

'Phantom references', 'nomina nuda' and the dilemma of freshwater fish taxonomy in India

Rajeev Raghavan, Neelesh Dahanukar, Siby Philip, K. Krishnakumar and Anvar Ali

'Taxonomy (the science of classification) is often undervalued as a glorified form of filing – with each species in its folder, like a stamp in its prescribed place in an album; but taxonomy is a fundamental and dynamic science, dedicated to exploring the causes of relationships and similarities among organisms. Classifications are theories about the basis of natural order, not dull catalogues compiled only to avoid chaos.'

Stephen J. Gould
Wonderful Life, 1989, p. 98

The discovery, collection, storing, study and description of specimens and tissues of the still unknown species before they turn extinct is an absolute priority for biology in the *century of extinctions*¹. To be really useful to all other comparative disciplines of biology, taxonomy must be carried out in a professional manner, and requires a strict methodology for the recognition of species, and for their nomenclature².

While it is true that a race is on to discover and describe new species before they vanish, this has to be done systematically. Once a species is discovered, and confirmed as unique, it has to be formally 'described' and assigned a scientific name before it can be officially referred to as 'new to science'. The key word here is 'description', i.e. formally published, taking into consideration the Code of the International Commission on Zoological Nomenclature (ICZN; Chapter 3, Article 8)³.

Although India harbours the largest number of endemic freshwater fish species in continental Asia⁴, our knowledge on this taxon is still limited⁵. Despite more than two centuries of fish taxonomy research, the Indian ichthyofauna remains in need of in-depth systematic study⁶. While some efforts have begun to emphasize the need, importance, urgency^{5,7,8} and improved understanding of taxonomy and evolution of freshwater fishes^{9–11}, others continue to add confusion and take Indian freshwater fish taxonomy to a point of no return.

Here, we highlight some glaring cases of unprofessional and unethical appro-

aches followed by Indian researchers while publishing papers and reports that have a long-lasting impact on the taxonomy and taxonomic literature of freshwater fishes. We specifically focus attention on two case studies to emphasize our points.

The first is the Fourth National Report¹² by the Ministry of Environment and Forests (MoEF), Government of India (GoI), to the Convention on Biological Diversity (CBD). Citing information from the National Bureau of Fish Genetic Resources (NBFGR), the MoEF report¹² mentions that 36 new fish species were 'discovered' from diverse biogeographic zones of the country in 2007. A closer look and a critical analysis of their taxonomic status reveal that the names of at least 10 of these 36 species are 'nomina nuda' (a name which is unavailable because it fails to conform to the rules set out in the ICZN), while one species (*Garra robustus*) was described (as *Placocheilus robustus*) as early as 2002 from southwestern China¹³. The nine nomina nuda or 'unavailable names' include 'Bangana orientalis, Garra nilamburensis, G. travancoria, Neolissochilus tamiraparaniensis, N. acutirostris, N. microphthalmus, N. capudelphinus, N. minimus and Tor moyarensis'.

Four more names cited in this report were 'unavailable' at the time of publication. The authors¹² mention that *Garra emarginata*, *Garra mlapparaensis*, *Homaloptera silasa (sic)* and *Tor ramadevi (sic)* were discovered in 2007. However, these four species were only scientifically described in October 2011 (for detailed dates see Eschmeyer¹⁴). While their claim of 'discovery' could be correct, naming those species before properly describing them and propagating these 'unavailable names' in taxonomic literature (to attract unwarranted attention and fame) is an unpleasant obsession in a region where fish taxonomic research is in a flux⁸.

From where have so many species that do not exist been 'discovered' and 'named'? To further this discussion, one needs to understand the recent trend of fish species discoveries in southern

India. New fish species discoveries from Kerala are often first published in daily newspapers rather than scientific journals, a trend exclusive to the researchers of the region. A report published in *The Hindu*¹⁵ in 2004 reported that four new fish species were discovered from the rivers of Kerala. Before formally 'describing' the species in a scientifically accurate fashion, their binomials were also provided in the newspaper – *Tor remadevi (sic)*, *Homaloptera silasi*, 'Garra travancoria' and 'Garra nilamburensis'. Interestingly it was only seven years later that two of these species (*H. silasi* and *T. remadevi*) were formally described in the scientific literature, while two of the names 'G. travancoria' and 'G. nilamburensis' remain unavailable till date (April 2013) and still represent 'nomina nuda'. This trend of providing binomials in popular press before the species is officially described is not a thing of the past. In December 2012, the on-line version of British Broadcasting Corporation (BBC) in its Science and Environment Section¹⁶ carried a news item of a new blind eel, 'Monoterus trichurensis' discovered in Kerala. As the species has not been described till date, this also constitutes a nomen nudum.

