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Introduction

Since its introduction by the librarian Jeffrey Beall several years ago,^{1,2} the concept of predatory publishing has become widely recognized. Many popular journals and media, such as *Science*, *Nature*, the *Chronicle of Higher Education*, and the *New York Times*, have discussed the practice. Scholarly blogs have extensively discussed the significance of identifying predatory publishers and journals (e.g. various blog entries on scholarlyoa.com and scholarlykitchen.sspnet.org).

A set of criteria to define predatory publishing is given on Beall's blog site;³ however, the common argument that 'journals that exploit the author-pays model damage scholarly publishing and promote unethical behavior by scientists'⁴ has shaped perception of the practice. As a result, many people associate predatory journals with charging authors (article publishing charges (APCs)), and consider other predatory exercises to be publishers' efforts to entrap researchers into submitting their work for money.⁵ Some studies even extend the definition of predatory publishing to cover the entire author-pays model of open access (OA) publishing.^{6,7}

The history of OA journals charging authors processing fees can be traced back to 2000 when the Public Library of Science and BioMed Central initiated the author-pays business model. Observing the success of APCs at supporting journals' operations, many existing and new OA journals have started asking for APCs from authors, their institutions, or funding agencies. Several studies have recently examined publication fees in OA journal publishing.^{8–10} Kozak and Hartley, upon examining OA journals registered with the Directory of Open Access Journals (DOAJ), find that 'only 2,380 (28% of those for which information is provided) charged the authors for their publications'.¹¹

So far, there is no formal research that analyzes APCs in predatory publishing. Most of the criteria associated with predatory behav-

Predatory journals and their article publishing charges

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ABSTRACT. *This study examines the payment policies of a list of standalone predatory open access journals available on scholarlyoa.com. It is found that 72% do charge article publication fees (APCs), which is a higher percentage than found in DOAJ journals. The mean number of articles published during 2013 was 227, but ranged from 4 to 2,286 articles. The majority of journals charge low APCs and can be assumed to have modest annual incomes. There was no correlation between the amount of APC charged and the number of articles published. Comparing the number of journals charging APCs compared to the percentage from DOAJ, the findings suggest a connection between predatory practices and charging author fees. However, a comprehensive assessment of the dynamics of open access journal publishing beyond author charges should be done to avoid using APCs alone as a measure of whether a journal is predatory or not.*



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iors seem to be dependent on APCs. In this present study, I examine the payment policy, alongside some other variables, of every journal in Beall's predatory journal list (scholarlyoa.com/individual-journals). The goal is to explore the relationship of APC level to other characteristics, such as the journals' geographic location and frequency of publication.

Method

In January and February of 2014, I examined the online list of standalone predatory journals created and maintained by Beall. There were a total of 318 journal entries (as of 21 November 2014 there were nearly 470 journals). For each entry, I first collected the journal's payment policy. Because the majority of these journals operate in developing countries, there are typically two rates of APCs: one for local authors and one for foreign authors. The fee rates for local authors were converted to US dollars for comparison, while the fee rates for international authors were ignored. This is because many of the journals were only able to attract local authors, and I wanted to make this analysis consistent.

To ensure parity in the comparisons I made judgments regarding which rate to compare when several local rates are available. For example, a few journals established different rates for varying types of publications, e.g. research articles and review papers. In this case, only the rate for research articles was selected because they are the main type of publication. Differences among the rates for different publication types, however, are too small to affect our analysis. Also, a few journals charge more for multiple authors. In this case, I recorded the rate for one author only.

I then counted the total quantity of articles published by each journal in 2013. The diverse design of these journals' websites made manual counting of articles a tedious task. For journals that did not publish full issues for 2013 as planned, or that started publishing in the middle of 2013, I counted the total number of published articles, divided it by the number of existing issues, and then multiplied by the planned number of issues to get a hypothetical number. Journals that ceased publication before 2013 were not included in the dataset.

