

## Viewpoint

# “One is the loneliest number”; are we witnessing the death throes of the single-author research paper in the field of biological invasions?

Calum MacNeil

Brookvale Cottage, Main Road, Union Mills, Isle of Man, British Isles IM4 4AJ

E-mail: [calummac73@hotmail.com](mailto:calummac73@hotmail.com)

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### Abstract

Single-author papers are the lowest relative contributors to the research output of international open access journals *BioInvasions Records (BIR)*, *Aquatic Invasions (AI)* and *Management of Biological Invasions (MBI)*, accounting for 5% or less of published papers. In contrast, papers by four or more authors are the highest contributors, accounting for over half of the research output for the three journals. Papers by two or three authors are intermediate between these extremes, accounting for 15–23% of research outputs. The relative contributions of research papers by single-authors to the output of *AI* and *MBI* has also significantly declined over time, while concurrently those by four or more authors has significantly increased. Although not significant, a similar pattern is also evident in *BIR*. Considering invasion ecology research, factors such as increasing globalisation, the increasing use of transboundary data-sets for invasive species and the proliferation of collaborative multidisciplinary author teams with multiple skill-sets, may be driving single-author papers to extinction.

**Key words:** invasion ecology research, globalisation, transboundary, multi-author, multidisciplinary, multiple skill-sets

### Introduction

This is a single-author paper. It originated as a single-author submission and if you are reading this, it was a successful single-author submission. The lead author of this article and indeed the only author of this article, was fortunate enough to be a co-author on a six-author paper in 2009, with the eminent freshwater ecologist H. B.N. Hynes (MacNeil et al. 2009). Hynes, along with similarly distinguished ecologists such as J.R.E. Jones and H.P. Moon wrote many of the papers that inspired this author to become a scientist and in particular a freshwater ecologist. What is remarkable looking back from the vantage point of 2018, is just how many of the papers produced by this trio, commencing in the 1930s, were the products of a single author. Such lone working is increasingly rare, as in recent decades there has been a strong trend away from single-author papers (Price 1963) towards multi-author papers across all scientific disciplines (Adams 2012). Barlow et al. (2018) in an examination of trends

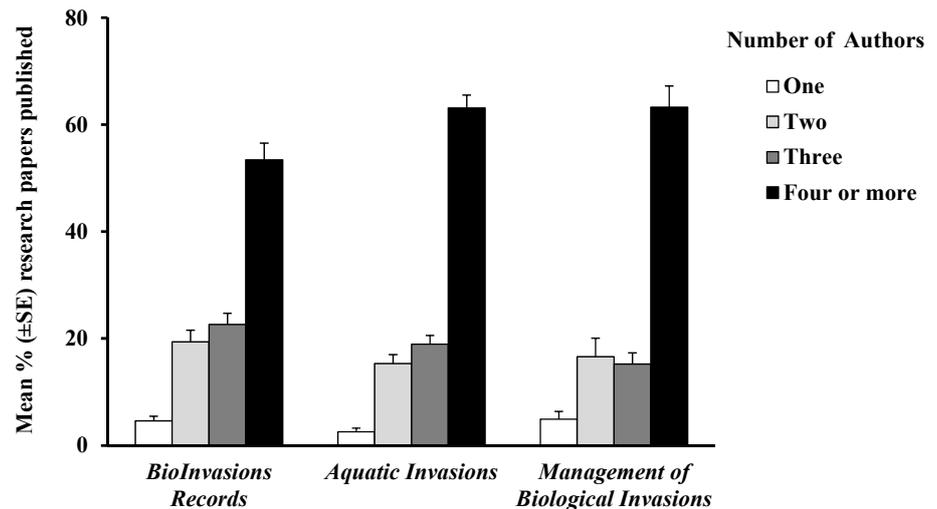
in single-author versus multi-author research papers in “*The Journal of Applied Ecology*” (*JAE*), noted that from single-author papers accounting for over 60% of the journal’s content in the 1960s, they account for less than 4% in the last decade. It is somewhat ironic that the Barlow et al. (2018) study entitled “*On the extinction of the single-authored paper*” is itself the result of eight authors from four different countries.

Research into invasion ecology is often transboundary (covering different regions, countries and political jurisdictions), multidisciplinary (involving ecologists, policy makers, environmental managers, historians, government environmental protection agencies) and often has an inherent reliance on additional multiple skill-sets in the authorship of papers (e.g. taxonomists, GIS specialists, geneticists, statisticians and behaviourists). It may be expected that the trend towards multi-author papers and away from single-author will mirror the trend observed in general ecology papers and may even be more extreme.