Naming a species before it is scientifically (and correctly) described is an unprofessional approach as it creates no end to confusion and disorients organized taxonomic works. Such practices can be traced back as far as Kalawar and Kelkar¹⁷ in 1956, who reported 'Balitora shimogensis' from a tributary of Krishna River system, and mentioned that the species will be described elsewhere. The species was never described, and as a result Kottelat¹⁸ in his review of Indian and Indo-Chinese balitorids considered this name as 'nomen nudum' and tentatively placed it under the doubtful synonymy of *B. mysorensis*. Recently, Bhoite *et al.*¹⁹ described *B. laticauda* from Krishna River, and suggested that this species could be the same as 'B. shimogensis'. However, true identity of 'B. shimogensis' still remains obscure in the absence of any distinguishing characters for the species.

Apart from creating taxonomic confusions, with no possible solution, there are several other problems associated with naming a species before it is described. Species descriptions in recognized journals have to go through peer review and several modifications, including changes to etymology and names can be made at this stage (although quite unusual). We wish to cite an example of an article that appeared in several regional newspapers in Kerala on 9 and 10 April 2007 about a new genus (*Pseudoconta*) and species (*madhusoodani*) of catfish discovered from the Bharatapuzha River²⁰. During the subsequent peer review and editorial process, the claim of the new genus was abandoned, and the fish was described as a new species with a completely different binomial, *Pseudolaguvia austrina*²¹.

The second (case study) and a rather more 'creative' example of 'naming' can be observed in a recent paper published in the *Journal of the Bombay Natural History Society*²². The authors list 65 species of fish that are consumed by the local communities in Parambikulam Wildlife Sanctuary, Kerala. Of these, six are unavailable names, viz. 'Barilius kadamparaiensis, Garra itamalayarensis, Neolissochilus anamalaiensis, Puntius poovarensis, Rasbora kannachiyarensis and Tor anamalaiensis'.

A serious problem with ichthyological literature (especially papers in the recent past) is that authors uncritically rely on earlier data (often from poor sources), and as a result many reviews are mere compilations of old and often incompatible information. Errors are thus propagated over long periods of time²³. A case in point from the Western Ghats is 'Pangio bashai', a nomen nudum that has been extensively mentioned in Indian ichthyology literature. A paper by Easa and Basha²⁴ in 1995 mentioned that 'a new species under the genus *Pangio* was obtained from Chalikkal river, a tributary of River Chaliyar in February 1994' and cites the description as 'in press' in the magazine *Tropical Fish Hobbyist*. Two years later, in a separate paper²⁵ on the fish fauna of the Kerala part of Nilgiri Biosphere Reserve, the authors listed 'P. bashai', and again refer to the species as 'in press'. It turns out that the description paper has not been published till date. However, citing these two papers^{24,25}, 'P. bashai' was recorded as a valid species in several publications²⁶⁻³⁰ during the years 2000–2010. Interestingly, a recent

book on the fishes of India²⁸ lists 'P. bashai', with a footnote that it is rare, but does not include it in the key to *Pangio* species for obvious reasons that the species has not been described, and as a result there are no distinguishing characters for the same. Finally, it took more than 17 years for a paper to state that the name 'P. bashai' is 'unavailable' and is a nomen nudum³¹.

Yet another example is 'Tor moyarensis', a nomen nudum which has been referred to as the Mahseer species distributed in Moyar River within the Mudumalai Wildlife Sanctuary³². The name 'T. moyarensis' is unavailable, as till date there is no scientific description that has been made of such a species.

A recent amendment to ICZN (ICZN 2012: 1–7) allows species descriptions to be made in electronic publications under the following conditions (in addition to articles 8.1.1–8.1.3 of ICZN 1999) – (1) the work must be registered in ZooBank before it is published; (2) the work itself states the date of publication with evidence that registration has occurred, and (3) the ZooBank registration states both the name of an electronic archive intended to preserve the work and the ISSN or ISBN associated with the work³³.

