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Predatory Journals: Revisiting Beall's Research

Graham Kendall[1,2] · **Simon Linacre**[3]

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Abstract

Between 2009 and 2012, Jeffrey Beall analyzed 18 publishers, which were publishing 1328 journals. He classified all but one of the publishers as predatory. In this paper we look again at these publishers to see what has changed since that initial analysis. We focus on the same 18 publishers so that we have a direct comparison with Beall's original analysis. One publisher has been acquired by Sage (the publisher no longer exists) and another has been acquired by Taylor & Francis (the publisher still retains its identity). Three of the publishers can no longer be found and, of the thirteen that remain, they now publish 1650 journals, an increase of 24.25% over the 1328 journals being published when Beall carried out his analysis. Other ways of carrying out this analysis, could put this increase as high as 50.14%. The increase in the number of journals being published, by fewer publishers, suggests that the problem of predatory publishing is getting worse, although this may be largely due to mega-predatory publishers which have dramatically increased the number of journals they now publish, when compared to ten years ago. Unlike Beall, rather than classifying the publishers as predatory (or not), we classify them into four categories, using data which is publicly available, rather than making a subjective decision. Two publishers are classified as category 1 (the most reputable). One journal is in category 2, four in category 3 and six in category 4.

Keywords Predatory publishing · Open access · Jeffrey Beall · Publication ethics

✉ Graham Kendall
Graham.Kendall@nottingham.edu.my

Simon Linacre
s.linacre@digital-science.com

[1] University of Nottingham, Nottingham, UK

[2] University of Nottingham Malaysia, Semenyih, Malaysia

[3] Digital Science, London, UK

Introduction

Both Eysenbach [1] and Sanderson [2], although not using the term, raised the issue of predatory publishing. The term "*predatory publishing*" was first used by Beall in April 2010 [3], in his second paper addressing this issue, the first being [4]. Beall highlighted predatory publishing as a serious threat to scientific publishing and, over ten years later, predatory publishing remains an issue that the scientific community has yet to adequately address, especially given that the number of identifiable predatory publishers and the journals they produce are rising. Beall is not the only person who has written about the dangers of predatory publishing. Linacre et al. [5], for example, said "*The purpose of this research note... is to ascertain what, if any, substantive damage can result from these practices. And to derive 'warnings signs' for those embarking on the road to creating/distributing what they have learned.*". Kendall [6] noted that a predatory journal, which accepted an obvious spoof paper, still exists and published more papers after accepting the spoof paper, than it did before.

Beall's first two papers [3, 4] analyzed ten publishers. Two more papers [7, 8], analyzed a further eight publishers. These 18 publishers published 1328 journals. With the exception of one publisher (AOSIS Open Journals), all were classified as being predatory. Kendall [9] has more details on Beall's first four papers, as well discussing Beall's legacy with regard to predatory publishing.

This paper is also written in the context of the number of predatory journals and publishers rising from 53,000 predatory articles in 2010 to 420,000 in 2014, which appeared in about 8000 predatory journals [10] and the community not responding to the warnings of Beall on the dangers posed by predatory publishers [11]. One of the watchdogs of predatory publishing, Cabells, maintains a list of more than 16,000 journals, which they have analyzed and can provide analytics and reports for these journals. Linacre [12] reports that about 150 journals are added to the Cabells' Predatory Reports database each month.

Beall's analysis of the 18 publishers was carried out about ten years ago. It seems timely to look at these publishers again to ascertain whether they still exist, whether they should still be considered predatory and to consider how the publisher's portfolio has changed in this time. It is useful to look at this subset of predatory journals, using Beall's analysis as a baseline, with this paper providing a further data point in the peer reviewed archive. We hope that this paper motivates other researchers to carry our further studies on the development of predatory journals and publishers, which could provide insights into how this pernicious practise can be eliminated.

