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Users beware: implications of database errors when assessing the individual research records of ecologists and conservation biologists

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Running title: Implications of database errors
Assessments of scientists' research records through citations are becoming increasingly important in management and in bibliometric research, but the databases available may contain errors that reduce the reliability of assessments. We investigated this by profiling our personal records in five databases: Scopus, Web of Knowledge, Web of Science, the Cited Reference Search within Web of Science, and the freeware Publish or Perish followed by correction in CleanPoP. We documented disparities between the results and our CVs, noting implications for bibliometric analyses from our perspective as conservation biologists.

No database provided a complete, accurate record for anyone. Sometimes publications were out of range or missing, especially if they were books and book chapters. Other errors included mistakes in author order, year of publication and misattribution of publications. The Hirsch index was robust across databases, but other metrics were more volatile. Nevertheless, all metrics except median citations/paper gave high correlations of 0.78 or greater for the rank order of authors across databases.

Profiling researchers' records without knowledge of their CVs will likely result in inaccurate assessments. Reliance on one database compounds the problem if the database does not encompass the researcher’s full output, especially books and book chapters. Coverage may be particularly important for conservation biologists, who sometimes publish material of local relevance in local journals not abstracted in some of the databases. Administrators and researchers seeking citation profiles should query multiple databases to obtain a more complete picture of research output and cross check against a full CV where possible. It is unjustified to assume that discrepancies between database and CV indicate mistakes made by the researcher, so verification from the original publication is necessary. Furthermore, citations are but one of many measures available for research quality, use or impact, and their sole use, irrespective of possible errors, may be misleading.
Keywords: Google Scholar, Publish or Perish, CleanPoP, Scopus, Web of Science, Web of Knowledge, citation counts, cited reference search, h-index, g-index, curriculum vitae
INTRODUCTION

Increasingly, managers, administrators and funding agencies are evaluating the track records of researchers to ensure that limited funds are distributed to the most productive teams and individuals (Corsi et al. 2010; OECD 2010; Oswald 2010). Citation records in major databases are important for such evaluations, because citations can be retrieved cheaply and quickly compared to traditional peer review (Hodge and Lacasse 2011; Buela-Casal and Zych 2012) (but see d’Angelo et al. 2011 for logistic issues in applying citation analysis on a large scale). Thus bibliometrics – quantitative analyses of the quality and impact of scientific or technical literature – are increasingly important in management, as well as in research addressing questions about the use of the scientific literature.

Tracking citations began as a literature search tool, enabling searches forward from a particular publication to the literature that cited it, thereby complementing the established process of using reference lists to work backwards. Librarians also used citations to determine demand for specific journals and hence to prioritize selection (Garfield 2005). It was then a short step to using citations as a surrogate for journal quality, and indirectly for the researchers who published in journals with differing citation records (Adler et al. 2008). Empirical evidence from many disciplines confirms that the quality of papers cannot be judged by the journal in which they appear (Seglen 1997; Bloch and Walter 2001; Hodge and Lacasse 2011), so attention has turned to other citation-based metrics that purport to evaluate researchers’ records directly (Chang and McAleer 2012). This is despite evidence that citations capture only a part of the quality and impact of research (Bollen et al. 2009), that the relative significance of searches in different databases is not understood completely (Jacsó 2008a,b), that small differences in specifying searches may lead to large differences in the records returned (Jacsó 2011a,b; Walters 2011), that the high cost of complete literature coverage for commercial databases leads to incomplete information availability (Canós Cerdá et al. 2012).
that the citing behaviour of authors is biased (MacRoberts and MacRoberts 1996),
that work may be influential but uncited (MacRoberts and MacRoberts 2010), that social
dynamics, not research quality, may underlie citation frequency (MacDonald and Kam
2011), and that the emphasis on citations indicates a marked shift to 'New Public
Management Models' (applying market management or private sector models to
administration in public departments) in academia (Elzinga 2010).

In this paper, we stepped back from the debate over the utility of citations in
evaluating researchers or testing hypotheses about the use of the literature and
investigated whether the basic information in the databases underpinning citation-based
evaluations is accurate. If the databases do not record researchers’ publications
accurately, then wrong conclusions may be drawn. This situation may be exacerbated if
evaluations are based on superficial literature searches by third parties without access to
researchers’ full CVs. The problem may be especially acute for conservation biologists,
whose work may well include publications in local journals, reports, species recovery
plans and the like that are covered poorly in many databases.