For journal location, I recorded the country of the publisher or journal managing office, rather than that of the editor. Difficulties sometimes arose when a journal's declared location and actual operations differed. Whenever data was unidentifiable, it was abandoned.

Of the 318 predatory journals, some were removed from the analysis because

- 28 journals have a dead link. Although a few can be found on Google, their data are not included.
- 11 journals ceased publication before 2013.
- 5 journals have not yet published any issues.

In addition, 3 journal entries are actually links to a publisher or a group of journals. In this case, I looked at each of the 27 journals published by these three entries. As a result, the final number of journals analyzed was 298.

Findings: APCs charged

Not every journal labeled predatory asks for APCs or specifies an amount:

- 15 journals in the list make it clear that there is no publication fee for authors.
- 46 journals do not mention APCs – there is no evidence to verify if these journals cheat authors by charging them after publication.
- 23 journals mention APCs, but do not provide the amount.

A total of 214 journals, about 72% of the journals analyzed, provide a fee scheme. The Indian rupee is the most popular type of currency for local submissions at 119 journals, representing 55% of the journals that openly declare APCs. The US dollar is second in popularity (81 journals), followed by the euro (8 journals), and the British pound sterling (2 journals). Other currencies include the Egyptian pound, Nigerian naira, Iranian rial, and Turkish lira, each of which is represented by one journal.

Upon converting all currencies to US dollars, it can be seen that most journals do not set a high APC rate: the vast majority of journals have a fee rate under \$100, primarily falling in the range of \$1–\$50 (Figure 1). Very few journals charge more than \$200. For journals charging rupees, the highest fee in US dollars is \$96 and the lowest is only \$8, with a mean of \$37 and a median of \$32. A compari-

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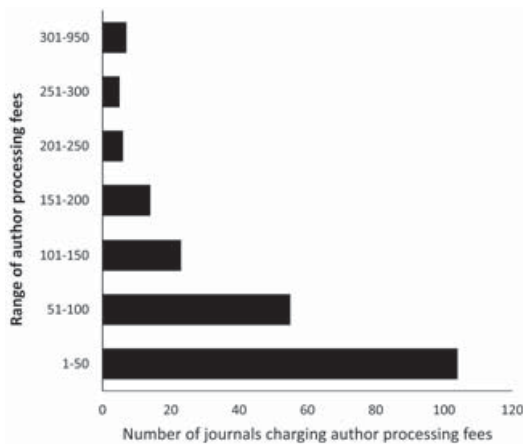


Figure 1. Number of journals charging APCs and the rate being charged (in US\$).

son of all journals that charge APCs is shown in Table 1.

The number of journals charging Indian rupees for local authors is different from the number of journals with operations in India. This is because some of the India-based journals also charge US dollars for local authors in addition to rupees.

Table 1. Summary of article publishing charges in US dollars by journal

	Journals charging rupees	All journals charging APCs
Mean	\$37	\$94
Median	\$32	\$51
Minimum	\$8	\$8
Maximum	\$96	\$950
Number	119	214

Findings: geographical location

Examination of the location of publishers or journal management offices highlights the position of India. Figure 2 provides a comparison of journal locations by country, showing how many journals within each country charge APCs. Indian journals are the overwhelming majority. Some journals in the US, UK, Canada, and unknown categories may actually be Indian journals as they specify Indian rupees or publish articles predominantly written by Indian authors. Other noticeable countries include Pakistan, Nigeria, Iran, Turkey, and Malaysia.