Recently, a paper describing a new species 'Barilius pectoralis' from northern India was published in the *Journal of New Biological Reports*³⁴. In addition to being poorly written and presented, the paper which was published in an electronic journal does not fulfil Article 8.5 of the amendment of ICZN³⁵. As a result, 'B. pectoralis' is still an 'unavailable name' until a whole new 'description' fulfilling all criteria is made and the species name is listed in ZooBank, or is validated in a print journal. For an interesting example, refer to the first description of *Garra namyaensis* in an on-line only journal³⁶ and its subsequent validation in a print journal³⁷.

With increasing consciousness regarding the conduct and misconduct in science, it is essential that there should be a check on the publications with phantom references and nomina nuda as they create confusion and distort proper taxonomic practices. It is essential to note that creating new names that really do not exist in the literature could be grouped under the 'fabrication (creating false data)' type of scientific misconduct. It is essential to expose authors of such publications and proper disciplinary

action should be taken by the journals which publish such data.

While citing an 'in press' article or mentioning that some aspect of the study will be published 'elsewhere' are not normally judged as scientific misconducts, it is advisable that at least in the case of taxonomic works, journal editors and reviewers should discourage such practices. Articles that merely review the previous work, especially in the case of listing the species, should go beyond the literature review and conform that the names mentioned are published according to ICZN (which is available freely on-line). Fortunately, with the advent of open access databases like the *Catalog of Fishes*¹⁴, it is now possible to confirm the availability of scientific names. Additionally, the authors should also visit museums to examine, measure and photograph type materials so as to gain 'first-hand' knowledge on the species that they compare it with, or write about. Researchers should recognize the merit of peer-reviewed publications rather than citing widely read newspapers (or institutional websites and annual reports, etc.), which quite often lack the 'required' scientific rigour; and thus is a wrong practice to be cited in the taxonomic literature unless in unavoidable circumstances.

There is a renewed interest and newfound vigour within the freshwater fish taxonomy and conservation community in India, with a flurry of papers describing new species, resolving age-old taxonomic issues and unravelling phylogenetic and evolutionary puzzles. Publications like those discussed here will no doubt derail and hinder the progress of fish taxonomy research in India. Finally, we would like to caution ichthyologists working in the Western Ghats (and elsewhere) to verify the sources of information especially with regard to species names before using them for their own work, so as to avoid presenting inaccurate and erroneous information.

1. Dubois, A., *C. R. Biol.*, 2003, **326**, S9–S21.
2. Dubois, A., *Taprobanica*, 2010, **2**, 1–5.
3. ICZN/International Commission for Zoological Nomenclature, International Code of Zoological Nomenclature, International Trust for Zoological Nomenclature, London, 1999.
4. De Silva, S. S., Abery, N. W. and Nguyen, T. T. T., *Divers. Distrib.*, 2007, **13**, 172–184.