As case studies to quantify errors and omissions, we examined our own records in
five popular databases: the subscription services Scopus, Web of Knowledge, Web of
Science and the Cited Reference Search within Web of Science, as well as the freeware
Publish or Perish followed by presentation improvement in CleanPoP. We attempted to
search as a third party might, without detailed reference to our CVs. From the output, we
calculated major bibliometric indices that purport to summarize research output. We also
noted errors and omissions in the records by comparing them against our own detailed
knowledge of our CVs. Based on the results, we offer suggestions for a more critical use
of citation-based data in evaluating researchers and ways in which individuals can
protect themselves against misleading evaluations.

METHODS
Researchers evaluated

We are not a random selection of researchers in conservation biology or ecology. However, as a group we cover varied histories of publication from nine to 31 years and a range of total output from five – 334 peer-reviewed publications to the end of 2011. Three of us (Calver, Dickman and Ebner) have uncommon names that are easily disambiguated in database searches, while Beatty, Bryant and Morgan are more common names posing challenges in disambiguation.

Selection of databases

We chose five widely used databases, including both subscription services and freeware, to sample the range of options available. These were:

Scopus – the publisher Elsevier launched this subscription database late in 2004 (Jacsó 2005, 2011a). It covers a broad range of conventional journals, trade journals (aimed at a trade or professional readership, rarely peer-reviewed and seldom with an editorial board) and conference proceedings (full papers only, not abstracts). Books and book chapters are not listed because of (i) the diversity of publishers and languages and (ii) the diversity of citation styles – for example, a chapter in an edited book may be cited as such, or the book itself may be cited whereas the chapter is the intended reference. However, books within a named series are included (Elsevier 2011). Citations from sources listed in Scopus to unlisted books and book chapters can be retrieved using the 'secondary documents' link (Calver and Linke in review). However, they are impractical for a search by name where the author's name is common. For example, in February 2013 an author search for D Morgan, Murdoch University, returned 54 documents. Following with a 'secondary documents' search returned 14,492 documents and limiting this to Morgan D or Morgan DL using options in the sidebar reduced the list to 2,409 documents - still impractical for a search in a reasonable time by cross-referencing to a CV, and unworkable for anyone without the CV. Therefore we did not include a
secondary documents search. Citation data in Scopus are only complete since 1996, so under-citation was an unavoidable issue for the three of us who had published before then.

Web of Knowledge (WoK) – published by Thomson Reuters, is a subscription service combining up to 18 specialist databases that can be searched simultaneously through the ‘search all databases’ tab on the search page (Testa 2006). However, an institutional subscription may not necessarily include all the possible subsidiary databases and there may be limitations to the range of years covered (warnings may be visible on the data search page). WoK includes books, journals and conference proceedings, with the range of years covered determined by the constituent databases.

Web of Science (WoS) – this is a well-known specialist database within WoK that includes journals, conference proceedings and books of primary relevance to the sciences (Jacsó 2011b). However, it is highly selective, claiming to include only the most significant journals, conference papers and books (Testa 2006), and it has a poor coverage of publications in the social sciences, humanities and publications in languages other than English (Harzing and van der Wal 2008). Citation counts reported are often lower than those reported by broader databases (Harzing and van der Wal 2008).

Web of Science Cited Reference Search (CRS) – this is an option within WoS to search for citations to a named author, work or journal. Its advantage is that it includes citations from sources listed in WoS to any source, irrespective of whether or not the cited source is listed in WoS. It thus retrieves more citations than a conventional WoS search. However, the results are aggregated according to how authors cited the source, so errors in fields such as year of publication, author initials etc. can lead to multiple output lines for a publication or a need to include common misspellings of an author’s name in a search field (Jacsó 2008a,b).
Publish or Perish (PoP), followed by CleanPoP – PoP is freeware for automating searches in Google Scholar (GS) to retrieve citation information for authors or journals (http://www.harzing.com/pop.htm). GS retrieves citations to journals, books, book chapters, conference proceedings, grey literature, theses, blogs and other websites by web-crawling, making it potentially the widest based of any of the options. Some see this as a significant advantage, especially for retrieving citations to books, book chapters, publications outside the sciences and publications in languages other than English (e.g., Harzing and van der Wal 2008). Jacsó (2010) claimed that uncertainty over the scope of GS searches and retrieval of incorrect citations make GS unsuitable for serious citation analyses when used directly, although he was more positive about the PoP interface (Jacsó 2009). PoP output can be challenging to interpret, often including records from non-target authors and multiple records for the same publication because of errors in citing. CleanPoP (Baneyx 2008) is a free, web-based utility that imports comma-separated values (.csv) output from PoP and, after further input regarding the target author and any doubtful publications, removes incorrect records and aggregates duplicate entries.

