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What Those Responsible for Open Infrastructure in Scholarly Communication Can Do about Possibly Predatory Practices

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What Those Responsible for Open Infrastructure in Scholarly Communication Can Do about Possibly Predatory Practices

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Introduction

We come to this book on "predatory practices in scholarly communication" as members of a project that develops journal publishing platforms and conducts research on open science. In this chapter, we work with a set of 521 journals using that platform that also occupy a place on one or both of the two significant lists of journals said to be "predatory." One of the lists, representing 30,968 journals from "potential, possible, or probable predatory scholarly open-access publishers," was maintained until 2017 by University of Colorado Denver librarian Jeffrey Beall (*Beall's list*, n.d.). The other, which has assembled 15,470 titles since 2017 in a "database of journals [which] our specialists have flagged as probable threats," is *Cabells Predatory Reports* (Cabells, n.d.). The publishers and journals on these lists are presumed to *prey* on researchers, luring them to pay an "article processing charge" (APC) to publish in what is only the pretense of an open access scholarly journal.[1]

We write "presumed to prey" because of how difficult it is for Beall, Cabells, or any other observer to know whether a journal is adhering to such scholarly standards as peer review. The challenge stems from how journals arose out of, and often continue to be, the work of scholarly societies and groups consisting of trusted colleagues (Csiszar, 2020). This has meant that editorial transparency has not been an issue, apart from a journal's listing of well-respected names on the masthead. Now that the internet and open access have broadened the global scale on which an expanded array of research is produced and circulated, those given to deception can hide behind this tradition of trust. Without access to a journal's editorial processes, Beall and Cabells rely on proxies for "probable threats" to scholarly integrity, such as unprofessional websites, incomplete mastheads, exaggerated claims, and email spamming.

[1] Note that author payments of APCs are not the problem, as such fees are common for open access publishing among all the major publishers, especially in the sciences, going back to PubMed Central's introduction of the APC in 2000. Shen and Björk (2015) found that journals on Beall's list had an average APC of $178.

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Predatory proxies, however, prove to be problematic. They frequently turn out to apply to well-established journals, including top-tier titles (Olivarez et al., 2018).[2] They are used by some in equating *predatory* with *open access* publishing more broadly, reflecting Beall's own outspoken opposition to open access (Beall, 2013; Krawczyk & Kulczycki, 2021). On the other hand, efforts to directly assess journals' adherence to the peer-review gold standard have proved questionable and mixed. By relying on authors' estimation, for example, Cobey et al. (2019) found that 83.3 percent of those publishing in Beall-listed journals believe their work was peer-reviewed, which is less than reassuring. More convincingly, the journalist John Bohannon submitted a hoax paper to over 304 journals (2013). With Beall's list, Bohannon reports that 18 percent of the journals rejected his fatally flawed paper (compared to 62.4 percent rejection overall), while among the minority that accepted it were journals from the leading publishers, Elsevier, Wolters Kluwer, and SAGE.[3] Then there are the researchers who appear to exploit predatory journals for the increased compensation and research awards from their institutions that follow from increased publication (Demir, 2018; Pyne, 2017;). Despite these reasons for approaching the issue with caution, the growing sense is that "predatory journals are a global threat," as some 35 scholars declared in *Nature* (Grudniewicz et al., 2019), which may be unduly undermining what might otherwise be a welcomed global expansion of research.[4]

The scholarly publishing industry has responded to the phenomenon with a "Think. Check. Submit." campaign. The campaign website advises authors "to check if [the journal] is trusted" before submitting a paper (*Think*, n.d.). This means relying on journals that "you and your colleagues know," that are indexed, and that belong to a trade organization like those sponsoring this campaign. The website allows that some well-intentioned journals are mislabeled "predatory" for want of resources, but the overall thrust is that as "more research is being published worldwide… many researchers have concerns about predatory publishing." From our perspective, at least, many researchers also have concerns about how to facilitate a more open science through open access, open infrastructure, and related initiatives, which is where this chapter comes into the picture.

Our three-phase study represents a response to the question of what scholarly publishing platform developers and researchers can do to address the combined problem of fake journals and

[2] See Teixeira da Silva et al. (2022) on how Beall's criteria are "insufficiently specific, excessively broad, arbitrary with no scientific validation, or incorrect identifiers of predatory behavior," along with an effort to improve them.

[3] Recently, on this theme of fraudulence not being confined to questionable publishers, at least two Springer Nature journals were found to have published hundreds of "nonsense articles," while "Taylor & Francis retracted a special issue because the guest editor had been 'impersonated by a fraudulent entity'" (Bartlett, 2021).

[4] Of the 7,000+ papers in Google Scholar on predatory journals, over a thousand refer to it as a "threat" (as does our paper) along these lines: "Predatory journals are a global threat to science (Harvey & Weinstein 2017; Grudniewicz et al., 2019; Strong 2019)" (Oviedo-García, 2021).