To assess this and consider its ramifications, I investigated the authorship, in terms of author number, of research papers published in the three international open access journals, *BioInvasions Records* (*BIR*), *Aquatic Invasions* (*AI*), and *Management of Biological Invasions* (*MBI*), over a number of years up until the present. I considered only peer reviewed research papers (research papers, short communications and technical notes) over a range of issues/years assumed to be representative of each journal’s output up until September 2018 (commencing at first issue in 2012 for *BIR*, 2007 for *AI* and 2012 for *MBI*, disregarding invited, non-peer review articles/issues and supplementary issues and taking into account major editorial changes/policy; V. Panov, *pers. comms.*). *BIR*, *AI* and *MBI* are journals of the International Association for Open Knowledge on Invasive Alien Species – INVASIVESNET (<https://www.invasivesnet.org>), an association established to provide an open platform for invasion scientists, both to promote community discussion and establish good practice in the management of invasive species (Lucy et al. 2016).

## Results

Number of authors had a significant impact on relative contribution to research article output in each issue of all three journals ( $P < 0.01$ , Kruskal-Wallis test, Figure 1). Single-author papers were, by far, the lowest relative contributors to the journal’s research output (5% for *BIR* and *MBI* and 3% for *AI*), while in contrast, papers by four or more authors were, by far, the highest contributors (53% for *BIR* and 63% for both *AI* and *MBI*). Thus, a reader of *BIR* and *MBI* is more than ten times as likely to come across a research paper by four or more authors than a contribution by a single author and for *AI*, more than twenty times. In all three journals, the relative contributions by two-author and three-author publications were

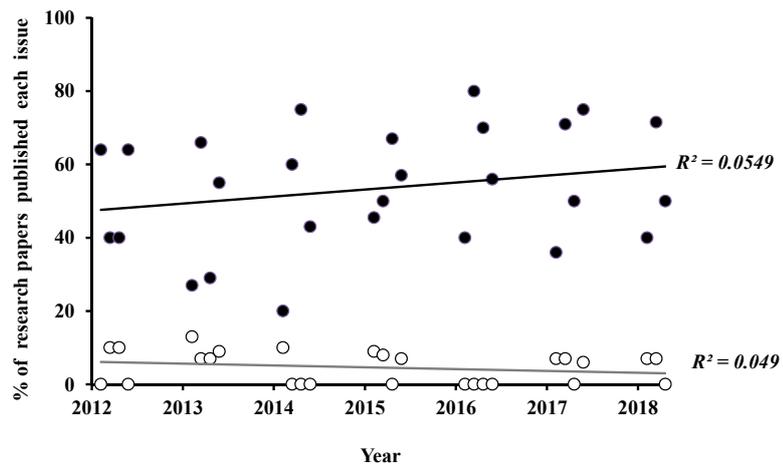
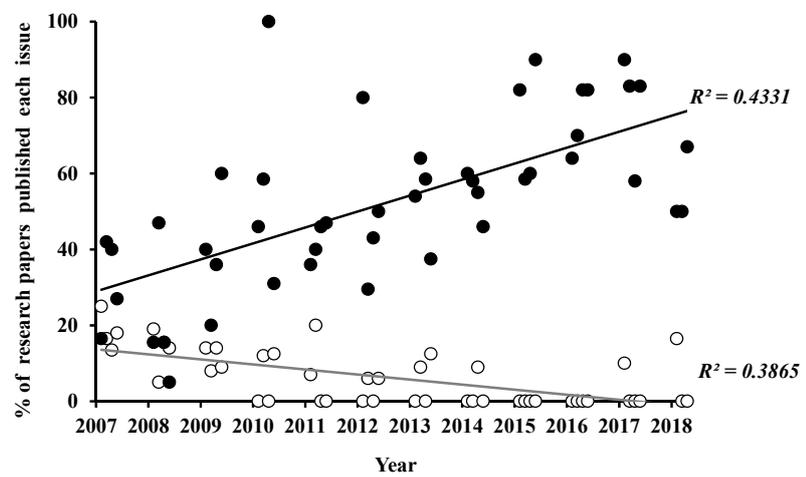
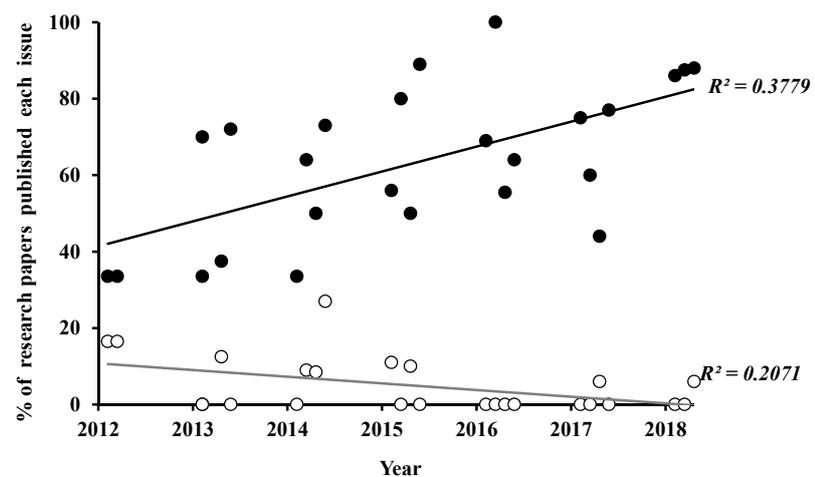


