

Supplementary material

Celebrating women conducting research in freshwater ecology ... and how the citation game is damaging them

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Formulae for some citation metrics

The h-index (Hirsch 2005)

The value of h for a researcher is the number of papers that have at least h citations each, with all other papers having $\leq h$.

Many modifications to the h -index have been suggested to correct for various biases (e.g. created by the age of researchers or differing numbers of poorly cited papers); see Schreiber (2018) for a critical review and reference to other sources.

Journal Impact Factor (JIF)

The JIF is calculated for each journal according to the following formula (<http://clarivate.libguides.com/jcr>, accessed October 2018):

$$JIF = \frac{\text{Number of citations in year } x \text{ to items published in years } x-1 \text{ and } x-2}{\text{Number of citable items in years } x-1 \text{ and } x-2}$$

Thus, if a journal received a total of 6000 citations in 2017 for papers published in 2015 and 2016 and published a total of 600 papers in 2015 and 2016, then its $JIF = 10.0$

Methods for conducting literature searches to gather data on citation counts

Table S1. Methods for conducting literature searches and analysing the data

Web of Science (<https://www.webofknowledge.com/>) was searched in October 2018. We did three separate searches using different terms and restricted papers to relevant subject categories, as set out in the table below. These search terms capture research engaging with long-standing debates in the population and community ecology literature, and these are research areas that have been a strong focus of freshwater ecologists. In each case, the period was restricted to papers published between 1990 and 2008, inclusive. This period was chosen because recent papers may still be gathering significant numbers of citations, and older research may reflect different perspectives regarding priorities for citation compared to modern research

Number	Search term	Subject categories	Number of publications
1	TS = (trophic cascades)	Ecology, Marine and Freshwater Biology, Environmental Sciences, Biodiversity Conservation, Zoology, Evolutionary Biology, Fisheries, Biology, Limnology, Entomology	115 reviews; 1011 articles
2	TS = (density dependen* OR density-dependen*)	Ecology, Marine and Freshwater Biology	266 reviews; 5741 articles
3	TS = (disturbance AND species diversity)	Ecology, Environmental Sciences, Biodiversity Conservation, Forestry, Plant Sciences, Marine and Freshwater Biology, Oceanography, Zoology, Entomology, Limnology, Fisheries, Ornithology	250 reviews; 4231 articles

For each search, papers were selected according to whether they were reviews or articles. The definitions of each category from Web of Science are listed below.

Article

Reports of research on original works. Includes research papers, features, brief communications, case reports, technical notes, chronology, and full papers that were published in a journal or presented at a symposium or conference.

Review

A renewed study of material previously studied. Includes review articles and surveys of previously published literature. Usually will not present any new information on a subject.

The citation counts and year of publication for each set of reviews and articles in each search were downloaded into a spreadsheet from Web of Science.

Statistical analyses on citation counts

We transformed citation counts onto a log₁₀ scale, and used analysis of covariance to compare citation counts for different publication types (reviews v. articles) using year of publication as a covariate. For each of these analyses, an interaction term between publication type and year was included to test whether the slope of the line differed between articles and reviews. For all three searches, the interaction between publication type and year of publication was non-significant ($P > 0.20$ in each case), so we

repeated analyses without the interaction term. In each case, year of publication was strongly associated with number of citations ($P < 0.001$ in each case) and there were differences between reviews and articles in number of citations gathered ($P < 0.001$ in each case).

Methods for examining gender biases in articles compared with reviews

Using two of the previously described searches (searches 1 and 2, Table S1), we generated random numbers (random numbers from between 1 and N , where N was the maximum number in each set) to select up to 40 publications from each set of articles and reviews. For each publication, we recorded the total numbers of men and women authors, and whether a man or woman was the lead author. Gender was judged by given name and verified where necessary using websites. In each set, there were a small number of papers that had to be discarded because we could not verify the gender of individuals (e.g. publications were old and authors could not be traced).

References

- Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences of the United States of America* **102**, 16569–16572. [doi:10.1073/pnas.0507655102](https://doi.org/10.1073/pnas.0507655102)
- Schreiber, M. (2018). A skeptical view on the Hirsch index and its predictive power. *Physica Scripta* **93**, 102501. [doi:10.1088/1402-4896/aad959](https://doi.org/10.1088/1402-4896/aad959)