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"predatory" mislabeling, both of which are undermining scholarly publishing. The study works with 521 journals that are both listed as "predatory" (by Beall and/or Cabells) and employ Open Journal Systems (OJS), a free open source editorial management and publishing platform. While Beall's list remains freely available online, Cabells Predatory Reports is only available by subscription for which, at our request, Stanford University subscribed in 2021 ($3,500). OJS is developed by the Public Knowledge Project (PKP) at Simon Fraser University and Stanford University. As members of PKP and in the service of full disclosure, we acknowledge two conflicts of interest, as well as a sense of responsibility, that underlie our research into these journals.

First of all, our findings bear directly on the reputation of PKP's software and those who employ it for their journals, as well as on the reason for this open source software project, which is to support open access to research as a human right and provide a means of improving this body of work. The data from the OJS journals used in this analysis have been made available for purposes of reproducibility and further studies, as a check on possible bias (Khanna et al., 2021). A second conflict of interest is rooted in how open source software projects, such as OJS, are generally committed to respecting users' "freedom to run the program for any purpose," to cite a common open source software definition (Wheeler, n.d.).[5] Yet rather than taking the typical open source "hands-off" approach to software's users, we are prepared to intervene out of a responsibility to assess and affect where OJS fits into the "predatory" picture. Our goal is to better understand the role that open source software and open infrastructure platform developers can play in addressing this issue.

Our intervention is two-fold: (a) We provide OJS-using publications identified as predatory with ways of addressing the seeming reasons for the label with the goal of improving their scholarly publishing quality; and (b) we are about to add verification technologies and communication strategies to publishing platforms by which readers will be in a better position to assess journal integrity. The overall goal here is to reduce the confusion and harm that this phenomenon is causing in scholarly communication, while raising the quality of scholarly publishing. Although providing such help, in the first instance, may equip bad actors with a better means of bluffing more authors and readers, we place this risk against writing off a substantial body of legitimate research and against new efforts to raise the technical bar for practicing deception in scholarly communication. Still, readers are advised to read this chapter with these conflicts of interest and sense of responsibility in mind.

Open Journal Systems

[5] Note that author payments of APCs are not the problem, as levying such fees is a common way for publishers to offer open access, especially in the sciences, beginning in 2000 with PubMed Central's open access journals.

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First released in 2002, the use of OJS has grown to 25,671 active journals in 2020, publishing in 155 countries, with 81.7 percent originating in the Global South, led by journals in Indonesia, Brazil, and the USA, and with research published in 56 languages, led by English, Indonesian, and Portuguese (Fig. 1).[6] These journals published an average of 38.8 articles in 2020, and over 4.7 million articles since 2010. PKP gathers this and other data from these journals through the software's optional beacon feature. The beacon provides PKP with access to journal data, although a portion of journal users turn the beacon off, implying the numbers reported here are undercounts. Other studies have found that the journals using OJS are largely open access (89 percent), and account for 60 percent of what are termed "diamond open access" journals, neither charging readers subscription fees nor authors APCs (Alperin et al., 2017; Becerril et al., 2021; Edgar & Willinsky, 2010;). While largely indexed by Google Scholar and in more limited ways by the Directory of Open Access Journals, the journals utilizing OJS represent an emerging force in research that includes a mix of century-old journals, new and inexperienced publishers, and a few outright crooks.[7]

Figure 1.

Journals Use OJS to Publish at Least Five Articles Annually Since 2002.

[6] A journal using OJS is identified as "active" for a given calendar year if it publishes five or more articles, a standard used by the DOAJ.

[7] The fraudulent use of OJS is most apparent with the duplication or hi-jacking of authentic journals, completely copied right down to its editors' names, which then accepts submissions intended for the original (Jalalian & Dadkhah, 2015). The one U.S. criminal conviction for predatory publishing, which resulted in OMICS International publishing group ordered "to pay $50.1 million in damages for deceiving thousands of authors who published in its journals and attended its conferences," did not involve OJS (Brainard, 2019).

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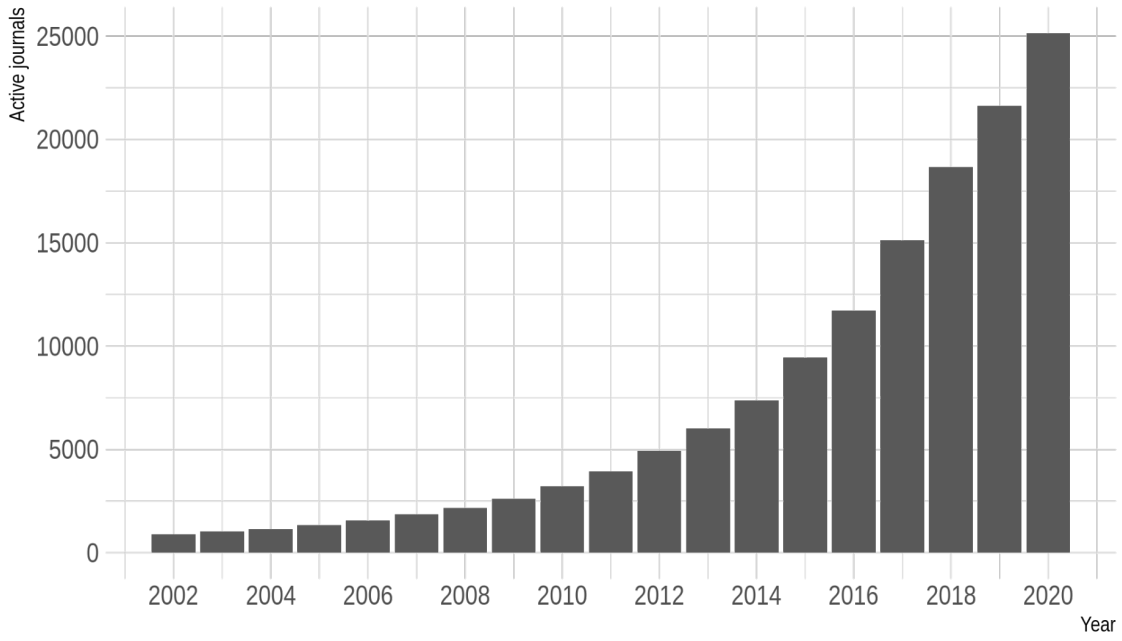