Beall's Analysis

Table 1 summaries the 18 publishers that Beall analyzed in his first four papers [3, 4, 7, 8]. He classified all of the publishers as predatory, with the exception of #15 (AOSIS Open Journals). Apart from three publishers (#11, #12 and #13)

Table 1 Publishers analyzed by four of Beall's early papers

#	Publisher	# of journals	Composite score	Where analysed
01	Bentham Open	236	1.750	Beall [4]
02	Academic Journals	106	1.500	Beall [3]
03	Academic Journals, Inc	53	1.000	
04	ANSINetswork	31	1.250	
05	Dove Press	76	1.625	
06	Insight Knowledge	15	1.000	
07	Knowledgia Review	20	1.500	
08	Libertas Academia	80	2.625	
09	Science Publications	28	1.125	
10	Scientific Journals International	72	1.000	
11	Medwell	35	N/A	Beall [7]
12	International Research Journals	10	N/A	
13	OMICS Publishing Group	68	N/A	
14	Academy Publish	4	1.000	Beall [8]
15	AOSIS Open Journals	16	3.500	
16	BioInfo	300	1.000	
17	Science Domain International	19	2.125	
18	Scientific Research Publishing	159	1.375	
	Total	1328		

he analysed them using four criteria. Although the criteria were given slightly different terms across the three papers, they were essentially the same (Content, User Interface/Searchability, Pricing, License/Contract). Each criteria was rated between one and five stars (we do not believe that zero stars could be awarded) and a composite score arrived at. Assuming that zero stars was not possible the composite scores range was 1.000 to 5.000. We note that five of the 18 publishers (#03, #06, #10, #14 and #16) received the lowest possible score (1.000) and that the publisher classified as non-predatory (#15) received the highest score (3.500).

The three journals that were not awarded scores (#11, #12 and #13) were discussed in a one-page update paper [7] which was written as a response to other researchers contacting Beall suggesting that these publishers might be predatory. Beall discusses these publishers but does not score them using the methodology utilized in his other three papers. Kendall [9] provides additional details about these papers, more details about his other papers and the legacy left by Beall.

Data Collection

In this paper we revisit the 18 publishers that Beall analyzed. This would be difficult to do manually, given that these 18 publishers produced 1328 journals (see Table 1) at the time of Beall's analysis. Faced with collecting data for over 1300 journals, and possibly many more, we decided to automate the data collection, as far as we could,

by utilizing web scraping or an application programming interface (API), where that service is provided.

An API is a service provided by the data owner that enables you to access their data using an interface defined by the data owner.

Web scraping is an automated way of processing hypertext markup language (HTML-the markup language which defines how a web page will be presented to the user). You could achieve exactly the same results by manually inspecting each web page and copying/pasting the data you see but using web scraping enables the data collection to be carried out much more quickly and it is also less error prone, assuming that the web scraping algorithm is correct.

Each publisher's web pages are different, so each one had to be analyzed and an individual web scraping script had to be developed for each publisher. This was, in itself, time consuming but not as time consuming as a manual data collection process would have been. Moreover, once the algorithm was developed, we could refresh the data at a later date, assuming that the underlying web page structure had not changed. There are many web scraping tools available. We developed our own using the PHP programming language, utilizing the functionality that is available within the language for scraping web pages.

All the data collected for this paper was collected between 10 and 22 August 2021.

Data Collected for Each Publisher/Journal

For each publisher, we collected details of all the journals they published, collecting the title, the ISSN and the URL. We also ascertained whether a given journal was a member of COPE, a member of DOAJ and whether the journal was indexed by Scopus. We chose these indicators as they are widely recognized and the data can be verified. We provide more details about each of these below. One of the criticisms of Beall is that his judgements were subjective and could not be validated and/or reproduced. Kimotho [13] surveyed 30 peer reviewed papers that were critical of Beall. We wanted our analysis to be more data driven, rather than us giving our subjective view, which is why we are utilising different sources of data which, we hope, support our conclusions.

We used the ISSN to collect data from COPE, DOAJ and Scopus. This was done using web scraping (COPE and Scopus) and the DOAJ API. More details about each of these data repositories is provided in the following sections.

Committee of Publication Ethics (COPE)

COPE[1] provides advice and guidance on publication ethics including areas such as peer review, plagiarism and the role of editors. If a journal is a member of COPE they agree to abide by the principles that it defines. For each publisher, we note

[1] https://publicationethics.org, last accessed 07 March 2022.

how many of their journals are members of COPE. We recognize that COPE is not a measure of journal quality (nor do they claim to be) but being a member of COPE does indicate that a journal is accepting of the underlying philosophy of COPE.

Directory of Open Access Journals (DOAJ)

DOAJ,[2] as its name suggests, is a directory of open access journals. DOAJ promotes high quality open access journals. Journals can apply to become a member of DOAJ and, if they meet DOAJ's criteria they will be accepted. Although DOAJ, in the past, has accepted predatory journals [14] they were swift to act to remove them and DOAJ is recognized as one measure of quality of an open access journal. For each publisher, we note how many of their journals are members of DOAJ.