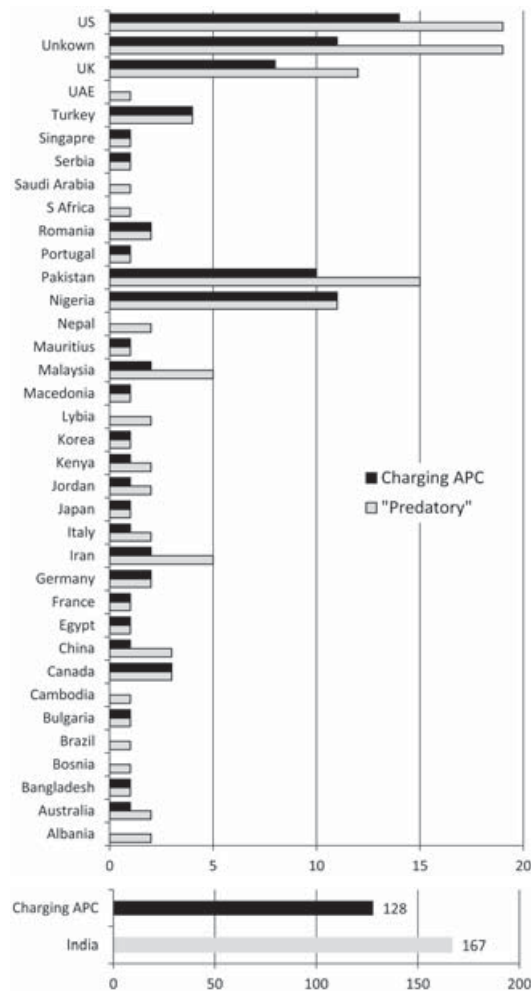


Figure 2. Journals listed as being predatory, and those charging APCs, by country. Note that the lower part shows the number of Indian journals (separated due to its large scale).

Findings: size of publication

Regarding the number of journal issues, the range varies from twice a year to once a week. The average frequency of publication is monthly (90 journals), followed by bimonthly (49 journals) and quarterly (45 journals). The number of articles published has a larger range than issue frequency: from as few as 7 articles to as many as over 2,000 articles per year. Table 2 shows the mean articles per journal is 227; the median is 86.

The majority of journals do not publish large numbers of articles. However, the small journals together produce the largest num-

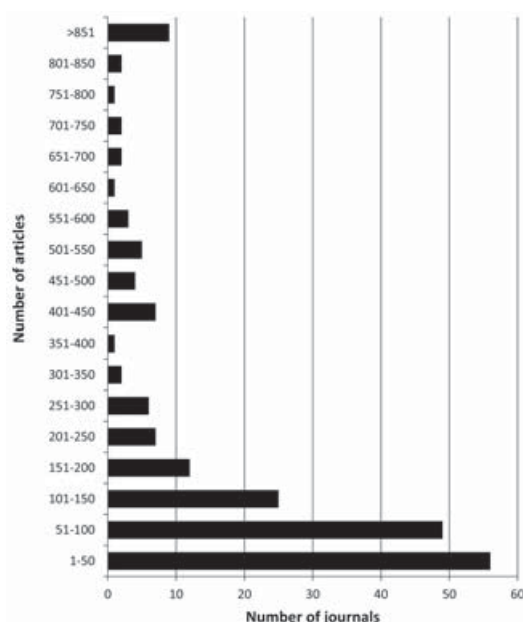


Figure 3. Numbers of articles published by predatory journals.

ber of articles (see Figures 3 and 4). Only 9 journals published more than 800 articles in 2013, contributing 32% of the total articles. In contrast, 56 journals, each publishing fewer than 50 articles, produced only 3% of the total articles.

Table 2. Number of articles per journal with summary statistics

	No. of articles
Mean	227
Median	86
Minimum	4
Maximum	2,286

The relationship between number of articles published per journal and APC level was also examined. A correlation coefficient calculation between journals' APCs for local authors and the number of articles showed this relationship (Pearson's $r = -0.0875$) to be negligible.

