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guidelines for struggle in science. *Brian Martin*

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zoology under threat

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Adaptive radiation in Australian journals in the Arbustocene ERA: an empty niche for JANCO?

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ABSTRACT

Scientific publication is undergoing rapid change. The expansion of the internet has facilitated electronic publication, while the prevailing fashion for 'quantifying' the quality of academic papers, academic journals, authors and institutions is changing where authors publish, what they publish and also the content of what journals *want* to publish. In Australia these forces are exacerbated by the Commonwealth government's Excellence in Research for Australia (ERA) initiative, with journal assessment a key component of its focus on the quality of university research. Not all journals will survive the new conditions, nor will those kinds of research and researchers that do not meet the preferences of the surviving journals. This is an example of politically driven change with far-reaching environmental consequences - what Recher and Ehrlich (2005) called 'the Arbustocene'.

In particular, research on uniquely Australian natural history and ecology may suffer because, despite its value for local conservation issues, such regional research is seldom accepted by the major journals in North America and Europe or by the growing number of Australian journals aspiring to an international profile. We argue that the 'empty niche' in publishing Australian natural history can be filled by the journals of Australia's naturalists' clubs, especially if the papers are accessible on-line via a common link enabling searching across all the clubs' journals simultaneously. We propose the acronym of JANCO, for Journals of the Australian Naturalists' Clubs Online, for this particular database and encourage applications for funds to make the concept a reality.

Key words: naturalists' clubs, impact factor, natural history, ERA, Arbustocene

Introduction

In the empty or vacant niche concept, the sudden availability of an array of resources provides opportunities for adaptive radiation, characterised by increases in morphological and ecological diversity in a single, rapidly diversifying lineage (Freeman and Herron 2007) or invasion of a new species into a community (Moles *et al.* 2008). Such ecological opportunities are made possible when radical changes occur, such as extinction, chance dispersal events, geological upheaval, or morphological innovations allowing organisms to exploit resources in a new way. Recher and Ehrlich (2005) argued that the governments of Australia and the USA were bent on a course of environmentally destructive policies likely to lead to widespread extinctions and usher in a new geological era, the Arbustocene (named for former USA President G. W. Bush - 'arbusto' is Bush in Spanish). Despite the negative elements, such a cataclysm might provide an opportunity for rapid adaptive radiation.

Our concern, though, is not with the natural environment directly but with an analogy based on it - the radical change currently occurring in scientific publishing. There is growing interest in 'quantifying' the quality of academic papers, academic journals, authors, institutions, and even countries. This is changing where authors publish, what they publish and also the content of what journals *want* to publish. Not all journals will survive the new conditions, nor will those kinds of research and researchers that do not meet the preferences of the surviving journals.

In Australia these forces are intensifying as a result of the Commonwealth government's Excellence in Research for Australia (ERA) initiative, in which profiles of journal quality play a significant part (Australian Research Council 2010). These pressures are occurring in the context of the rapid development of on-line publication and the potential for faster and more extensive dissemination of publications (Henry 2003). Thus to borrow from Recher and Ehrlich (2005), scientific publishing in Australia is indeed entering an Arbustocene ERA of cataclysmic change and possible extinctions, but one that also brings opportunities. In this paper we discuss the changes in scientific publishing in Australia and what they may mean for the scientific literature, before suggesting how they create an 'empty niche' which we argue can be filled by the journals of Australia's naturalists' clubs.

The Arbustocene ERA - changes occurring in the publishing world

The rise of bibliometric evaluation of research

Citation tracking was first devised as a tool for reference searching and mapping the linkages between articles, connecting papers on related topics with far greater efficiency than keyword searches. A derivation of citation data, the Journal Impact Factor (JIF) (a journal's impact factor for a particular year is the number of citations