5. Dahanukar, N. *et al.*, In *The Status and Distribution of Freshwater Fishes of the Western Ghats* (compilers Molur, S. *et al.*), IUCN, Cambridge, UK and Gland, Switzerland, and Zoo Outreach Organization, Coimbatore, 2011, p. 116.
6. Lundberg, J. G. *et al.*, *Ann. Mo. Bot. Gard.*, 2001, **87**, 26–62.
7. Viswanath, W. and Linthoingambi, I., *Indian J. Anim. Sci.*, 2010, **80**, 16–25.
8. Raghavan, R. *et al.*, *Curr. Sci.*, 2012, **102**, 835–837.
9. Benziger, A. *et al.*, *PLOS One*, 2011, **6**, e21272.
10. Jadhav, S. S., Paingankar, M. and Dahanukar, N., *J. Threat. Taxa*, 2011, **3**, 2078–2084.
11. Knight, J. D. M., Rema Devi, K. and Atkore, V., *J. Threat. Taxa*, 2011, **3**, 1686–1693.
12. Goyal, A. K. and Arora, S., India's Fourth National Report to the Convention on Biological Diversity, 2009; www.cbd.int/doc/world/in/in-nr-04-p1-en.pdf (accessed on 10 November 2012).
13. Zhang, E., He, S.-P. and Chen, Y.-Y., *Hydrobiologia*, 2002, **487**, 207–217.
14. Eschmeyer, W. N. (ed.), *Catalog of Fishes*; <http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp> (accessed on 24 December 2012).
15. Anon., *The Hindu*, 2004; <http://www.hindu.com/2004/11/15/stories/20041115-06140300.htm> (accessed on 16 November 2012).
16. Parameswaran, S., *BBC*, 2012; www.bbc.co.uk/news/science-environment-20-661661 (accessed on 21 January 2012).
17. Kalawar, A. G. and Kelkar, C. N., *J. Bombay Nat. Hist. Soc.*, 1956, **53**, 669–679.
18. Kottelat, M., *Rev. Suisse Zool.*, 1988, **95**, 487–504.
19. Bhoite, S., Jadhav, S. and Dahanukar, N., *J. Threat. Taxa*, 2012, **4**, 3038–3049.
20. Anon., *Mathrubhumi*, 10 April 2007.
21. Radhakrishnan, K. V., Sureshkumar, S. and Ng, H. H., *Ichthyol. Explor. Freshwaters*, 2011, **21**, 377–383.
22. Yesodharan, K., Padmanabhan, P. and Cini, N. U., *J. Bombay Nat. Hist. Soc.*, 2011, **108**, 41–46.
23. Kottelat, M. and Freyhof, J., *Handbook of European Freshwater Fishes*, Kottelat, Cornol, Switzerland and Freyhof, Berlin, Germany. Publications Kottelat, 2008, pp. xiii + 646.
24. Easa, P. S. and Basha, S. C., A survey on the habitat and distribution of stream fishes in the Kerala part of the Nilgiri Biosphere Reserve, Kerala Forest Research Institute, 1995, vol. 104, p. 87.
25. Easa, P. S. and Shaji, C. P., *Curr. Sci.*, 1997, **73**, 180–182.
26. Gopi, K. C., In *Endemic Fish Diversity of Western Ghats* (eds Ponniah. A. G. and Gopalakrishnan, A.), NBFGR-NATP Publication 1, National Bureau of Fish Genetic Resources, Lucknow, 2000, pp. 13–32.
27. Thomas, K. R., Biju, C. R. and Ajithkumar, C. R., *J. Bombay Nat. Hist. Soc.*, 1999, **96**, 479–480.
28. Jayaram, K. C., *The Freshwater Fishes of the Indian Region*, Narendra Publishing House, New Delhi, 2010, 2nd edn, pp. xxxi + 616.
29. Rema Devi, K., Sathish Kumar, V. M., Beta, M. and Manakadan, R., *Hornbill*, April–June 2010, 34–38.
30. Dahanukar, N., Raut, R. and Bhat, A., *J. Biogeogr.*, 2004, **31**, 123–136.
31. Britz, R., Ali, A. and Raghavan, R., *Ichthyol. Explor. Freshwaters*, 2012, **23**, 45–50.
32. Johnsingh, A. J. T. and Raghunath, *Frontline*, 2010, **27**; <http://www.flonnet.com/fl2705/stories/20100312270506400.htm> (accessed on 16 November 2012).
33. Zhang, Z.-Q., *Zootaxa*, 2012, **3450**, 8.
34. Hussain, A., *J. New Biol. Rep.*, 2012, **1**, 21–24.
35. International Commission for Zoological Nomenclature. *Zookeys*, 2012, **219**, 1–10.
36. Shangningam, B. and Vishwanath, W., *ISRN Zool.*, 2012, 325064.
37. Shangningam, B. and Vishwanath, W., *Ichthyol. Explor. Freshwaters*, 2012, **23**, 10.

ACKNOWLEDGEMENT. We thank Ralf Britz, Natural History Museum, London for valuable comments which helped improve the manuscript.

*Rajeev Raghavan**, Siby Philip, K. Krishnakumar and Anvar Ali are in the Conservation Research Group, St. Albert's College, Kochi 682 018, India; Neelesh Dahanukar is in the Indian Institute of Science Education and Research, Sai Trinity Building, Sus Road, Pashan, Pune 411 021, India; Rajeev Raghavan and Neelesh Dahanukar are also in the Zoo Outreach Organization, 96, Kumudham Nagar, Vilankurichi Road, Coimbatore 641 035, India.

*e-mail: rajeevraq@hotmail.com