Note.

Journals using OJS can upload back issues, which will date the first appearance of the journal in this bar graph ahead of their OJS deployment.

Findings

This study took place in three phases from 2018 to 2021. The initial phase involved reaching out to a small sample of publishers and journals using OJS that appear on Beall's list and in *Cabells Predatory Reports* to see if they would be receptive to suggestions on improving their journals' quality. The second phase sought to establish how many journals using OJS are to be found on Beall's list and in *Cabells Predatory Reports*. The final phase represents a technical response to the first two phases. It proposes ways for the scholarly publishing industry to both verify and communicate to the public a journal's adherence to scholarly standards, as the long-standing lack of transparency makes predatory practices possible while leading to the uncertainty surrounding, and likely misuse of, the "predatory" label.

Phase One: Sample Study of Journal Elements

In this initial phase, conducted from July to December of 2018, we worked through Beall's 2017 list until we had identified 50 publishers and 51 standalone journals using OJS. We then emailed the publishers and editors and publishers, noting their appearance on Beall's list and offering to

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provide guidance on their journal websites. Of those contacted, 14 publishers (representing 113 journals) and two of the standalone journals responded with interest. We then reviewed example journals for each publisher. We were guided, in part, by Beall's *Criteria for Determining Predatory Open-Access Publishers*, for which the 54 bullet points range from "no single individual is identified as any specific journal's editor" (p. 2) to "the publisher has an optional 'fast-track' fee-based service for expedited peer review which appears to provide assured publication with little or no vetting" (2015, p. 6). Two of the publishers, Scholar Science Journals and Khalsa Publisher upgraded several features within a month of our emails, while COES&RJ (Center of Excellence for Scientific & Research Journalism) responded that it was acting on our advice.[8] Three of the fourteen publishers stated that they had unsuccessfully petitioned Beall to take them off the list, while a fourth convinced Beall to note their inclusion in the Directory of Open Access Journals (DOAJ).

In our analysis of the 14 publishers and two standalone journals, we discovered that seven of the publishers (or 14 percent of the publishers randomly chosen at the outset) did not charge authors for publication, which basically disqualifies them from the Beall and Cabells characterization of "predatory." Two of the seven sold subscriptions to their journals, and five had neither subscriptions nor author charges. In addition, we checked the entire set for compliance with what we judged to be eight key criteria from among Beall's set (2015), to which we added DOAJ and Google Scholar listings (Table 1). For those that charged authors, only one publisher (Fundamental Journals) did not comply with seven or more of the 10 scholarly standards.

On the peer-review question, we asked the 14 publishers who responded to our original inquiry, if they would allow us limited use of password access to their peer review process (based on our knowledge of OJS). Five publishers granted us access to a journal (Table 1). In spot-checking an average of 12 recent articles per journal, we found four of the five publishers' journals had complete sets of reviews, while the fifth was missing reviews for three articles out of 20. There were 1.6 reviews per article on average, although 24 percent of the reviews contained only a recommendation to publish without comment, suggesting that there is much work to be done on improving peer review quality. In sum, of the original randomly selected 50 publishers using OJS on Beall's list, 14.0 percent (7 publishers) are not even contenders for this classification; another 12.0 percent, who qualify, are

[8] The publisher Scholar Science Journals, for example: (a) added names and addresses of editors; (b) publish an annual reviewers list; (c) switched to continuous publication cycle; (d) sent special letters to users to encourage use of ORCiD; (e) included copyright info and applied for DOAJ approval; and (f) added publisher's name and address in footer. In addition to doing (a)-(e), Khalsa Publisher also (g) identified each of its journal's editors-in-chief; and (h) added a note on the responsibility of reviewers to authors in its section on peer review. The publisher COES&RJ indicated that it was increasing efforts to obtain reviewers and implement technical fixes.

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Table 1.

The Compliance with Beall's Criteria of Publishers and Journals Participating in Phase One (2018).