in that year to articles published in the two years immediately preceding it, divided by the total number of papers published by the journal in those two years) was developed initially to assist librarians in prioritising journals to choose for subscriptions (Garfield 2006). It is published by Thomson Reuters' Institute for Scientific Information (ISI) in its annual Journal Citation Reports. Other options, similarly based on numbers of citations to articles, are the h-index (adapted for journals by Braun *et al.* 2005), the g-index (adapted for journals by Harzing and van der Wal 2008), the mean number of citations per paper (Andreis and Jokic 2008), the median number of citations per paper (Calver and Bryant 2008; Calver and Bradley 2009) and, most recently, ranking statistics based on algorithms analogous to the 'page rank' algorithm used by the Google internet search engine to rank internet sites (Colledge *et al.* 2010; Jacsó 2010; Moed 2010). Citation indices are now being used as proxy-measurements for journal quality in all disciplines (Cameron 2005; Calver and Bryant 2008; Calver and Bradley 2009).

The concept that such bibliometric indices reflect the relative quality of journals and that papers in higher-ranked journals are therefore of greater quality than those in lesser-ranked journals has been challenged with empirical data in many scientific disciplines. Criticisms are levelled at the databases used to derive the citation data, and include: the regional selectivity in the journals covered by some data bases (Cameron 2005), bias against some disciplines (Butler 2006; Stergiou and Tsikliras 2006), and a high frequency of errors (Reedijk 1998; Bloch and Walter 2001; Belew 2005; Harzing and van der Wal 2008; Leydesdorff 2008; Canós Cerdá *et al.* 2009). Further criticisms concern the inappropriateness of some of the metrics (especially the JIF) to what they purport to measure (Bloch and Walter 2001; Cameron 2005; Campbell 2008; Lawrence 2008).

In particular, the citedness of an article does not necessarily measure research merit (Bloch and Walter 2001; Lawrence 2007; Campbell 2008). Even if one accepts some relationship between citation frequencies and quality, there have also been numerous demonstrations that a small proportion of a journal's papers contribute most of its citations (Seglen 1997; Campbell 2008; Calver and Bradley 2009), so that it is common to find individual papers in low-ranked journals receiving more citations than some papers in high-ranked journals (Bloch and Walter 2001). Campbell (2008) notes that the reason most papers published in *Nature* had a low number of citations (i.e. 75% of papers give only 11% of citations), was because they were in disciplines with characteristically low citation rates, such as physics, or because the research contained within them was excellent, but just not the 'hot' topic of the time. This supports the notion that the 'impact' of a journal says nothing about the citedness, nor quality, of many of the papers within it.

Despite these trenchant and on-going criticisms, well-founded in data, citation-based rankings are still championed by authors who argue that they represent the

most objective method available for evaluating journals, authors, and by extension, their institutions and even countries (Olden 2007; Ritzberger 2008; Holguin 2009). This view is shared by many governments, universities and public funding agencies throughout Europe, Asia and Australasia (Seglen 1997; Bloch and Walter 2001; Cameron 2005; Steele *et al.* 2006; Lawrence 2007; Tsikliras 2008). For example, the indicators of research quality under the first (2010) iteration of the Australian Commonwealth's Excellence in Research for Australia (ERA) initiative consisted of levels of peer reviewed research income and bibliometrics, with a heavy reliance on citation data (Australian Research Council 2008; 2010). Publications for each discipline group within each university were profiled according to whether they appeared in journals that were in the top 5% (Tier A*), the next 15% (Tier A), the next 30% (Tier B) or the remaining 50% (Tier C) for that discipline¹. Other bibliometric 'quality' measures included the 'relative citation impact' for a university's publications, against Australian and world benchmarks. The alternative views that bibliometrics cannot substitute for peer review (Seglen 1997; Campbell 2008; Lawrence 2008) or that qualitative measures such as peer review should be considered alongside the bibliometric measures (Steele *et al.* 2006; Butler 2008) may be losing favour in the interests of efficiency.

Changes in author behaviour

In response to the growing emphasis on bibliometric assessments, researchers often aim their manuscripts at high-impact, top-tier journals in the hope of greater recognition. The result is more likely to be rejection. For example, the number of manuscripts submitted to *Nature* doubled over a 10 year period, and about 95% of papers are rejected (Lawrence 2003; Steele *et al.* 2006), while *Science* accepts less than 8% of the 12,000 manuscripts it receives each year (McCook and Miller 2006). Other elite journals are reporting increasing submissions (McCook and Miller 2006; Meffe 2006). For example, Meffe (2006) listed seven categories of paper that while 'important', 'critical' or 'relevant' still do not meet the additional criteria of novelty and interest to a broad readership necessary for publication in *Conservation Biology*.

