

# Taxonomy: no decline, but inertia

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## Abstract

The recent literature is rich in papers sounding the alarm about taxonomy. We analyzed data from the Zoological Record (1864–2010 and 1978–2010) to show that we cannot speak of a decline. The number of authors describing new species is growing, along with the number of articles describing new species and the number of new species. We also observed a growing interdisciplinarity and a change in the number of species described per author, suggesting that taxonomy is experiencing new ways of doing research. The modalities of these changes remain to be explored. It is therefore more pertinent to speak not of a decline, i.e. of a degradation relative to a previous situation, but of inadequacy relative to its objective, namely the scientific inventory and classification of the planet's living taxa.

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The recent literature is rich in papers sounding the alarm about taxonomy (McClain, 2011; Pearson et al., 2011). Joppa et al. (2011) and Bacher (2012) counted the number of species described and of authors responsible for their descriptions per year since 1800 as provided in eight large databases specialized on eight taxa: birds, mammals, amphibians, spiders, flowering plants, the genus *Conus*, as well as the less studied superfamilies of parasitic wasps Chalcidoidea and Ichneumonoidea. The two studies concluded that taxonomy is not on the way to disappearing, but that its practices are in a process of transformation.

Such attempts at evaluating the health of taxonomy are becoming increasingly numerous. They are based on either the rate of species description, the rate of taxonomic publications, and/or an estimation of the number of taxonomists. However, the size of the databases available has so far limited such analyses to a mesoscopic level (taxon, country) (Michán et al., 2008; Rodrigues et al., 2010; Joppa et al., 2011; Bacher, 2012; Fontaine et al., 2012) or to a sampling of taxonomic articles (Tancoigne et al., 2011). To date, no evaluation of taxonomy at a macroscopic level exists.

To address this problem, we made counts based on the *Zoological Record* (ZR), the database of reference in zoology (3.9 million references from 1864 to the present).

We used the analysis tool Analyze Results of the ZR for various requests made on 8 June 2012, as well as on the data of the Index to Organism Names (ION; <http://www.organismnames.com/>) on the same date. We identified taxonomy in the ZR through two approaches: first via the keyword “systematics” and second via the combination of keywords “Sp nov” OR “Subsp nov” OR “New species” OR “New subsp”. All these keywords are present in the indexation thesaurus of the ZR. The word “taxonomy” is used in the ZR in a sense too restrictive to be useful here.

The data from the ZR reveal an exponential increase in the number of publications in zoology since World War II, except for the period 1989–1999 (Fig. 1a). According to the ION, the number of species and subspecies described since 1864 follows a similar progression, with a decrease in the year 1990 and an increase since the beginning of the year 2000 (Fig. 1b). ION data show identical patterns to NameBank-uBio data from Sarkar et al. (2008), except for the 1970s and 1980s, where the data show opposite trends. This is explained by numerous gaps in Sarkar et al.'s data for

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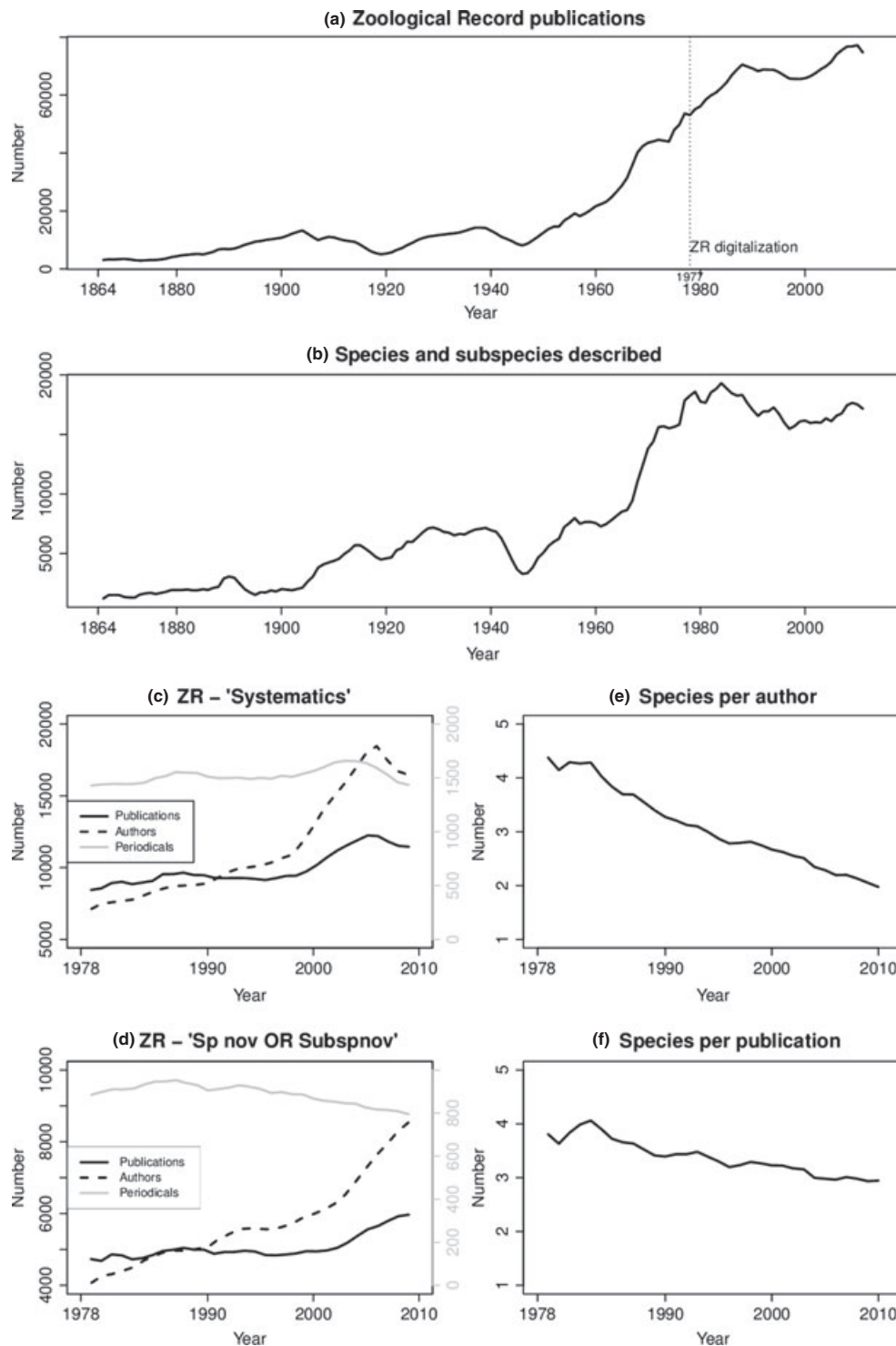