	Journals	APC	ISSN	Address listed	Editor named	Editor/ journal	Board/ journal	Review policy	DOI applied	Proper metrics	Google Scholar	DOAJ	Total /10
PUBLISHER													
AABL (Australian)	2	None[a]	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	8
ASD Publisher	12	$100	✓[b]	✓	✓	✓	✓	✓	✗	✓	✓	✗	8
Atlas Publications	9	None	✓	✓	✓	✓	✓	✓[c]	✓	✓	✓	✓[b]	10
CESER	11	None	✓	✓	✓	✓	✓	✓	✗	✓	✓	N/A[d]	8/9
COES&RJ[e]	1	$170	✓	✗	✓	✗	✓	✓[c]	✓	✓	✓	✗	7
EconJournals	3	$300	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	9
Engineering Pub. House	9	$80	✓	✓	✓	✗	✓	✓	✗	✗	✓	✓	8
Fundamental Journals	3	$300	✓	✗	✗	✗	✓	✗	✗	✓	✗	✗	3
GRDS Publishing	4	None	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗	7
ID Design Press	11	?	✓	✓	✓	✗	✓	✓[c]	✓	✓	✓	✗	8
Khalsa Publications	12	$100	✓	✓	✓	✓	✓	✓[c]	✓	✓	✓	✓	10
Scholar Science Journals	9	$50	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓[b]	9
Speak Foundation	4	None	✓	✓	✓	✗	✓	✓	✗	✓	✓	N/A	7/9
TathQeef Sci. Publishing	22	None	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	8
STANDALONE JOURNALS													
ATScience	1	None	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	9
Journal of Human Sciences	1	$35	✓	✗	✓	✓	✓	✓[c]	✓	✓	✓	✗	8
Total or Average	115	$142	16	12	14	9	16	15	9	15	14	6	7.8[f]

Note.

[a] No Article Processing Charge (APC) thought to motivate predatory publishing.
[b] Not all the publisher's journals possess this element or quality.
[c] Journal's peer review checked for 12 articles on average.
[d] Not open access and thus not qualified for indexing in DOAJ.
[f] COES&RJ: Center of Excellence for Scientific & Research Journalism.
[f] Average for the nine publishers and journals that levy an APC.

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largely compliant with Beall's basic criteria, with five of the seven providing direct evidence of peer review.

While Beall did not specify the reasons that individual publishers or journals were added to his list, *Cabells Predatory Reports* (2021) identifies the "violations" for each title, ranking them from "severe" to "minor." Cabells' "60+ behavioral indicators" for journals are described as indicative of "misconduct," "fraudulent operations," and "probable threats" (Cabells, n.d.). For the journals using OJS in its list, Cabells identified 4.3 violations, on average, per journal. The most common violation was that the journal failed to possess or post a policy for digital preservation. This "moderate" violation is included for 107 or 45.1 percent of the journals using OJS (Table 2). For each of the publishers that had one or more journals in Cabells Predatory Reports, we prepared an email for publisher and editors that listed their violations. After all, it would be very unlikely that they would otherwise have access to this list. We also included our recommendations for addressing these concerns and the method of notifying Cabells of the corrections that they may have made to their journals. For the most common violation, for example, we recommended that the publisher sign up their journals for the PKP Preservation Network, available to all journals using OJS and post this as their preservation policy. As the emailing of the publishers was only completed at the point at which we submitted this chapter for publication, we are not in a position to report on its success in helping the publishers.

Table 2. Top ten Cabells Predatory Reports "violations" by journal (N=237) with our advice to the publishers.

Rank	Cabells violation with its (assigned severity)	Journals	Our advice
1	No policies for digital preservation. (Moderate)	107 (45.1%)	(d)
2	The publisher displays prominent statements that promise rapid publication and/or unusually quick peer review (less than 4 weeks). (Moderate)	82 (34.6%)	(a)
3	The journal's website does not have a clearly stated peer review policy. (Moderate)	74 (31.2%)	(a)
4	Poor grammar and/or spelling on the journal or publisher's website. (Minor)	68 (28.7%)	(c)
5	The website does not identify a physical address for the publisher or gives a fake address. (Minor)	52 (21.9%)	(a)
6	Dead links on the journal or publisher's website. (Minor)	51 (21.5%)	(a)
7	Authors are published several times in the same journal and/or issue. (Moderate)	49 (20.7%)	(b)
8	Little geographical diversity of board members and the journal claims to be International. (Moderate)	35 (14.8%)	(a)

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9	No articles are published or the archives are missing issues and/or articles. (Severe)	32 (13.5%)	(b)
10	The publisher or its journals are not listed in standard periodical directories or are not widely catalogued in library databases. (Minor)	29 (12.2%)	(b)

Key to our advice to the publishers

(a) Take steps to correct.

(b) Not a violation of academic standards in our judgment.

(c) Place text in Google Docs, which will suggest corrections.

(d) Your publishing platform OJS can use (and list) the PKP Preservation Network as a digital preservation policy.

Cabells method of identifying "violations" for each title listed is a step up from Beall's method of simply adding publishers and journals to its list. Yet there remains a reliance on relatively weak proxies for what may or may not reflect a lack of experience and professional support. As well, the trade-off for this gain in detail is that the journals' identities, as well as their "violations," are unlikely to be available to those listed. This is of concern because Cabells' list of violations does helpfully identify ways to improve the journals. We have suggested to Cabells the basic fairness of sharing its assessments with the journals designated a "probable threat." While Cabells is not prepared to undertake such a step at this point, we plan to update the company on the results of our strategy of reaching out to the publishers with journals in *Predatory Reports* with advice for addressing the "violations" attributed to their publications and for seeking reconsideration. Our hope is that there may yet be a reason for this company to reconsider its contributions to scholarly publishing. This approach might also lead to an increased accuracy of their predatory reports by excluding false positives.