The jostling by authors to get their papers into the top journals may be very damaging to the scientific environment as authors shift "thoughts and efforts away from scientific problems and solutions, and towards the process of submission, reviewing and publication" (Lawrence 2007, p.R584). There are several ways in which scientists may change what they research and the way they report it (Lawrence 2003; 2007; 2008). In the quest for papers, work can be rushed out before it is ready, or sliced thinly into too many papers that would have been better as one larger one. Authors realize that journals want to maximize their impact factors, so trendy or novelty topics, or articles on popular species

¹ The ranking system will be replaced in future ERAs by an unspecified 'journal quality profile' (Carr 2011).

might proliferate. Authors may create links, either legitimate or not, to topics that generate lots of interest and citations, such as human disease. Null results or results that disagree with leaders in the field might be played down or avoided, as this might be risky in getting past editors and reviewers. Papers can be written overly concisely so they fit into a letter format that can be published in *Nature* or *Science*. Lawrence (2003; 2007; 2008) details a number of other undesirable strategies that might be, or are being, employed. Furthermore, the nature of modern science is likely to discourage those who are not naturally competitive (Lawrence 2007; 2008).

Changes in publisher and editor behaviour

Commercial publishers and editors both seek to increase the status of their journals, but often from different motivations. Publishers want to increase or at least maintain their profits and are aware of the marketing power of high status in increasing subscriptions and, in the case of many biomedical and veterinary journals, wooing advertisers (Hoey 2008). Editors derive prestige and recognition from the status of the journals they edit and, if they are employed by a publisher, there may be financial rewards too (Gowrishankar and Divakar 1999; Hoey 2008).

One manifestation of the desire to increase status is to focus on papers of international relevance at the expense of regional ones (Meffe 2006). Unfortunately for Australian authors, the definition of 'international' for editors in Europe or the USA often includes local European or North American papers but not Australasian ones. For example, the title of Loo (2009) "Ecological impacts of non-indigenous invasive fungi as forest pathogens" promises internationality, but the regional nature (that slipped past the editors) is revealed in the opening sentence "Non-indigenous pathogenic fungi increasingly threaten North American tree species".

Furthermore, an examination of the instructions for authors published by several Australian journals shows significant changes over the last thirty years that may make it more difficult to publish Australian regional studies (Table 1). There is increased focus on experimental studies, conceptual advances and overseas reviewing, while biological surveys, regional studies and descriptive work are either excluded or given reduced emphasis. While these are legitimate changes in editorial policy irrespective of whether or not one agrees with them, Falagas and Alexiou (2008) produced a 'top ten' list of impact factor manipulations that are undertaken by some publishers and editors to increase their journals' citations. Despite these being rather spurious practises, there is disquiet that they are already in use. Increasing the number of review articles (Gowrishankar and Divakar 1999), and encouraging self citations (Bloch and Walter 2001) have actually been documented for some journals. Increasing the number of 'non-source' articles, that is, articles which collect citations but are not included in the total articles used to calculate the impact factor, also seems to have been occurring (Gowrishankar and Divakar 1999; Lawrence 2002).

Why the ecological and conservation literature in Australia might suffer

While many significant insights are likely to arise as a result of the renewed emphasis on quality empirical research, good empirical research in ecology and conservation biology is grounded in thorough biological survey and careful documentation of natural history. It is only through an understanding of such fundamental information that interesting new hypotheses can be proposed, or changes measured against a baseline that has been well established in terms of community composition and structure (Erskine 1994). For example, Shortridge's (1909) account of biological surveys of Western Australian mammals continues to be cited a century later (e.g. Robley *et al.* 2001; Wardell-Johnson *et al.* 2004) and was recently the subject of a detailed re-examination by Short (2004). Natural history notes, such as range extensions (e.g. Sedgwick 1950), feeding observations (e.g. Turpin and Dell 1991), breeding records (e.g. Erickson 1950; Menkhurst 1979) and field keys (Cooper 1993; 1994) are also critical and are the basis of key secondary works summarising the understanding of major taxonomic groups (e.g. Johnstone and Storr 1998; 2004). Despite its value, this information is likely to be harder to publish given the changes in editorial policy in some Australian journals. Such a situation has already been observed for the worldwide marine ecological literature (Stergiou and Tsikliras 2006).