**Database searches**

We completed database searches independently between January and September 2011 (with each of us completing our individual records in all databases in a period not exceeding four weeks). Thus temporal effects might be important in comparisons between authors, but not in comparing different databases for each author. The only exception was Author 3, who encountered considerable problems in running CleanPoP because of wild characters generated in downloads from PoP. Author 3's CleanPoP records were not resolved until January 2013, and thus had a further 15 months to accrue citations relative to the other databases.
Database subscriptions covered similar ranges for all authors, except for WoK, WoS and WoS (CRS), where those of us using the Murdoch University subscription had access to data back to 1974 whereas the relevant subscription for the others extended back to 1945, or in the case of the University of Sydney, 1900. This was not significant, however, because none of the Murdoch authors had published prior to 1980. There were also small differences in the range of the databases available under WoK. We did not attempt to correct for these discrepancies, but consider the implications of the range of different subscriptions to databases in the discussion.

None of us had created an individual researcher ID in any database to facilitate speedy and accurate retrieval of our publications. In Scopus we used the author search feature, specifying family name, initials and institution to retrieve records. In WoK, WoS, WoS (CRS) and PoP our search terms followed the form ‘family name, first initial *’. We did not use the Author Search option in WoS. CleanPoP asks further questions regarding institutional affiliation and address, as well as querying potential duplicates or potentially incorrect records while sorting.

Data profiling and presentation

Authors compared the records retrieved in each database against their CVs, discarding any records not corroborated by the CV except for the case of PoP followed by CleanPoP. CleanPoP supposedly produces a ‘clean’ publication list, so we specifically wished to note any incorrect publications that crept through. Once a list of corroborated records was established, it was scanned for errors such as incorrect year, volume or page attribution, missing co-authors, mis-spelling of one or more authors’ names or multiple entries of the same publication. Where a publication on the CV was within the range specified by the database but not retrieved by the search, we searched specifically for the publication to determine if it was missing from the database or present but not linked to the author (not applicable to the CRS – only cited publications appear, and indeterminable for PoP followed by CleanPoP – the range of the underlying
GS search is undefined). If a publication was listed multiple times, the different entries were aggregated prior to data reporting. Records to unreviewed items, theses and publications in press were also identified.

From the corroborated records listed for each author in each database, after aggregation of duplicate records and removal of records applying to unreviewed items or publications in press, we determined: number of publications; number of publications as first author; Hirsch index \( h \) – when publications are ranked in order from the most highly cited to the least highly cited, \( h \) is the highest rank where the number of citations equals or exceeds that publication’s rank (Hirsch 2005); Egghe’s index \( g \) – when publications are ranked in order from the most highly cited to the least highly cited, \( g \) is the highest rank where the cumulative sum of citations equals or exceeds the square of that publication’s rank (Egghe 2006); mean citations/publication (Calver and Bradley 2009) and median citations/publication (Calver and Bryant 2008).

Lastly, we listed all cases where any of us had written to a database seeking correction of an entry. We noted the type of mistake that had occurred and the response of the database administrators to the request.

**Data analysis**

Publication details for the six authors and bibliometric statistics are summarized in tables. For each bibliometric statistic, we used Friedman’s ANOVA to compare the scores of each author, interpreting the significance values using the sequential Bonferroni correction (Quinn and Keough 2002, p. 50). We used Kendall’s coefficient of concordance to test whether the different databases produced similar rankings of the authors on each bibliometric statistic.

**RESULTS**

**Author profiles**
Our publication histories span nine to 31 years. All of us have published peer-reviewed journal papers (4 - 200), three of us have published peer-reviewed book chapters (4 – 87), five of us have edited or authored peer-reviewed books (1 - 24), three of us have published peer-reviewed conference papers (1 – 9) and five of us have unreviewed reports or publications in the grey literature (2 - 94) (Table 1). Thus we cover middle to late career researchers, but not early career researchers.

**Type and frequency of discrepancies between retrieved records and CVs**

*Scopus*

Four authors had journal/conference papers out of range of Scopus, and these authors also reported journal/conference papers within range that were not listed. Scopus does not claim to index books or book chapters unless they are part of a series, so those publications were out of range for all authors who had them.