Nonetheless, our experiment of reaching out to publishers and journals has had limited success. What we found adds to the literature on predatory list overreach. However, a response rate of 28.0 percent among publishers and 3.9 percent among standalone journals, with only two publishers acting on our suggestions, suggests that while this may be the right thing to do, it is not an effective strategy for rectifying this issue, which calls for increasing certainties around identifying fraudulent journals.

Phase Two: Journals Using OJS in Beall's List and *Cabells Predatory Reports*

In this phase, we set out to determine the extent to which journals using OJS are identified as "predatory" in Beall's and Cabells' lists. In the first instance, we compared the PKP list of journals using OJS with Beall's final list of predatory publishers and journals, which he suspended in 2017 after several publishers and organizations fought back against such listings (Silver, 2017). To establish how many journals Beall's list ultimately represented in 2018, we counted the journals in a

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sample of 231 publishers (19.9 percent of the 1,163 publishers) without regard to the use of OJS (Table 2). The average we found of 24.3 journals per publisher suggested that Beall's list represents 30,968 journals as "predatory," including the 1,395 standalone journals. We also found that 61.7 percent of these journals had not yet published an article, while 6.3 percent did not have a website, a proportion that rose to 32 percent by 2021.[9] Of journals using OJS, 366 titles are associated with Beall's list, amounting to 1.2 percent of the journal total for Beall's List and 1.4 percent of the 25,671 active journals known to be using OJS (Table 3).[10]

Table 3.

Journals Listed by a Sample of Publishers (*n*=231) from Beall's Publisher List (*N*=1,163).

Journal status	Journals	Percent
With published articles	1,800	32.1%
Without articles	3,462	61.7%
Without a website	353	6.3%
Journals listed by publishers	5,615	100%
Average journals/publisher	24.3	

Table 4.

Journals Using OJS on Beall's List (2017) and in *Cabells Predatory Reports* (2021).

	Beall's List	Cabells PR
Total journals	30,968	7,490
Using OJS	366[a]	237[b]
Of the predatory total	1.2%	3.2%
Of the OJS total	1.4%	1.0%

Note.

[a] Journals using OJS (*N*=25,671) that share URLs with publishers and journals on Beall's List.

[9] A publisher or journal was considered to possess a website if we received a successful HTTP 200 OK response on pinging its URL with a wait time of 30 seconds.

[10] Despite the deficiencies to Beall's projected total, noted above, its seeming size lends great weight to the predatory-journal issue and is used for that reason in this study.

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[b] Journals using OJS (*n*=22,802) with an ISSN matching those on journals in *Cabells Predatory Reports*.

For its part, Cabells International was generous enough to undertake a comparison of PKP's list of journals with those in *Predatory Reports* by matching the journal's ISSNs (International Standard Serial Number) across the two lists. Limiting the match to journals with ISSNs reduced Cabells' list to 7,490 titles (out of 15,470) and the PKP's to 22,802 (out of 25,671). Within this set, 237 journals appeared on both lists, representing 3.2 percent of Cabells list (with ISSNs), and 1.0 percent of the journals using OJS (with ISSNs).

We examined the overlap among journals using OJS that appear on both the Beall's and Cabell's lists (Table 4). We found that 82 journals (0.3 percent of the OJS total) appear on both lists, led by journals published in India and the United States.[11] Taken together, a total of 521 journals using OJS appear on one or both predatory lists, amounting to 2.0 percent of the journals known to be using OJS. Between the two lists for those journals using OJS, Cabells appears to have a somewhat greater focus on the Global South, while the country differences between the two lists are likely the result of publishers' journal sets.

Table 5.

Top Ten Countries by Journals Using OJS on One or Both of Beall's List and Cabells Predatory Reports Alone.

Beall's list alone (*n*=284)		**Both lists (*n*=82)**		**Cabells' list alone (*n*=155)**	
Indonesia	47 (16.6%)	India	27 (32.9%)	Singapore	62 (40.0%)
United States	47 (16.6%)	United States	26 (31.7%)	India	60 (38.7%)
India	35 (12.3%)	Australia	7 (8.5%)	Bangladesh	5 (3.2%)
Pakistan	22 (7.8%)	Indonesia	6 (7.3%)	Turkey	4 (2.6%)
Canada	20 (7.0%)	Bangladesh	5 (6.1%)	Ukraine	4 (2.6%)
Romania	19 (6.7%)	Turkey	3 (3.7%)	United States	4 (2.6%)
Kenya	16 (5.6%)	Jordan	2 (2.4%)	Australia	3 (1.9%)
Malaysia	12 (4.2%)	China	1 (1.2%)	Belgium	3 (1.9%)

[11] The 82 journals using OJS that appear on both lists represents an overlap of 15.7 percent compared to the 31.8 percent overlap between the two lists that Xiotian Chen (2019) found for journals generally (based on a modest sample), while Chen's finding that 28.5 percent of publisher and journal websites on Beall's list no longer exist is comparable to our finding of 32.1 percent.