There is also a chance that changes in author and editor behaviour may cause some journals to fold. With scientists using impact factors for guidance as to where to publish and what to read, and librarians using them for guidance in making decisions about journal subscriptions, some journals may be starved for submissions. This has the potential to affect revenue, and in some cases, the survival of a journal (Gowrishankar and Divakar 1999; Steele *et al.* 2006).

To protect valuable work not currently fashionable with leading journals, Lawrence (2003; 2007) argued that scientists should "fight back" against the "audit society" undervaluing certain types of scientific publication. One suggestion is that authors can overcome the obsession with 'top journals' by publishing a range of work in appropriate journals, rather than concentrating solely on work appropriate to prestige outlets. Given that the range of possibilities is narrowing for publishing certain types of Australian ecological work, there is a 'vacant niche' to provide an outlet for such material.

An empty niche for the journals of the naturalists' clubs?

If citations are becoming the ultimate currency, where will research on less catchy topics such as natural history or less popular species be published? We suggest that the 'vacant niche' created can be filled by the six journals published by naturalists' clubs in Australia. They currently provide outlets for papers reporting biosurveys, natural history and local wildlife or ecological studies, and could be developed further

Table I. Changes in publication policy in some prominent Australian journals, as indicated by changes in 'instructions to authors' over time.

Journal	Instructions to authors 1974-1978	Instructions to authors 2009
<i>Australian Wildlife Research/Wildlife Research</i>	"Papers will be considered for publication if they make an original contribution to knowledge of the biology of wild native or feral introduced vertebrates, including biological surveys, habitat management and description and assessment of field and laboratory techniques." (Anon. 1974b)	"Papers reporting well-structured field studies, manipulative experiments, and analytical and modelling studies are encouraged. All papers should aim to improve the practice of wildlife management and contribute conceptual advances to our knowledge and understanding of wildlife ecology." (CSIRO 2009c)
<i>Australian Journal of Ecology/Austral Ecology</i>	"Research papers, critical reviews, key-note articles and abstracts of Australian theses dealing with any aspect of pure or applied ecology are considered for publication in the Australian Journal of Ecology." (Anon. 1976)	" <i>Austral Ecology</i> publishes original papers describing experimental, observational or theoretical studies on terrestrial, marine or freshwater systems, which are considered without taxonomic bias." (Wiley-Blackwell 2009a) "Specifically, we do not publish papers that simply describe an ecosystem or a local ecological pattern. Nor do we publish papers that ask ecological questions that are only relevant to some local region ... , although local studies that can make new contributions to broader generalizations can be accepted." (Wiley-Blackwell 2009b)
<i>Emu/Austral Ornithology</i>	"The EMU prints original papers, short communications (<2,000 words) and notes (<500 words) on the ornithology of the Australian region. Papers are printed in order of receipt, but priority may be given to reports on official RAOU undertakings. MSS are accepted on the understanding that are being offered only to the EMU." (Anon. 1974a)	" <i>Austral Ornithology</i> is a major journal for the publication of research articles, reviews and short communications in all branches of ornithology. It has a proud tradition of publishing papers on many aspects of the biology of birds. Papers highlighting the conservation and management of birds are particularly welcomed. The Journal's emphasis is on studies relating to the Southern Hemisphere and adjacent tropics." (CSIRO 2009b)
<i>Australian Journal of Zoology</i>	"Papers will be considered for publication if they make an original contribution to any branch of Zoology." "Anatomical papers should throw light on matters of biological interest beyond the anatomical features described. Ecological papers should generally be of wider scope than lists of species and associations; they should be of general interest and exemplify some general principle. Taxonomic papers must have Australian relevance and, except in special circumstances, must deal comprehensively with a natural group of animals." (Anon. 1978)	"Australian Journal of Zoology is an international journal that publishes papers and critical reviews that demonstrate a conceptual advance to any aspect of zoology. The focus is on the Australasian fauna, but high quality papers from any region that have practical or theoretical relevance to any general zoological issue will be considered. All papers are peer reviewed by referees from around the world." (CSIRO 2009a)