**Figure 1.** Mean ( $\pm$  SE) % of research papers published in each issue of *BioInvasions Records*, *Aquatic Invasions* and *Management of Biological Invasions* categorised by number of authors.

intermediate to these extremes and similar to one another (19% and 23% for two and three-authors respectively in *BIR*, with comparable figures of 15% and 19% respectively for *AI* and 17% and 15% for *MBI*; Figure 1). For *BIR*, there were no significant correlations between relative contribution of either single-author papers or four or more author papers to journal output and time ( $r_s = -0.314$ , and  $r_s = 0.267$  for single-author and four or more authors respectively, both ns, Spearman Rank; Figure 2a). However, for both *AI* and *MBI* the relative contributions of single-author papers to an issue's output have significantly declined over time ( $r_s = -0.622$ ,  $P < 0.001$ , Figure 2b and  $r_s = -0.409$ ,  $P < 0.05$ ; Figure 2c for *AI* and *MBI* respectively). In contrast, over the same period the contributions of four or more author papers have significantly increased in the research outputs of both journals ( $r_s = 0.698$  and  $r_s = 0.609$ , both  $P < 0.001$  for *AI* and *MBI* respectively; Figure 2b, c).

## Conclusions

The similarity in the relative contributions of single-author papers to the research output of a general ecology journal such as *JAE* (less than 4%; Barlow et al. 2018) and that witnessed in these three more specialised invasion science journals (3–5%) within the past decade, is noteworthy. Such an analysis led Barlow et al. (2018) to conclude about single-author papers that 'their extinction now appears imminent'. In my view, even the very simple preliminary analysis of *BIR*, *AI* and *MBI* research outputs presented here, would inevitably lead one to draw a similar conclusion. I have purposely concentrated only on each journal's published output and further studies could investigate both submission rates and submission success. For instance, Barlow et al. (2018) also found acceptance rates in *JAE* increased with author number and intuitively one would expect a similar

**(a) BioInvasions Records**

**(b) Aquatic Invasions**

**(c) Management of Biological Invasions**


**Figure 2.** Changes in % of research papers published over time by single-authors (white circles and grey line) and four or more authors (black circles and black line) in issues of (a) *BioInvasions Records*, (b) *Aquatic Invasions* and (c) *Management of Biological Invasions*.

trend in *BIR*, *AI* and *MBI*. Groom et al. (2015) noted that globalization has forced scientists to take a dynamic and long distance perspective for many organisms, particularly invasive species. It could also be argued that research funding considerations which often encourage collaboration between different institutions and countries and the increasing use of large scale geographic and jurisdictional data-sets for invasive species (for instance for investigating pest species in both their native ranges and invaded territories), may even drive the demise of the single-author paper in invasion ecology at a faster pace than in other disciplines. This is not necessarily a bad thing but merely a reflection of the increasingly collaborative nature of 21<sup>st</sup> century science and in particular invasion ecology. Despite this, being an ecologist at heart and being appreciative of diversity in all things, it will be sad to witness the imminent extinction of that increasingly rare species, the single-author.

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