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Singapore	11 (3.9%)	Iran	1 (1.2%)	United Arab Emirates	2 (1.3%)
United Arab Emirates	11 (3.9%)	Italy	1 (1.2%)	Canada	1 (0.7%)
Total	240 (84.5%)		79 (96.4%)		148 (95.5%)

We take little comfort from the proportion of journals using OJS on these two lists. An open source publishing platform that is free to download and documents setting up and operating journals might have been expected to be more widely used by fake journals. It may be that OJS' design, dedicated to providing editorial oversight of peer review, is off-putting to those with no such intent, or that the platform's design and support enable journals to rise above the subjective judgments behind the "predatory" label. Still, some journals are almost certainly using OJS to illegitimately charge authors for publishing their submissions without peer review to the detriment of science. While there is evidence of overcounting on both lists, the proportion of journals using OJS is higher in the more recent list maintained by *Cabells Predatory Reports* (3.2 percent) than in Beall's list (1.2 percent), just as Cabells appears to be providing greater coverage of journals in the Global South than Beall. This increase may reflect OJS' growth rate, which only adds to our responsibilities as platform developers to address this issue.

Also troubling is the scale of the uncertainty and innuendo to Beall's list and *Cabells Predatory Reports*. Yet rather than blame Beall and Cabells International, it may be time to redirect the scholarly publishing technologies that have made this global knowledge exchange possible. New systems are needed that can verify and demonstrate to the public the extent to which these journals adhere to scholarly standards, which bring us to the third phase of this study.

Phase Three: A Journal Integrity Plan for OJS

To support the public value of open access and the global expansion of scholarly publishing, PKP is developing new tools for assessing and communicating scholarly trustworthiness. This will involve journals turning to third-party trade organizations to verify and register who is doing what in the publishing process, with an example involving ORCiD, a researcher identity and profile management organization, presented below. Initially, the goal is to work with five basic scholarly standards, before considering more granular and specialized standards around, for example, clinical trials (Table 5). These systems will depend on the exchange of information between journals and these organizations, with an openness to a level of scrutiny not possible today, whether in seeing the background of a journal's reviewers or how many reviews a paper is typically subject to. While

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involving automated connections and controls, the outcomes will be subject to human review and challenge. Through open source licensing of the connecting technologies, such developments will also be made available to commercial and other platforms.

Table 6.
Scholarly Publishing Standards for Which Third-Party Verification Systems Are to Be Developed for Journal Publishing Platforms.

Standard	Level	Trade org.[a]	Metrics	Additional information
Research status	Article	Crossref, Publons, Retraction Watch	Versions, downloads	Whether the research is (a) peer-reviewed research, moderated preprint; final draft; or working paper; (b) the latest or an earlier version; (c) a research article, letter, editorial, opinion piece, systematic review, etc.; (d) corrected, withdrawn or retracted; and (e) open access or paywalled.
Editorial oversight	Journal	ORCiD	Percent of editorial team displaying ORCiDs	ORCiD is a trusted source of academic identities and profiles icons, which provides editors, board members, and reviewers of the journal with an iD that links to their profiles.
Peer review	Journal	ORCiD, Publons	Reviewers, period, and rounds	Availability of open reviews, and article types subject to peer review.
Data deposit	Article	Dryad, Dataverse, Figshare	Data set size; presence of tools	Data availability policies and statements for journals, as well as existence of a dataset for replicability and other analytical tools (e.g., Jupyter Notebooks) for articles.
Sponsorship	Article	Crossref	No. of funders; average funded	Utilizes Crossref Funder Registry, and author conflict-of-interest declarations.

Note.
[a] Trusted trade organizations to be used as a check on journal adherence to scholarly standards.

For example, when editors, editorial board members, reviewers, and authors initially register with a journal's publishing platform, they will be required to log into ORCiD (Fig. 2). To be listed as the editor of a journal would involve a further log in with ORCiD in which this new position would be added to one's ORCiD profile, while ORCiD will provide the journal with a hyperlinked ORCiD icon, enabling readers and authors to explore the editor's background and qualifications knowing that the identities have been authenticated and that appeals can be made to ORCiD if anything seems amiss. Such systems may be susceptible to circumvention, as no technology is foolproof, of course, but the effort required to do so without detection will have been greatly increased and in ways that can be further improved in the face of violations.

Figure 2.
A Hypothetical Example of Two-Way Third-Party Authentication for the Editorial Oversight Standard Using PLOS ONE.