for wider dissemination and increased accessibility. One of their great strengths is that they are supported by members with a genuine interest in natural history, so their editorial policies are unlikely to change to favour other types of ecological research. Being state based, they also value local contributions unlikely to be published elsewhere. Such a role is undertaken successfully by journals of the naturalists' clubs in Canada and the USA, which provide a model for what could be achieved in Australia.

The North American example

Excluding newsletters and discontinued titles, we located seven current North American journals with the word 'naturalist' in the title, suggesting that they may publish natural history material unsuitable for other journals. In fact, four of these journals

are published by research institutes or universities and, despite their titles, are not outlets for basic natural history information submitted through a natural history society (*American Naturalist*, *American Midland Naturalist*, *Western North American Naturalist* and *Northeastern Naturalist*). However, *The Canadian Field-naturalist*, *The Southwestern Naturalist* and *The Maryland Naturalist* are published by natural history societies and do publish basic natural history information about their local regions.

The Canadian Field-naturalist was first published in 1880, under a different title, by the Ottawa Field-Naturalists Club. It is a peer reviewed journal and "features both articles and notes on original research and observations on the natural history of northern North America (including distribution, faunal analyses, taxonomy, ecology, and behaviour)" (Ottawa Field-Naturalists'

Club 2009). *The Southwestern Naturalist* was first published in 1956 by the Southwestern Association of Naturalists. It publishes peer reviewed papers “dealing with living or fossil organisms, assemblages, or ecosystems of Mexico, Central America, and that region of the United States west of the Mississippi River and south of 40° N latitude” (Southwestern Association of Naturalists 2006). *The Maryland Naturalist* has a broken publication history (1930-1960, 1987-1999, and since 2001), providing an outlet for publications on the natural history of Maryland (Natural History Society of Maryland 2010).

Significantly, *The Canadian Field-naturalist* and *The Southwestern Naturalist* are abstracted by ISI Web of Science. ISI, by its own admission, is the most selective of the three main citation databases (ISI Web of Science, Scopus and Google Scholar), claiming to index only the top journals (Thomson Reuters 2009). Although critics claim this selectivity is a matter of convenience rather than quality (Cameron 2005; Leydesdorff 2008), a listing by ISI indicates that a publishing profile including natural history information can still be of considerable interest to the broader scientific community as well as serving

amateur naturalists and other members of naturalists’ societies. This is an important concept in the current environment because authors must *want* to publish in such journals, knowing that such publications will be recognized by their institutions and by their funding bodies. We believe that the journals of the Australian naturalists’ clubs can emulate this example.

The journals of the Australian naturalists’ clubs

There are six naturalists’ clubs in Australia covering Tasmania, all mainland states (except NSW, which presumably is served by *The Proceedings of the Linnean Society of New South Wales*) and the Northern Territory, and each publishes a peer reviewed journal (with the possible exception of *The South Australian Naturalist* for which we could not determine the reviewing and editorial policy). Wapstra’s (2008) comment describing *The Tasmanian Naturalist* could apply to all of them: “The articles cover a range of topics from the invertebrate to the vertebrate, native to exotic, marine to terrestrial, and botanical to zoological subjects.” *The Victorian Naturalist* has been published for over a century, while *Northern Territory Naturalist*, at just over 30 years old, is the most recent (Table 2).

Table 2. The Australian naturalists’ clubs’ journals. Note that not all the journals have had continuous publication since their first publication date.