Fig. 1. Data on taxonomy from the *Zoological Record*: (a, b) 1864–2011; (c–f) 1978–2011. Mobile averages over 3 years. (a) Number of publications in the ZR (IC = “ZOO\*”). (b) Number of species and subspecies described (Index to Organism Names). (c) Number of publications, authors, and periodicals in systematics (SD = “Systematics”). (d) Number of publications, authors, and periodicals describing new species or subspecies (SD = “Sp nov” OR “Subsp nov” OR “New species” OR “New subsp”). (c,d) For authors and periodicals, results were refined by document type (Document type = “Article”). (e) Number of species or subspecies described per author of new species or subspecies articles. (f) Number of species or subspecies described per article describing new species or subspecies.

that period (see <http://taxatoy.ubio.org/>; restricted to Animalia and 1864–2000). The number of publications on systematics (Fig. 1c) and the number of publications containing descriptions of new species and subspecies (Fig. 1d) show the same trend as ION data: an ascending curve with a plateau during the 1990s. The same pattern can be found in the Web of Science data (UT = “WOS\*”) when subject category is restricted to (“Zoology” AND “Entomology”), but not in the whole Web of Science, nor in the CAB database (UT = “BIOABS\*”), which present a constant increase (data not shown).

The number of periodicals publishing papers of systematics or descriptions of new species and subspecies shows a recent decrease. However, this is not the sign of a decline, but of a modification of the “publication landscape”. A single journal, *Zootaxa*, born just before the inflection of the curve, has provided 20% of the papers describing new taxa in 2010.

In contrast, the number of authors of systematics or describing new species and subspecies has been steadily increasing since 1978 (Fig. 1c,d). The sharp decrease observed at the end of the year 2000 for systematics reveals only a change in ZR thesaurus indexation.

All these data therefore point in the same direction: there might have been a global steady state of taxonomy in the 1990s, but this is not true for today’s taxonomy.

In our study, we also paid attention to the proportion of interdisciplinary publications, indexed with several keywords for disciplines, including “systematics”. The proportion increases from 0.9% in 1950 to 27.8% in 2008. In 2008, this interdisciplinarity equals 70% of works associated with the keyword “evolution”. Ecology associations decrease from 93% in 1950 to only 37% in 2008 (note that collaboration between three fields or more leads the total to exceed 100%). Moreover, the mean number of species or subspecies described annually per author decreases from 4.1 in 1980 to 2.1 in 2010 (fig. 1e). The number of species described per publication decreases from 3.8 in 1980 to 2.9 in 2010 (fig. 1f). Finally, the proportion of “Book or book chapter” (field “document type”) including new species or subspecies descriptions rose from 1% (20 items) in 1950 to 5% (254 items) in 1980 but decreased to 2% (131 items) in 2008. Revisions or monographs are thus less numerous, both in direct and in proportional counts.

Therefore, while the data from the ZR contradict the idea of a global decline of taxonomy, they also testify to modifications of practices within the discipline. The modalities of these changes remain to be explored. Are taxonomists diversifying their tools? Is the field of taxonomy progressively becoming invested by researchers from other fields? Are collaborations between taxonomists and other researchers becoming more important?