*Web of Knowledge*

Four authors reported journal/conference papers out of range of WoK, and five reported journal/conference papers within range but not listed. WoK was variable in retrieving books and book chapters. It did not list the one book chapter for Author 3, and had entries for 17 of the 20 chapters for Author 5 but neither of the two books, and only 25 of the 101 book chapters and none of the 24 books for Author 6.

*Web of Science*

All authors reported journal/conference papers that were out of range for WoS, but only one reported a paper missing from within the range covered. No books or book chapters were retrieved for any author, reflecting the very recent introduction of book coverage to WoS.
Publications not retrieved in CRS are uncited in sources covered by WoS, so comments on missing or out of range publications do not apply. Nevertheless, the ability of the CRS to retrieve citations to books and book chapters was shown by retrieval of 10 book chapters for Author 5, and six book chapters and four books for Author 6 (chapters and books not listed being assumed to have gone uncited by WoS listed sources).

Four authors noted one or more cases of the same item appearing multiple times in CRS because of an issue such as different year of publication or volume number given. These reflect mistakes in authors citing the work, not an error in the database itself. Citations to publications in press appeared in four authors’ CRS records and could not be attributed confidently to a single publication. Citations to theses by three authors were also retrieved.

Publish or Perish followed by CleanPoP

PoP followed by CleanPoP did not show all the publications of any author, but because the range of GS is unclear we cannot say whether these publications were missing or out of range. It retrieved records for the book chapter for Author 3, 9 book chapters and one book for Author 5, and 16 book chapters and 5 books for Author 6.

Two authors noted that CleanPoP discarded one or more of their publications identified in the original .csv file from PoP. Author 1 observed that eight reviewed publications were omitted, two of which had citations within the range of h. Author 5 noted that CleanPoP dropped 18 legitimate publications from the original .csv file, including five with 18 or more citations that would have contributed to the h and g indices. Four authors noted examples of publications by the wrong author appearing in the final output, which would bias bibliometric indices. In the case of Author 3 this was substantial: 43 incorrect records were retrieved. Author 5 also noted that PoP followed by CleanPoP retrieved two citations to a book review. These are possible but unlikely, and the citations should probably have gone to the book. Three authors reported
duplicate entries for the same publication in the output, despite CleanPoP's attempts to remove duplicates. Finally, two authors reported problems with an author missing from an author list from a publication or authors being given in the wrong order. These are most likely because of mistakes by the citing authors.

**Peer-reviewed publications retrieved by different databases**

No single database consistently retrieved the most peer reviewed publications for each author. For three authors PoP followed by CleanPoP retrieved the most, for two authors it was WoSCRS and for one author it was Scopus (Table 2).

The different databases varied greatly in terms of the total proportion of peer-reviewed publications they retrieved for each author, from a low of 0.45 for Author 4 in PoP followed by CleanPoP to a high of 96% for Author 2 in Scopus. Expressing retrieval as a proportion of publications within the claimed range of the database showed an equal or higher incidence of retrieval, especially for WoS, which retrieved 100% of papers within range for five authors and 96% for the sixth (Table 2).

**Experiences of referring discrepancies to databases**

Prior to the study, Authors 1 and 5 had sought corrections to incorrect data entries in Scopus. Author 1 had several journal papers wrongly assigned to the author ID of another author with the same family name, given name and middle initial. Author 5 sought corrections to two journal papers where the family names and given names of the authors were reversed. In all cases, the errors were corrected following presentation of .pdf files of the relevant papers.

**Bibliometric statistics**

Despite variations in the proportion of the peer-reviewed publications retrieved by the different databases, the h indices and g indices of all authors were similar across databases. The largest difference in range was for Author 6 (h - 36 in Scopus to 45 in
PoP followed by CleanPoP, g - 52 in Scopus to 65 in PoP followed by CleanPoP). The other measures were often more volatile across the databases, probably reflecting fluctuations in the number of publications retrieved, which affected the denominator in calculations of mean citations/publication and the range of values in calculations of median citations/publication (Table 2). Despite this volatility, Kendall’s coefficient of concordance across the databases was 0.78 or above for all variables except median citations/publication, where it was 0.52. There were significant differences in scores for authors on each measure (Table 3).

