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When human understanding of fish invasion is blurred

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Leprieur et al.'s observation that fish invasions are blurred by human activity (Leprieur et al. 2008 doi:10.1371/journal.pbio.0060028) correctly reflected the well established understanding that fish invasion is human mediated (1-4).

However, shortcomings in Leprieur et al's (2008) article stem from confusion between introduction and invasion, a crude analysis of human activity which has lead to a misrepresentation of introduction hotspots and lastly, a misunderstanding of ecological impacts associated with non-native fish introduction.

First, the article refers indiscriminately to fish introductions and invasions. These terms, although often misused, have different meanings and ecological implications. A fish introduction is a deliberate or accidental release of a novel species into a specific water while an invasion is a process whereby an introduced fish species has established, spread rapidly and presents a risk to native species. In building the database on self reproducing populations of novel species within a given river basin, the authors have analysed fish introductions in the world's river systems rather than fish invasion. Subsequently, they identify six non-native fish introduction hotspots, not invasion hotspots. This has great implications for global understanding and forecasting of ecological impacts and possibly biodiversity losses associated with fish introductions.

In calculating human activity, the authors used a combination of human population density and purchase power (GDP). This combination has generated a bias toward wealthy populated regions. Thus Australia and New Zealand rather than Asian countries emerged as "invasion hotspots". But, for historical geographical and cultural reasons, countries such as the Philippines, China, Japan and Singapore represent half of the total number of fish introductions in Asia (n= 1056) with 25% of all these introductions for the Philippines alone [3]. An understanding in fine of human activity responsible for fish introductions worldwide [3] would have helped to correct the models predictions. Out of the 624 fish species introduced worldwide, 91% can be explained by a need for food (51%), hobbyist fish (21%), angling or sport (12%) or fisheries (7%). The level of non-native introductions in a given FAO region is in fact determined by the level of aquaculture production [3]. Asia, driven by the countries mentioned above, has the highest aquaculture production of freshwater fish (circa 300 million tonnes of fish in 2004) and the highest ranking for global import/export of non-native freshwater fish.

Finally, not all fish introductions result in invasion or harm native species and disturb ecosystem processes [3]. Species recognised as having the greatest detrimental impacts on ecosystem functioning are those that are typically ecosystem engineers. However, the overall probability of an ecological impact resulting from freshwater fish introductions is relatively low (circa 6%, see [3]). Highlighting hotspots as a tool to tackle conservation strategies is simply incorrect. Introduction of Nile perch in Lake Victoria is a good example of a single introduction being responsible for a great loss in fish biodiversity despite being independent from propagule pressure and outside the "South African hotspot". References to plants and higher vertebrate introductions to support the idea that non-native fish are a key component of human-induced biodiversity crisis is misleading and not supported by evidence [3]. It is about time that our understanding of ecological impact and fish invasion developed beyond such generalities as in Leprieur et al (2008). This can only contribute to blurring human understanding of fish invasion.

1. Copp G.H. et al. (2007) J. Fish Biol. 71, 148-159.
2. Duggan I.C.et al. (2006) Biol. Inv. 8, 393–398.
3. Gozlan R.E. (2008) Fish & Fish. 9 106-115.
4. Rixon C.A.M. et al. (2005) Bio. & Cons. 14, 1365–1381.