Despite these relatively positive trends, there is undoubtedly a feeling of anxiety prevalent in the community of taxonomists. The use of striking metaphors and the dramatic tone often adopted (“endangered”, “extinction”) reveal, in our opinion, perhaps less of a real menace of disappearance of the discipline, than of a striking inadequacy of its strengths (taxonomic impediment) (Blackmore, 1994), at the time of the biodiversity crisis (Wilson, 1985) or century of extinctions (Dubois, 2003). Given the size of the remaining work of taxonomic inventory still ahead of us (taxonomic gap), there is a real urgency (taxonomic emergency) (Dubois, 2010) to describe unknown species. Taxonomy is today one of the few scientific disciplines (with linguistics and some branches of anthropology) confronted with the disappearance of its objects of study.

It is therefore more pertinent to speak not of a *decline*, i.e. of a degradation relative to a previous situation, but of inadequacy (González-Oreja, 2008; Bacher, 2012) relative to the objective, namely the scientific inventory and classification of the planet’s living taxa. Systematics is confronted with a growing challenge and has so far not shown clear signs of its ability to address it properly. This passivity, which we might term *taxonomic inertia*, certainly deserves attention from the entities responsible for scientific policy and funding worldwide, as well as from taxonomists themselves.

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## References

- Bacher, S., 2012. Still not enough taxonomists: reply to Joppa et al. *Trends Ecol. Evol.* 27, 65–66.
- Blackmore, S., Cutler, D.F. (Eds.) (1994) *Systematics Agenda 2000: Charting the Biosphere: A Global Initiative to Discover, Describe and Classify the World’s Species*. Samara Publishing for the Linnean Society, New York.
- Dubois, A., 2003. The relationships between taxonomy and conservation biology in the century of extinctions. *C.R. Biol.* 326, 9.
- Dubois, A., 2010. Zoological nomenclature in the century of extinctions: priority vs “usage”. *Organisms, Diversity & Evolution*, 10, 259.
- Fontaine, B., van Aelterberg, K., Alonso-Zarazaga, M.A., Araujo, R., Asche, M., Aspöck, H., Aspöck, U., Audisio, P., Aukema, B., Bailly, N., Balsamo, M., Bank, R.A., Belfiore, C., Bogdanowicz, W., Boxshall, G., Burckhardt, D., Chylarecki, P., Deharveng, L., Dubois, A., Enghoff, H., Fochetti, R., Fontaine, C., Gargominy, O., Lopez, M.S.G., Goujet, D., Harvey, M.S., Heller, K.-G., van Helsdingen, P., Hoch, H., De Jong, Y., Karsholt, O., Los, W., Magowski, W., Massard, J.A., McInnes, S.J., Mendes, L.F., Mey, E., Michelsen, V., Minelli, A., Nafria, J.M.N., van Nieukerken, E.J., Pape, T., De Prins, W., Ramos,

- M., Ricci, C., Roselaar, C., Rota, E., Segers, H., Timm, T., van Tol, J., Bouchet, P., 2012. New species in the Old World: Europe as a frontier in biodiversity exploration, a test bed for 21st century taxonomy. *PLoS ONE*, 7, e36881.
- González-Oreja, J., 2008. The Encyclopedia of Life vs. the Brochure of Life: exploring the relationships between the extinction of species and the inventory of life on Earth. *Zootaxa*, 1965, 61.
- Joppa, L.N., Roberts, D.L., Pimm, S.L., 2011. The population ecology and social behaviour of taxonomists. *Trends Ecol. Evol.*, 26, 551.
- McClain, C., 2011. The mass extinction of scientists who study species. [online] *Wired.com* Available at: <http://www.wired.com/wiredscience/2011/01/extinction-of-taxonomists/>.
- Michán, L., Russell, J.M., Sanchez Pereyra, A., Llorens Cruset, A., López Beltrán, C., 2008. Análisis de la sistemática actual en Latinoamérica. *Interciencia*, 33, 754.
- Pearson, D.L., Hamilton, A.L., Erwin, T.L., 2011. Recovery plan for the endangered taxonomy profession. *Bioscience*, 61, 58.
- Rodrigues, A.S.L., Gray, C.L., Crowter, B.J., Ewers, R.M., Stuart, S.N., Whitten, T., Manica, A., 2010. A global assessment of amphibian taxonomic effort and expertise. *Bioscience*, 60, 798.
- Sarkar, I.N., Schenk, R., Norton, C.N., 2008. Exploring historical trends using taxonomic name metadata. *BMC Evol. Biol.*, 8, 144.
- Tancoigne, E., Bole, C., Sigogneau, A., Dubois, A., 2011. Insights from *Zootaxa* on potential trends in zoological taxonomy. *Front. Zool.* 8, 1–13.
- Wilson, E.O., 1985. The global biodiversity crisis: a challenge to science. *Issues Sci. Technol.* 2, 20–29.