Scopus

Scopus[3] is a bibliographic search engine, which also tracks the number of citations to each paper. This metric is commonly referred to as an impact factor which, in the case of Scopus, is more correctly called CiteScore.

Along with Clarivate (Web of Science), Scopus' impact factors are the ones most commonly used by scholars when gauging the quality of a journal. We could debate whether impact factors are a meaningful measure of quality but what both Scopus and Clarivate do is to assess journals before they are accepted, and thus have their citations tracked.

We ascertained whether each journal is a registered by Scopus. We used Scopus, rather than Clarivate, as Scopus tends to have wider coverage, thus providing more opportunities for journals to be recognized. We also observe that journals recognized by Clarivate are likely to be recognized by Scopus as well.

Analysis

In this section we look at the publishers that Beall analyzed, looking at how they have changed since his original analysis. Five of the publishers (#3, #7, #8, #10, #14) no longer exist. We note that #8 (Libertas Academia) was acquired by Sage in September 2016.[4] The journals have been absorbed into Sage's portfolio, so it is difficult to analyze separately, so we exclude this publisher in later analysis. We further note that #05 (Dove Press) was acquired by Taylor and Francis in September 2017.[5] Dove Medical Press (as it is more properly known) maintains a separate

[2] https://doaj.org, last accessed 07 March 2022.

[3] https://www.scopus.com/, last accessed 07 March 2022.

[4] https://uk.sagepub.com/en-gb/eur/press/sage-publishing-acquires-journal-portfoliofrom-prominent-open-access-publisher-libertas, last accessed 07 March 2022.

[5] https://newsroom.taylorandfrancisgroup.com/dove-medical-press-joins-taylor-francisgroup/, last accessed 07 March 2022.

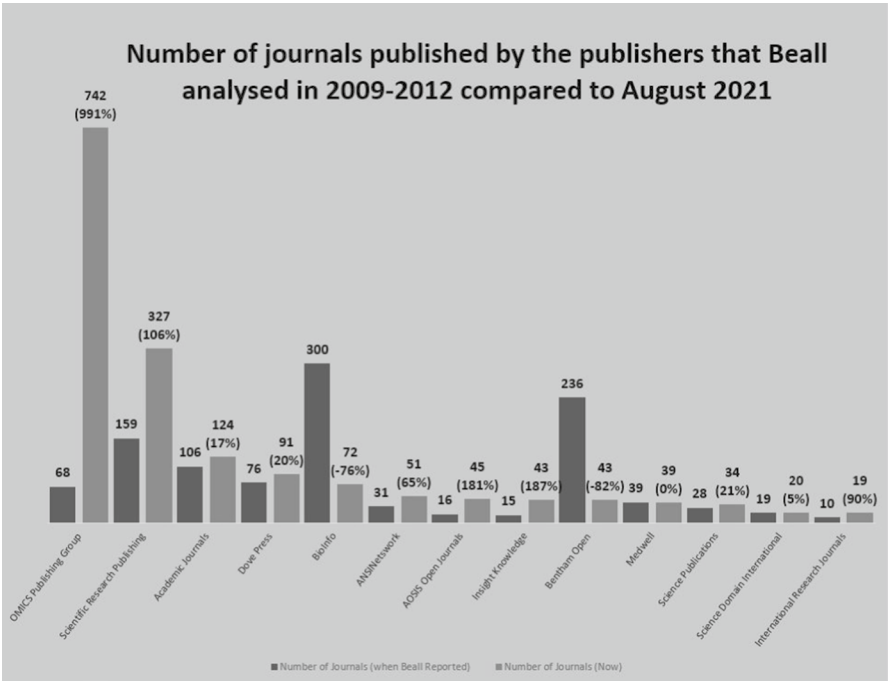

Fig. 1 Analysis of the number of journals published comparing Beall's analysis and August 2021

identity,[6] so we can include that publisher in our analysis. We note that Dove Press is one of the better performing journals in the analysis we perform, and this could, in part, be attributed to the positive influence of Taylor and Francis, although we also assume that Taylor and Francis would not have acquired a journal that was considered predatory, indicating that Dove Press had already made changes to its processes and quality. It would be an interesting study to analyze the history of Dove Press publications to see what could be inferred about how the publisher has developed and changed.

Figure 1 shows the thirteen publishers that are still publishing. The figure shows the number of journals as reported by Beall and the number of journals that the publisher now publishes. The percentage figure above the bars is the change in the number of journals published.

Of the thirteen publishers, two have reduced the number of journals they publish, ten have increased their number and one has remained the same.

