1999). Moreover, conserving birds may not be enough to protect biodiversity as a whole (Fonseca *et al.*, 2000; Howard *et al.*, 1988; van Jaarsveld *et*

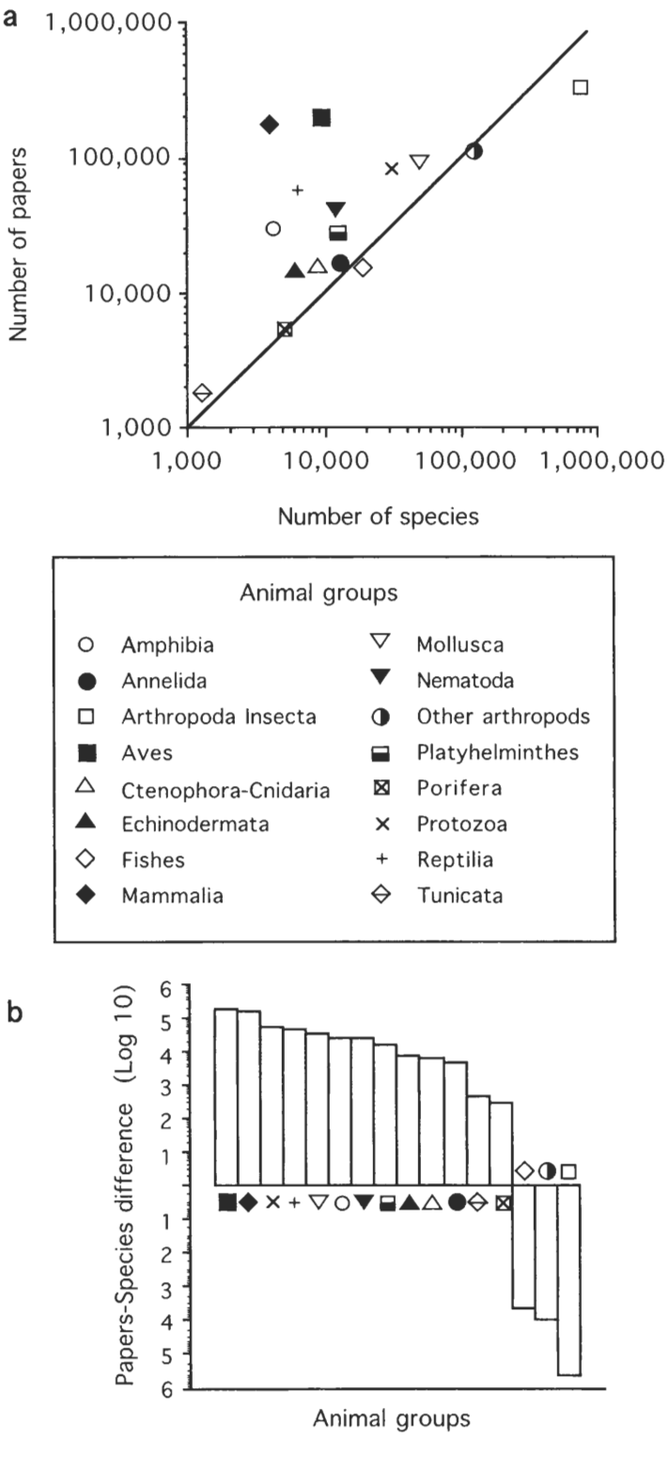

Figure 1. *Number of species in the main animal groups, and research productivity measured as number of papers on each main animal group over 20 years (1978-1998). (a) The number of papers published on each animal group was related to the number of species in such groups (Pearson's coefficient of correlation = 0.65, P < 0.01). Notice that over 20 years, biologists have produced more research papers than animals species in most groups: all except three animal groups were above the isoline papers-species (black line in the figure). (b) A possible, proportional lack of research in some taxa is highlighted when the differences between research production and number of species are plotted as vertical bars in log-scale.*

al., 1998). From Figure 1 it may be expected that lists of threatened species will fail to include enough fishes and arthropods. In fact, the agreement between national and global lists of threatened endemic species in South American animals is worse for arthropods and fishes than for birds and mammals (Rodriguez *et al.*, 2000). In current worldwide conservation biology, there is a lack of basic data on fishes (there could well be at least 5,000 species waiting to be discovered, Myers *et al.*, 2000) and arthropods (insects mainly), which are largely undocumented. Given the proportional lack of information about arthropods and fishes, and although the vast majority of species remain entirely unstudied, we suggest that more effort should be applied to these two groups of animals.

Basic research on these two groups of animals is highly commendable. Where possible, government agencies and non-government organizations should invest in high quality biodiversity inventories before picking protected areas (Balmford & Gaston, 1999), because if they do not, conservation objectives will be substantially less likely to be met. The only long-term solution is to collect new biological data and to conduct basic taxonomy (Fonseca *et al.*, 2000), until enough knowledge about animal abundance and diversity is gathered. Whether enough human and financial resources will be allocated in time by public administrations to study fishes and arthropods is also a hot spot in nature conservation.

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