**DISCUSSION**

**Type and frequency of discrepancies between retrieved records and CVs**

Discrepancies found included peer-reviewed publications out of range, duplicates, incorrect records and, in the case of CleanPoP, exclusion of legitimate publications retrieved correctly by PoP. Having our own CVs to hand, we were able to eliminate incorrect records from our searches and to recognize and aggregate duplicate records created by authors’ referencing errors. Even so, we may have missed citations caused by errors in spelling our family names. Searching for common spelling errors in an author’s name can increase the number of records retrieved, although at an increased cost in time searching larger lists of records (Jacsó 2008a). In the absence of accurate and up to date author IDs in databases or a reference copy of a CV, identification of incorrect records, aggregating duplicates and searching for stray citations attached to a misspelled name would be extremely difficult.

Errors in citing references are an acknowledged problem, with examples of the error rates in different disciplines including 13.3% in burns literature (Al-Benna et al. 2009), 20% in orthopaedics literature (Davids et al. 2010) and 24.4% in environmental science literature (Lopresti 2010). The problem is acute with books, especially book chapters, with increased potential for error in crediting chapter authors and editors.
correctly (Elsevier 2011). Therefore, databases begin with corrupted information and attempt to aggregate it to assist in literature searches and citation counts. It is unsurprising that mistakes carry through Leydesdorff (2007).

Initial errors are then compounded by the sophistication of searches used to retrieve the information (Walters 2011). For example, family names of the form ‘van (name)’ or ‘van der (name)’ may retrieve very different results if specified as, for example, ‘vandernname’ versus ‘van der name’. It may also be that although an author has taken great care to always use a middle initial and published as ‘JC name’, a citation may give an incorrect middle initial. Thus a search for ‘JC name’ will miss the incorrect ‘JL name’ but ‘J* name’ will not (but at the cost of retrieving non-target publications of authors with a different middle initial, necessitating a careful search of the output) (Jacsó 2007, 2008a,b). East Asian names may cause confusion because of inconsistencies between eastern and western conventions over whether citations have given the family name first or last. In the absence of authoritative author IDs, these issues may cause substantial variations in the results of searches by different individuals.

**Peer-reviewed publications retrieved by different databases**

No database retrieved any author’s total publications, although when retrievals were corrected for the claimed range of the databases higher proportions of publications were retrieved. This is in keeping with larger scale comparisons of the completeness of databases that concluded that it was advantageous to profile authors’ citation records in multiple databases and that WoS in particular was too narrow for evaluation of some researchers (e.g., Yang and Meho 2007; Meho and Yang 2007). We noted that WoS had the lowest retrieval proportions of all the databases for total reviewed publications for all authors except Author 4, although it was close to perfect in retrieving publications within its claimed range, as noted by other authors (García-Pérez 2010). WoSCRS retrieved more publications than WoS for all except Author 2, in keeping with the observations of Jacsó (2008a,b). It is possible for WoSCRS to retrieve fewer publications than WoS,
because WoSCRS only includes publications that are cited whereas WoS includes all publications listed irrespective of citations.

Bibliometric statistics

While bibliometric statistics were easy to calculate from the records retrieved in each database, the consequences of incomplete retrieval of records vary for each variable. The h index and the g index will be underestimated if any highly cited publications are not retrieved, but will not change if the missing publications have few citations. Therefore these indices could be underestimated but not overestimated unless a highly cited wrong record was included; conversely several studies claim that the h index in particular is robust against incompleteness in the publication record (e.g., Franceschini and Maisano 2010). Our finding of a high correlation in the rankings of the authors produced by each database using h supports this view. It was also true of g. The largest fluctuations in h and g across the databases were for Author 6. In this case, the lowest values for h and g were recorded for Scopus and the highest for PoP followed by CleanPoP. Author 6’s publication record includes numerous books and book chapters, which were missing in Scopus but some of which are included in PoP followed by CleanPoP. High citations for some of these items caused the difference.

Substantial variations in the h indices calculated for authors across different databases are known, with authors publishing extensively in books, conference proceedings, social science journals or languages other than English more likely to report increases when drawing data from GS relative to other common databases (Harzing and van der Wal 2008, García-Pérez 2010; De Sutter and van den Oord 2012). Particular databases are also known to favour researchers in certain disciplines (Ouimet et al. 2011), and rankings of authors via databases may or may not correlate strongly with peer judgement (Li et al. 2010). We all publish predominantly in journals, so no major improvements in h scores from PoP followed by CleanPoP were apparent in our data, with the exception of Author 6 who benefitted from PoP followed by CleanPoP’s
coverage of books, despite these constituting a minority of his publications. Author 3 revealed a different problem, with PoP followed by CleanPoP unable to remove some incorrect publications. Such potential 'inflation' would be hard to detect when compiling a record without the benefit of a CV.