Table 2 presents more details about the publishers. We show again the number of journals published by each publisher. This shows that these publishers now publish 1650 journals, compared to 1328 when Beall carried out his analysis. We can analyse the increase in the number of journals in several ways.

[6] https://www.dovepress.com, last accessed 07 March 2022.

Table 2 Number of journals published and statistics of membership

#	Publisher	# of journals	COPE	DOAJ	Scopus
01	Bentham Open	43	–	–	29 (67.44)
02	Academic Journals	124	–	–	–
04	ANSINetswork	51	10 (19.61)	–	2 (03.92)
05	Dove Press	91	90 (98.90)	83 (91.21)	53 (58.24)
06	Insight Knowledge	43	–	–	–
09	Science Publications	34	–	–	4 (11.76)
11	Medwell	39	–	–	–
12	International Research Journals	19	–	–	–
13	OMICS Publishing Group	742	–	–	–
15	AOSIS Open Journals	45	22 (48.89)	41 (91.11)	28 (62.22)
16	BioInfo	72	–	–	–
17	Science Domain International	20	–	–	–
18	Scientific Research Publishing	327	–	–	–
	Total	1650	122 (7.39%)	124 (7.52%)	116 (7.03%)

Analysis 1

If we consider just the raw figures, there is an increase of $[(1650-1328)/1328]\times 100=24.25\%$ in the number of journals that are now being published by the publishers analysed by Beall.

Analysis 2

If we disregard the number of journals published by the publishers that are no longer operating, that is (#3 = 53; #7 = 20, #8 = 80; #10 = 72; #14 = 4) = 229 journals, we can analyse using this reduced number of journals, that is 1328 − 229 = 1099. Using this number of journals, the percentage increase is $[(1650-1099)/1099]\times 100=50.14\%$.

Analysis 3

One of the publishers (#8, Libertas Academia) was acquired by Sage in September 2016. At the time of the acquisition, 83 journals were being published. If we add these to the total number of journals being now published (so we have 1650 + 83 = 1733), the percentage increase is $[(1733-1328)/1328]\times 100=30.50\%$.

Analysis 4

If we exclude the journals of those publishers that are no longer in business (#3 = 53; #7 = 20, #10 = 72; #14 = 4) = 149, but include those that were published by #8, Libertas Academia (83), at the time they were acquired by Sage, this gives

1328 − 149 + 83 = 1262. Using this figure, the increase in the number of journals since Beall's original analysis is [(1650 − 1262)/1262] × 100 = 30.74%.

Analysis 5

Looking at Fig. 1, OMICS could be considered an outlier as the increase in the number of journals it has published has risen from 68 to 742. We may want to exclude OMICS from our analysis to ascertain if the number of journals being published still shows an upward trend.

Excluding these OMICS journals (68 and 742) from the above calculations, the percentage changes are (Analysis #1)-7.94%, (Analysis #2)-11.93%, (Analysis #3)-21.35% and (Analysis #4)-23.95%.

If it were not for OMICS, the number of predatory journals published now, when compared to Beall's analysis, has actually decreased by about 25%, depending how you wish to carry out the analysis.

There is a perception that the number of predatory journals is increasing, which our analysis supports, albeit due largely to one publisher. However, is the increase in the number of journals due, as it appears to be in this paper, to "*mega-predatory publishers*", which are starting to dominate (indeed, already may dominate?) the predatory publishing landscape? This is certainly worthy of further investigation.

Professional Body Recognition

The remainder of Table 2 shows how many journals are members of COPE, DOAJ and recognized by Scopus. A hyphen indicates the no journals are in that category (so zero journals, thus zero percent) for that publisher.

Of the thirteen publishers, ten of them do not have any of their journals registered with COPE. Of the 1650 journals, 122 journals (7.39%) are registered with COPE, with Dove Press having 90 of their 91 journals registered.

Only Dove and AOSIS Open Journals have any of their journals recognized by DOAJ, with both publishers having over 90% of their journals registered. The 124 journals registered with DOAJ represent 7.52% of the 1650 journals that are published across the 13 publishers.

Five publishers have at least one of their journals recognized by Scopus. The 116 journals is 7.03% of the 1650 journals. It is, perhaps, a little surprising that more publishers have their journals recognized by Scopus than the number of publishers who have journals registered with COPE or DOAJ. However, the percentage of journals recognized by Scopus is less than the number recognized by COPE or DOAJ, although the percentage figures are quite similar being around 7%.