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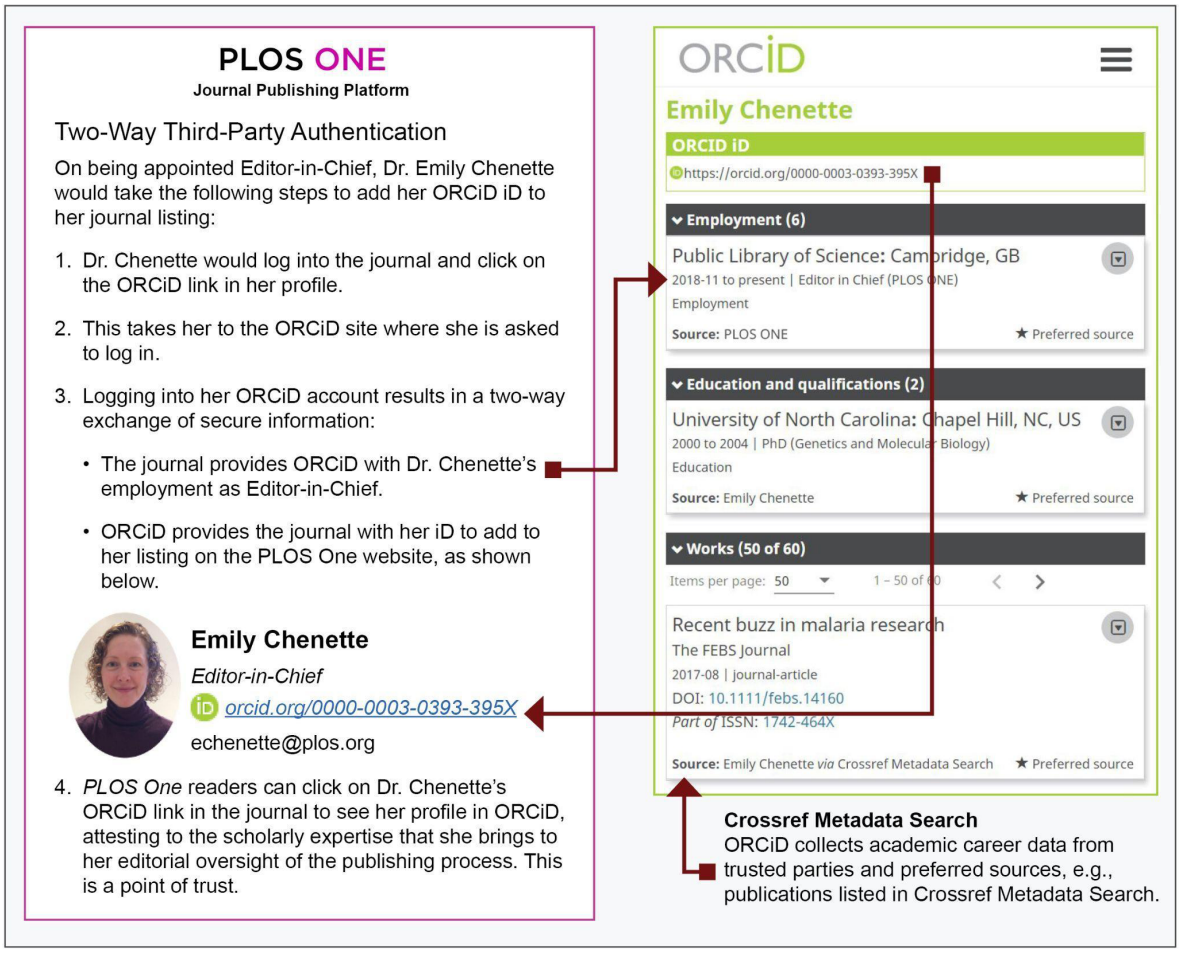

Then there is the question of how the results of this and other verification systems, whether for peer reviews, indexing, and other elements, will be communicated to readers and authors. Here we have begun to develop a "Publication Facts" label, based on the common FDA Nutrition Facts label (Fig. 3). This approach will be not only be open to public scrutiny, following open science principles, but also assessed and refined with various audiences, from high school students to journalists, to ensure the label's clarity and comprehensibility with researchers and members of the public who should be able to use the label to assess the trustworthiness of research articles.[12] The label, which will be linked to individual studies, will provide metrics on their compliance with standards, along with detailed explanations of each standard and metric. Such labelling is intended to inform and educate the public and the professions on research standards, while providing a basis for readers to briefly consider or explore in more detail the trustworthiness of research publications.

[12] See *Biology Now with Physiology* for an example of a high school textbook that grapples with journal scholarly standards and research quality (Houtman et al., 2018).