The mean citations/publication, median citations/publication and proportion of publications that are first-authored could move up or down if data were available on all publications. Our decision to exclude unreviewed publications was important here. Assuming that these are unlikely to be highly cited (or even cited at all), including them would not change the h or g indices but would lower mean citations/publication and median citations/publication, especially if the unreviewed publications were numerous.

We did not take the extra step of profiling citations themselves to look for errors. Studies that have done so report that GS is much more likely to include erroneous citations such as contents pages, so its generous citation counts are probably inflated (García-Pérez 2010, but see Calver and Linke in review). We also did not consider the influence of any differences in range of years of subscription or constituent databases in our different institutional subscriptions to WoK or WoS.

**Implications**

Attempting to profile a researcher’s citation record from the databases without reference to that person’s CV is extremely risky. The CV will indicate the likely appropriateness of a particular database (e.g., Scopus is less useful than PoP for an author with many books or book chapters), allow confident identification of duplicate entries and disambiguation of records where authors share a name, and identify miscitations that might otherwise be overlooked. Examination of different databases may provide a more complete assessment of an individual’s publications, especially where many are not in journals or published in languages other than English. Where a CV and a database disagree, the CV is not necessarily misrepresented – a check of the original publication, as is done to establish CV fraud, is necessary (Kuo et al. 2008; Wiggins...
If citation data are collected to test hypotheses regarding use of the research literature, our data corroborate earlier work that h and g are robust against many of the problems that may arise. They would be preferable to options such as mean citations/paper, which is sensitive to changes in the number of publications retrieved.

Researchers may help themselves by registering an author ID in the major databases and keeping it current. Alternatively, independent projects such as ORCID (Open Researcher and Contributor ID) (http://about.orcid.org/about/what-is-orcid) provide opportunities for researchers to attach a unique identity to all their scholarly outputs that can link to profiles, grant applications and manuscript submissions. GS also provides an option for creating an individual citation profile, which can be made public and could resolve many problems regarding an individual's work (http://scholar.google.com.au/intl/en/scholar/citations.html). Researchers could also check their profiles in the databases and request corrections for errors such as incorrect linking of individuals to publications or misspelling of names. Note, though, that databases need to see copies of the original publications before making any change so that their entry agrees exactly with what is published - if the mistake is in the original paper, then no correction is possible. It is also advisable to check CV entries carefully against the final publication to ensure accuracy. Hastily updating a CV from a quick look in a database, especially GS, is fraught with danger if an error is copied and misinterpreted by others as intentional fraud.

Lastly, it is important to remember that citations, despite their convenience, are only one part of the assessment of a research record. Focusing on them alone neglects many other important research outputs (Bollen et al. 2009), or fails to acknowledge the extent of uncited influences in research (MacRoberts and MacRoberts 1996; MacRoberts and MacRoberts 2010). There is also evidence that a reward-focused fixation with outcomes rather than process can damage innovation and collaboration (Kohn 1993) or possibly undervalue some areas of research, including some areas of conservation biology (Adler et al. 2008; Marsh et al. 2012; Calver et al. 2013). Other signs of
significant research include, but are not limited to, uptake of research by professional bodies or government instrumentalities (Witten and Hammond 2010), download-statistics indicating wide readership (Bollen et al. 2009), or publication in languages other than English to reach local communities or local professionals (Adler and Harzing 2009). Researchers should not be reticent in showcasing such alternative signs of achievement, and tenure committees, grant assessors and appointment panels ought to give them serious consideration.

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Table 1. Publication details for the six authors analyzed to the end of 2011. Note that the number ID for authors is given in terms of years since first publication and does not correspond to the order in the author list.

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* Proportion of publications retrieved does not apply to the Cited Reference Search because it only retrieves cited publications. Unretrieved publications are assumed to be uncited.
The range of publications covered by Google Scholar is undefined, so it is not possible to calculate a proportion of publications within range that were retrieved.
Table 3. Results of Friedman ANOVAs for the hypothesis that the six authors differed in their scores for each of six bibliometric variables, and Kendall’s coefficients of concordance for the agreement in rankings of authors by five different databases based on each of the six bibliometric variables. P-values for Friedman ANOVA are all significant after sequential Bonferroni correction.

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