Table 3 Cabells analysis of 13 of the publishers analysed by Beall

#	Publisher	PR records
13	OMICS Publishing Group	968
09	Science Publications	281
16	BioInfo	133
18	Scientific Research Publishing	132
02	Academic Journals	110
06	Insight Knowledge	43
01	Bentham Open	0
04	ANSINetswork	0
05	Dove Press	0
11	Medwell	0
12	International Research Journals	0
15	AOSIS Open Journals	0
17	Science Domain International	0

Cabells' Predatory Reports

One of the authors of this paper has previously worked for Cabells, so had access to their database and is able to analyse the thirteen publishers that are still operating. The data that we can provide is limited, due to the commercial nature of the data. However, we were able to ascertain journals that had Cabells' Predatory Reports.

Table 3 shows this analysis. The "PR records" column gives the number of Predatory Reports that Cabells have in their database for the given publisher. The table is sorted from the largest to smallest, by the number of PR records. It is interesting to note that the six publishers that have Cabells' Predatory Reports do not have any journals registered with COPE, DOAJ or Scopus, with the exception of one. Science Publications has four journals recognized by Scopus. These are, 1557–4555, *American Journal of Animal and Veterinary* Sci*ences*; 1553–3468, *American Journal of Biochemistry and Biotechnology*; 1549–3636, *Journal of Computer Science*; 1608–4217, *OnLine Journal of Biological Sciences*. We note that none of these journals have Cabells' Predatory Reports.

Three publishers (#11 Medwell, #12 International Research Journals and #17 Science Domain International) do not have any Cabells' Predatory Reports but also do not have any of their journals recognized by COPE, DOAJ or Scopus. The remaining four publishers (#01 Bentham Open, #04 ANSINetwork, #05 Dove Press, #15 AOSIS Open Journals) do not have any Cabells' Predatory Reports and also have a reasonable number of their journals recognized by COPE, DOAJ and Scopus, with Dove Press and AOSIS Open Journals having some of their journals being recognized by all three of these professional bodies.

Table 4 Categorisation of publishers

#	Publisher	Category
05	Dove Press	1
15	AOSIS Open Journals	1
01	Bentham Open	2
04	ANSINetswork	3
11	Medwell	3
12	International Research Journals	3
17	Science Domain International	3
02	Academic Journals	4
06	Insight Knowledge	4
09	Science Publications	4
13	OMICS Publishing Group	4
16	BioInfo	4
18	Scientific Research Publishing	4

Categorization

We are not going to classify the publishers as being predatory or not. This is for a number of reasons. We are analyzing the publishers, not the journals and it may not be the case that all the journals for a publisher are predatory. This is unlikely, we know, but we do not want to be accused of classifying a publisher as predatory, when we have not looked closely at all of their journals.

Beall's list [15] also provides a good example why it may not be wise to label a publisher, and by definition, all of their journals as predatory. Some of the scientific community were critical of Beall when he added Frontiers to his list. One of the Associate Editors of Frontiers remarked "*Frontiers being added to Beall's list reveals the big weakness of Beall's list: It's not based on solid data but on Beall's intuition. Having a single influential individual cast doubt on such a huge journal feels very unfair*" [16]. It has been argued that this case ultimately led to the list being closed down [17].

To classify each journal, we would need to look at them in a lot more detail, such as the editorial board, the papers they have published, how long the reviews take, the Article Processing Charges and their web site before we could make an informed decision whether the journal was predatory or not. We are also conscious that Beall received criticism for being the sole arbitrar in deciding whether a journal was predatory, or not. We do not wish to make this judgement, at least not without carrying out a deeper investigation of individual journals. However, we can make some comments about each of the publishers that are the focus of this article. We have placed the publishers into four categories (see Table 4). These categories were decided upon using the following definitions.

Category 1 The journals published by these publishers do not have any journals listed in Cabells' Predatory Reports. The publishers also have a high proportion of their journals recognized by COPE, DOAJ and Scopus. In the case of the

two publishers that are in this category (AOSIS Open Journals and Dove Press), the percentage of recognition is more than 50%, with the exception of COPE for AOSIS Open Journals, which is 48.89%. We note that AOSIS Open Journals was the only publisher that Beall did not believe to be predatory.

In Beall's original analysis, Dove Press had a relatively low composite score (1.625) (see Table 1), publishing 76 journals. They have increased the number of journals to 91, with a high percentage of these being recognized by COPE and DOAJ and almost 60% of their journals being recognized by Scopus. We would note reservations about the early articles/published by Dove Press but between Beall's analysis and ours they do appear to be making the transition into a reputable, open access journal, assuming they were not at the time of Beall's analysis.