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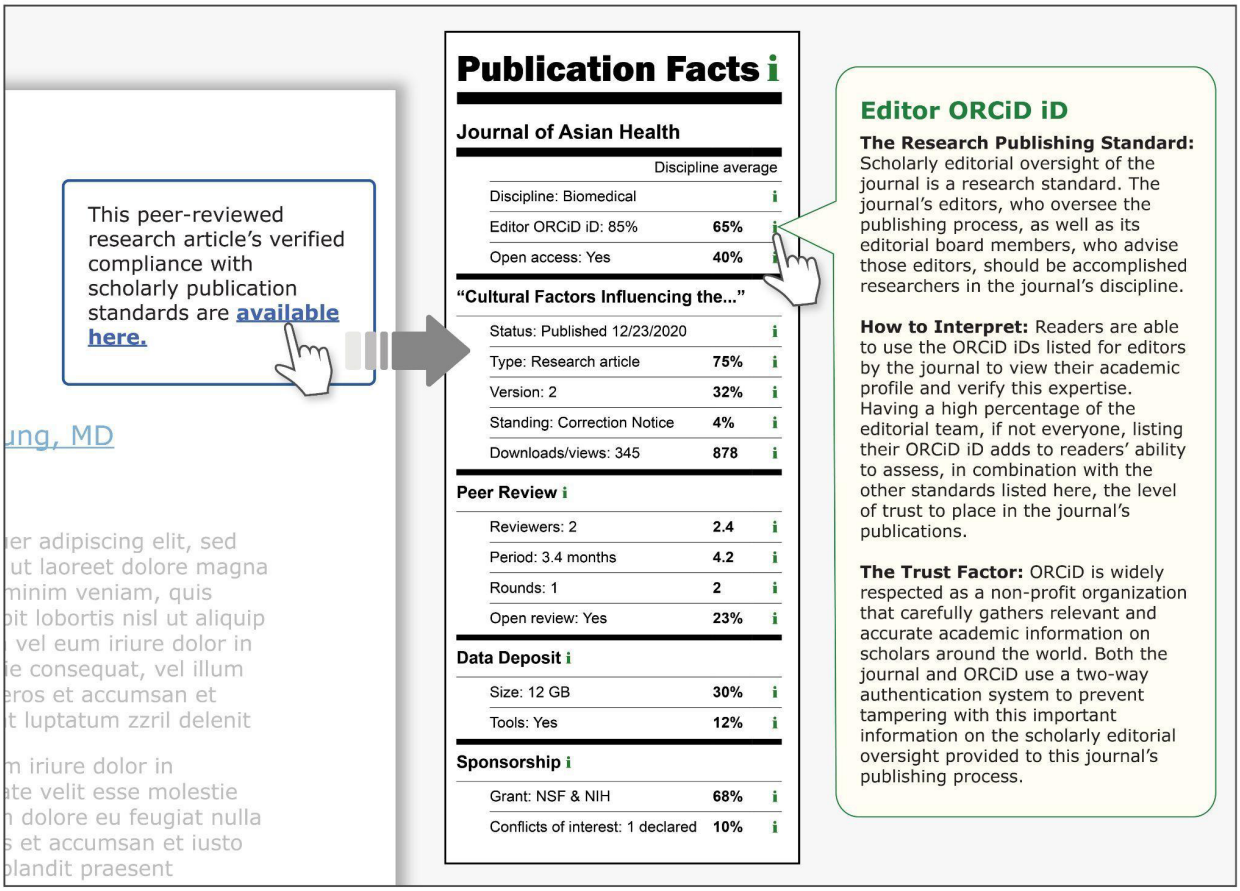
Figure 3.

The Publication Facts Label to Convey Verification Results to Readers and Authors.



Note. "Discipline average," would draw data from multiple uses of this project within a discipline. A Preprint Facts label would be similar, except that "Editor ORCiD iD" would be "Moderator ORCiD iD" and "Peer Review" would be "Moderation," with a measure of whether the moderator approves the initial posting and subsequent versions.

Although the lack of transparency and clarity in the degree to which journals adhere to scholarly standards applies to the larger world of scholarly publishing, these verification and communication systems will also, of course, help reduce the number of journals mislabeled as "predatory." To make journals adherence to scholarly standards explicit in publicly accessible ways may well encourage wider use of this work. Journalists and other professionals would get into the habit of checking the label before using research, while reading such labels could well form part of what high school and college students would learn about science. Such an industry standard for scholarly publishing seems to go hand in hand with universal open access and public support for research.

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Conclusion

No one doubts that unscrupulous website operators are present in scholarly publishing, much as they are in other fields. Without denying this reality, this study joins others in demonstrating how the lack of transparency at important points in the scholarly publishing process can lead to an over-application of the predatory label to journals and publishers. While this may increase awareness of a real problem, it threatens the progress that open access is making in the emergence of a greater global research effort. Nowhere is this more apparent than the industry's current response with "Think. Check. Submit." While it is aimed at assisting authors considering where best to submit their work, it cannot help but foster a broader distrust of the research literature beyond familiar and recognized publications.

What this study adds to the considerable literature on predatory journals is both evidence and reason for addressing the underlying issues of transparency. By developing verification systems for publishing platforms involving trusted trade organizations, the bar is raised for both those operating predatory journals and those (mis)applying the label. While PKP is taking the lead with these systems, we recognize that their effectiveness will depend on their adoption as an industry standard for journal accountability across publishers and publishing platforms. This will involve a wide range of journal platforms and scholarly publishers that share a common goal of assisting the public in assessing the trustworthiness of research publications, given their growing open access to research. These standards for verification and authentication, especially as they are attuned to communicating to the public, as well as professionals, the publishing practices that distinguish scholarly publishing, will raise the bar for both legitimate and deceptive journals.

If we can provide a publicly accessible, trustworthy basis for having greater confidence in a journal's legitimacy, then services such as Cabells might be willing to shift their efforts from assembling lists of potential offenders to more directly protecting the public interest by working with those journals in need of corrections and other improvements, while still seeking to expose deliberate acts of deception and fraudulence. What Jeffrey Beall and Cabells International have exposed, above all, is the need for means of verifying and communicating journal adherence to scholarly standards in an age of open access and global participation in research.

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