Journal	First published	URL for naturalists club	Online journal content
The Victorian Naturalist	1884	www.fncv.org.au/welcome.htm	Content list and abstracts for most volumes 2000-2009. Indices to volumes 1994 – 2008. Also online availability through Informit, fulltext 2006 – present (back issues being gradually extended)
The Western Australian Naturalist	1947	www.wanaturalists.org.au/	Content list 1996 - 2011
The Queensland Naturalist	1908	www.qnc.org.au/	Subject index and author index 1907 – present. Also online availability through Informit, fulltext 2010 – present (back issues being gradually extended)
The South Australian Naturalist	1919	www.fnssa.org.au/	Online availability through Informit, fulltext 2006 – present (back issues being gradually extended)
Northern Territory Naturalist	1978	ntfieldnaturalists.org.au/	Content list 1978-2010. Also online availability through Informit, fulltext 2005 –2010 (back issues being gradually extended)
The Tasmanian Naturalist	1907	www.tasfieldnats.org.au	Content list 1994-2010, pdfs of articles 2004-2009

Together these journals are a comprehensive library of natural history issues in Australia. For example, Harris (2008a) exhaustively searched volumes of *The Western Australian Naturalist* and collated records from 119 relevant papers for mammal species currently extant or recently extinct in Western Australia. This is an invaluable resource for anyone looking for information on a particular species, highlighting the wealth of information in the journal on historical distributions that could be used for comparisons with current patterns. It also shows that many species have been little studied and could be

targeted by naturalists and scientists for future work. In connection with Harris’ work on mammal records in other Australian naturalist journals (Harris 2005a; 2005b; 2005c; Harris and Maloney 2006; Maloney and Harris 2006a; 2006b; Harris 2008b), these compilations highlight “...the significant contribution of naturalists in documenting information on mammal species occurrence and ecology” (Harris 2008a, p 183). Aside from showing the immense value of these journals, they also illustrate that online availability of journals would make this information much more accessible.

Usage of the journals of the Australian naturalists' clubs – who publishes in them and who cites them?

In terms of describing the usefulness of the journals of the Australian naturalists' clubs, we can follow the approach of Calver and Bryant (2008) and Calver *et al.* (2010) and consider who currently publishes in them and who currently cites them. To this end we analysed authorship and citations for the six journals of the Australian naturalists' clubs and, as a comparison, citations to the two journals of the North American naturalists' clubs. The authorship analysis was based on papers and research notes published in the period 2000 – 2006 (deeming this long enough ago for citations to begin to accrue, while still recent enough to be currently relevant), but excluding book reviews, editorials, annual reports, obituaries, club news and, in the case of *The Queensland Naturalist*, the anonymous biographies of Queensland naturalists published in the 2006 centenary issue. Data for the authorship analysis were retrieved from the contents pages of the journals, including each author on multi-authored papers as one count. We noted whether an author's address, both for Australian and international authors, indicated an academic affiliation (university, school or college), a government agency, or other (which included private addresses and unknown affiliations).

The citation analysis was based on all types of content published in the period 2000-2006. Both the North American naturalist journals are abstracted in ISI and Scopus. However, none of the Australian naturalist journals is abstracted in either database, although citations to these journals from journals that are abstracted can be retrieved. This process has several difficulties in ISI Web of Science, including the fact that a comprehensive cited reference search requires knowledge of all published abbreviations of the journal title (Calver and Bryant 2008). To avoid this and a possible high frequency of errors in Google Scholar

(Meho and Yang 2007), data for the citation analysis were retrieved from Scopus in October 2008. This type of search retrieves citations to all types of published journal content and does not allow limitation of results to papers and research notes only. For this reason, and to aid comparison with the North American naturalist journals, and eleven mainstream Australian ecological journals (published data from Calver and Bryant 2008), manual exclusion of citations to other types of published content was not undertaken. For the Australian naturalist journals that are not listed in Scopus, the total number of papers was determined from the contents pages of the journals.

Authors from government departments, universities and private individuals all publish in the journals of the Australian naturalists' clubs, although the relative mix varies from journal to journal. Several of these journals also receive contributions from international authors, usually reporting work undertaken during a time in Australia (Figure 1).