Category 2 There is only one journal in this category (Bentham Open). We have classified the journals in this category as those that does not have any journals listed in Cabells' Predatory Reports but do have representation in COPE, DOAJ or Scopus, to a reasonably high level. In the case of Bentham Open, they have almost 70% of their 43 journals recognized by Scopus, but do not have any recognition by COPE/DOAJ.

Category 3 Category 3 publishers are defined as those that does not have any journals listed in Cabells' Predatory Reports and either their COPE, DOAJ and Scopus recognition is low or non-existent. Of the four journals that we have placed in this category, ANSINetwork has some journals recognized by COPE and Scopus. The other three journals (Medwell, International Research Journals and Science Domain International) have no recognition in COPE, DOAJ or Scopus, but have zero journals listed in Cabells' Predatory Reports.

Category 4 These journals all have journals listed in Cabells' Predatory Reports. Even if they had significant COPE, DOAJ or Scopus representation we would still classify them as category 4. However, looking at the six publishers (see the top six publishers in Table 3), only one of the publishers (Science Publications) has any recognition across COPE, DOAJ or Scopus.

Science Publications has four journals registered with Scopus. Scopus is usually considered a reliable source to indicate that a journal is reputable. However, predatory journals have been found in the Scopus database, which Scopus have taken steps to remove [18, 19]. For completeness, we note that none of the four journals of Science Publications that are indexed by Scopus have journals listed in Cabells' Predatory Reports.

You may notice that the data collection shows that OMICS currently publish 742 journals, yet Cabells have 968 Predatory Reports for this publisher. We attribute this discrepancy to the fact that when predatory journals shut down, even if they remove articles (or never publish any in the first place) they often leave the journal homepage up, often with the only functioning element being the payment facility. This discrepancy is worthy of further investigation but, for the purposes of this article, the fact that they are classified in category 4 and have so many journals listed in Cabells' Predatory Reports is evidence enough that there is significant concern about this publisher. This is also against the background that the US Federal Trade Commission "*ordered Srinubabu Gedela and his companies to pay more than $50.1 million to resolve FTC charges that they made*

deceptive claims about the nature of their conferences and publications, and hid steep publication fees" [20, 21].

Conclusion

We have reanalysed the publishers that Beall analysed over ten years ago to see how they have changed. Of the 18 publishers that he analysed, four are no longer publishing and two have been acquired by other publishers. Of the 13 that are still publishing, they have increased the number of journals that they are publishing. Depending how you carry out this analysis, this percentage increase is between 24.25% and 50.14%. OMICS alone has increased the number of journals it publishes from 68 to 742, an increase of almost 1000%.

Rather than classify the publishers as predatory (or not), we have classified them into four categories, with this categorisation being done on whether the publisher has journals listed in Cabells' Predatory Reports and their representation in COPE, DOAJ and Scopus.

When authors are choosing a journal/publisher to submit their work to, we would suggest that those in a lower category are more reliable than those in a higher category. Of course, the author should carry out their own due diligence, as well as seeking advice from their peers/supervisor(s). If there are any doubts, look for another journal as the world is not short of scientific journals.

Future Work

The web scraping algorithm that we have developed can be extended to other publishers. It just requires an analysis of the underlying page structure and tailoring that part of the algorithm. We plan to use this to collect data about other publishers for our future research, especially those that might be considered predatory.

As we note in this paper, we have analysed the publishers, only producing high level statistics with regard to journals listed in Cabells' Predatory Reports and their recognition by COPE, DOAJ and Scopus. It would be useful to delve more deeply into the journals to look at areas such as their web site, the editorial board, article processing charges etc. There have been many papers published which provide guidance how you can spot a predatory journal and these would be good starting points to identify the exact data that needs to be collected (for example, Bowman and Wallace [22], Esfe et al. [23], Manca et al. [24], Shahriari et al. [25]).

We also noted that it would be interesting to look deeper into the evolution of Dove Press, as they appear to have made the transition from a predatory publisher into a legitimate publisher. A deeper analysis of Dove Press, and other publishers, could be illuminating.

Finally, as mentioned in the paper, an investigation as to whether mega-predatory publishers are starting to dominate this area is worthy of further investigation.

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Declarations

Conflict of interest Simon Linacre was directly employed by Cabells while research for this paper was being conducted, but is longer employed by them.

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