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### Photography-based taxonomy is inadequate, unnecessary, and potentially harmful for biological sciences

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#### Note

The question whether taxonomic descriptions naming new animal species without type specimen(s) deposited in collections should be accepted for publication by scientific journals and allowed by the *Code* has already been discussed in *Zootaxa* (Dubois & Nemésio 2007; Donegan 2008, 2009; Nemésio 2009*a–b*; Dubois 2009; Gentile & Snell 2009; Minelli 2009; Cianferoni & Bartolozzi 2016; Amorim *et al.* 2016). This question was again raised in a letter supported by 35 signatories published in the journal *Nature* (Pape *et al.* 2016) on 15 September 2016. On 25 September 2016, the following rebuttal (strictly limited to 300 words as per the editorial rules of *Nature*) was submitted to *Nature*, which on 18 October 2016 refused to publish it. As we think this problem is a very important one for zoological taxonomy, this text is published here exactly as submitted to *Nature*, followed by the list of the 493 taxonomists and collection-based researchers who signed it in the short time span from 20 September to 6 October 2016.

#### Correspondence

In defense of a species description without preserved specimens, a few colleagues recently provided arguments that could lead to widespread use of photography-based taxonomy (PBT) (Pape *et al.* 2016). We 493 collection-based researchers refute these arguments.

The main purpose of the *Code's* Article 73.1.4—which tolerates the naming of species described based on illustrations—is to allow the nomenclatural availability of species names established without reference specimens before the maturity of taxonomy. However, modern descriptions shouldn't be done without *material* evidence through at least one museum 'type' specimen, carrying many characters that cannot be seen on photographs and enabling objectivity, replicability and refutability.

Species delimitation is a matter of taxonomy, not of nomenclature, but taxonomic work requires such a specimen to make an *objective* link between a name and a natural population, without which the allocation of the name remains uncertain.

Alleged species known only from photographs can be referred to by non-scientific names until the collection of a specimen enables acceptable taxonomic descriptions.

Peer-review, which is not required by the *Code*, may indeed be useful for taxonomic works if carried out by competent referees, but it has repeatedly proved insufficient to prevent flawed descriptions. PBT will promote rapid dissemination of poorly reviewed descriptions based on unverifiable "evidence".

PBT is detrimental for fields of biology that depend on taxonomy: impeding approval of permits to collect—a strong nuisance for taxonomy; harming the credibility of and obstructing advances in taxonomy, as untrained/unscrupulous persons can easily flood life "catalogues" with dubious taxa; increasing instability and inaccuracy, as scrutiny is hindered by the lack of specimens.

The *Code* must be reformed to prevent that Articles designed to deal with contributions from the early ages of taxonomy are used to justify outdated practices that can harm science and biodiversity conservation.

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