Some papers in the Australian naturalist journals are cited in the broader scientific literature, but these citations are below the level of the North American naturalist journals listed by ISI Web of Science and Scopus (Table 3) and also that of eleven mainstream Australian journals that publish ecological studies, most of which are also searchable in ISI and/or Scopus (Table 4). Nevertheless, our interpretation of these figures is that much of the material published by the Australian naturalist journals is useful, and that usefulness might be increased if the papers were more widely available.

Furthermore, citation data only give us one measure of usage. Articles may be read and valued, used in teaching or applied in professional practice without ever being cited in a publication (Cameron 2005; Jones *et al.* 2006). Where articles are available online, the number of downloads has been used to measure usage (Steele *et al.* 2006). If publishers released those data they might be a better measure of utility.

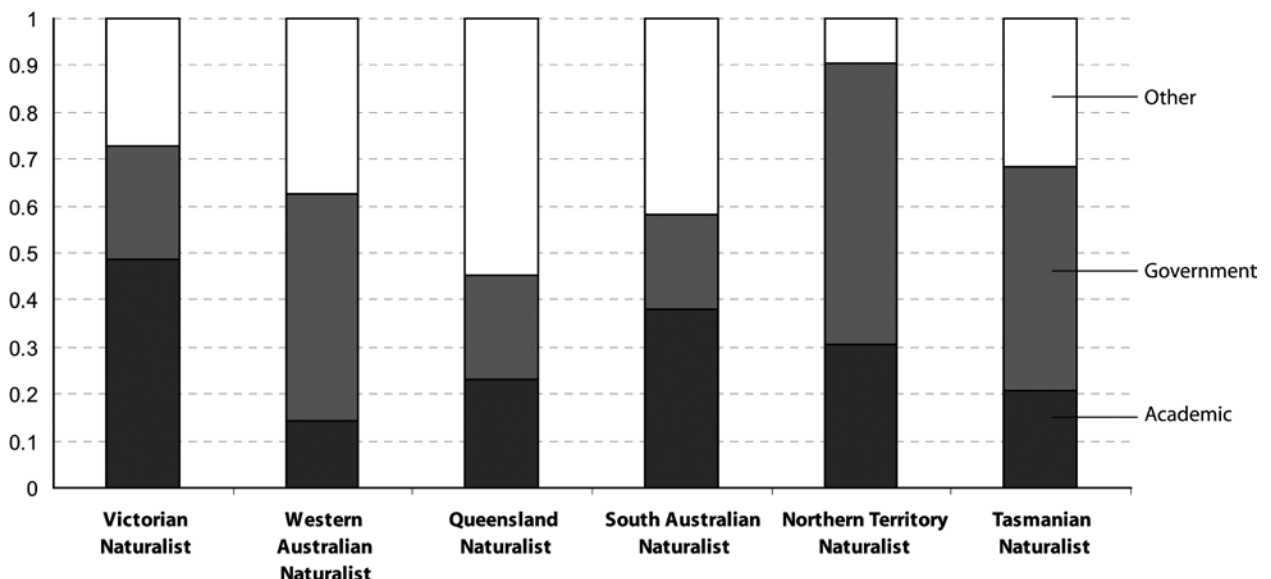


Figure 1. Affiliations of authors publishing in the Australian naturalists' clubs' journals for the period 2000-2006.

Table 3. Journal citation data from the six Australian naturalists' clubs' journals and the two North American naturalists' clubs' journals for the period 2000-2006, retrieved from Scopus in October 2008. An * indicates this journal is abstracted by ISI and Scopus, and ** indicates listing in neither database.

	Total citations	Total papers	Mean citations per paper	Median citations per paper
Australian journals				
The Victorian Naturalist**	129	281	0.46	0
The Western Australian Naturalist**	11	82	0.14	0
The Queensland Naturalist**	8	73	0.11	0
The South Australian Naturalist**	6	65	0.09	0
Northern Territory Naturalist**	7	32	0.22	0
The Tasmanian Naturalist**	18	67	0.27	0
North American journals				
The Southwestern Naturalist*	989	618	1.60	1
The Canadian Field-Naturalist*	801	616	1.30	0

Table 4. Citation data for 11 Australian journals publishing ecological studies for the period 2000-2006. Data are from Calver and Bryant (2008) and were drawn from Scopus between April 25th and April 28th 2008. An * indicates this journal is ISI and Scopus listed, a # indicates this journal is only listed in Scopus, and ** indicates listing in neither database.

	Total citations	Total papers	Mean citations per paper	Median citations per paper
Austral Ecology*	4915	532	9.2	6
Wildlife Research*	2824	521	5.4	3
Australian Journal of Botany*	3162	532	5.9	4
Australian Journal of Zoology*	1552	336	4.6	4
Emu*	1044	294	3.6	2
Australian Journal of Entomology*	1032	382	2.7	2
Pacific Conservation Biology#	692	217	3.2	1
Australian Zoologist#	154	108	1.4	1
Journal of the Royal Society of Western Australia#	340	159	2.1	1
Australian Mammalogy**	260	(101)	(2.6)	(2)
Corella**	126	(66)	(1.9)	(1)

Note: that the figures given in brackets for Australian Mammalogy and Corella are skewed as only cited publications are listed in the Scopus data base for these journals. This inflates the Mean CPP and the Median CPP, because uncited papers are not considered in the total number of papers. Counting the total number of articles using the journal contents pages to correct this was not undertaken as it was with the Australian naturalists' clubs' journals above.

The JANCO model

The journals of the Australian naturalists' clubs are well-placed to expand into the vacant niche created as the publishing policies of many other Australian journals change. To begin with, the naturalist journals already have a solid subscriber base provided by the members of their clubs. They thus have no pressure to 'grow a business' for their journals, because the journals exist to serve a membership that already covers costs. Their current editorial policies encourage the natural history and biological survey papers out of favour with changing mainstream journals and, given the interests of their members, these policies should persist. Furthermore, there may even be a financial benefit for clubs if their journals become more widely known and private or institutional subscriptions increase.

A significant drawback, though, is that the Australian naturalists' clubs' journals are not listed by the major data bases ISI Web of Science or Scopus. They cannot

be searched electronically other than through Google Scholar, which appears incomplete. This means that finding relevant articles requires trawling through the on-line contents pages for each of the different journals (if available on club internet sites), or searching hard copy. Once found, most articles are available only in hardcopy, which is another barrier to their usefulness. The Victorian Naturalists' Club has announced on their website that they have recently received funds from the Norman Wettenhall Foundation to create an online, searchable archive for *The Victorian Naturalist* extending back to the first issue in 1884. *The Tasmanian Naturalist* also has full articles on-line from 2004-2009, with plans to extend on-line availability back to 1909 (M. Waptra pers. comm.). *The Victorian Naturalist*, *The Queensland Naturalist*, *The South Australian Naturalist* and the *Northern Territory Naturalist* have also registered with the commercial online content supplier Informit (RMIT publishing, <http://www.informit.com.au/>). Recent issues are available online free to those whose institutions subscribe to Informit and for a

charge to the rest of the public, with back issues gradually being added. However, we suggest the provision of online content be taken one step further.

North America's Searchable Ornithological Research Archive, SORA (<http://elibrary.unm.edu/sora/>), is a model for increasing the accessibility of the journals of the Australian naturalists' clubs. Users of this archive can search the contents of twelve North American ornithological journals back to their foundation issues (sometimes in the 19th century), as well as download relevant studies as PDF papers. A great advantage is the ability to search several related journals simultaneously

by keyword, author or title. Other important features of SORA are that individual journals maintain their own publication policies and that the most recent issues of journals are unavailable, thus protecting subscriptions while allowing easy access to past papers.

We suggest that accessibility of publications in the Australian naturalists' clubs' journals would be greatly increased if they were available through a database similar to SORA. We propose the acronym of JANCO, for Journals of the Australian Naturalists' Clubs Online, for this particular database and encourage applications for funds to make the concept a reality.

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