Discussion and conclusion

Several studies have examined journals in the DOAJ for their APC requirements. The DOAJ includes a comprehensive list of OA

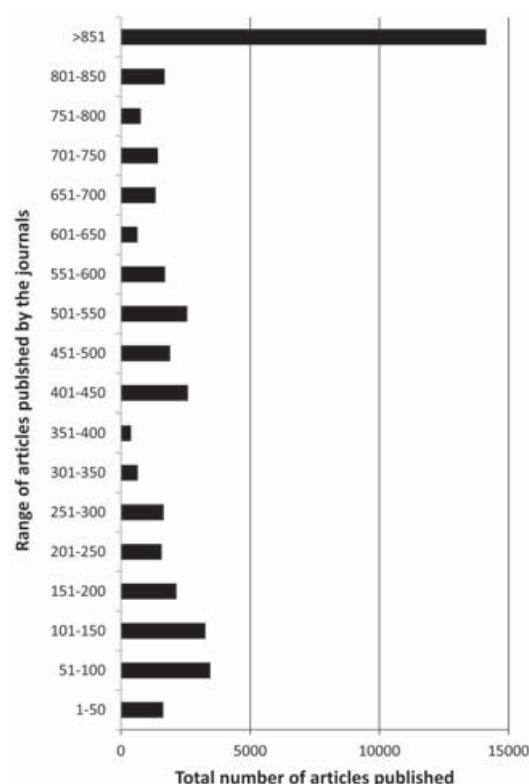


Figure 4. Total number of articles published by the journals, presented by the size of the different journals, demonstrating that while the largest-publishing journals (>851 articles total) have produced the largest number of articles, the smaller journals together (those publishing fewer than 500 articles in 2013) actually publish more articles when taken together.

journals that need to provide evidence of quality control. It recently implemented a new policy for increasing the requirements of participating journals to ensure the quality of their operation. An examination in 2005 discovered that 'more than half of DOAJ journals did not charge author-side fees of any type'.¹² Recently, Kozak and Hartley found this figure to be 28%, based on an analysis of nearly 9,000 DOAJ journals in 2012.¹¹

This present study shows that around 72% of the predatory journals set an APC, which is higher than all previous findings. This number does not include journals that mention APCs but do not provide an amount. By running a search to cross-match the predatory journal list with journals registered in the DOAJ database, it was found that a total of 33% of

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the journals in the list overlap that in DOAJ. Therefore, the journal population in this study is largely different from the journal population used in former studies. If Beall's judgment of viewing predatory publishing as questionable in quality control is followed, the present findings do suggest a connection between predatory practices and article publishing fees.

The APC rates of these predatory journals are generally lower than that of many DOAJ-registered journals. As shown in the findings of this study, the vast majority that charge publication fees set rates below \$100. Around 50% of the journals in the entire list charge fees of less than \$50; and very few of them ask for fees more than \$200. This is possibly because most of the predatory journals in the list operate in India where the cost index is lower than that in the West. If using Indian rupees (INR) as a measure, the mean of the India-based journals' APCs is INR 2,000 which is about 5% of a middle-class man's monthly income.¹³ When counting only Indian-based journals in the predatory list, their APC rates are even lower.

There is great variation in the revenue that these predatory journals have generated. Let us use the summary statistics displayed in Tables 1 and 2 to compute the median and mean article publishing fees and the median and mean numbers of articles. The calculations were run for one of the largest journals (*Indian Streams Research Journal*) and one of the smallest journals (*International Journal of Fundamental & Applied Sciences*) regarding the number of their articles. Note that all are Indian-based journals and the calculations are based on US dollars; note also that these calculations allow for no waivers, and assume that an APC is paid for every article published.

$\$37 \times 227 = \$ 8,399$	[mean]
$\$32 \times 86 = \$ 2,752$	[median]
$\$100 \times 19 = \$ 1,900$	[one small journal]
$\$105 \times 1,367 = \$143,535$	[one large journal]

The results reveal that while a journal publishing a small number of articles had an annual income of less than \$2,000, a predatory mega-journal could earn a six-digit number for the same year. The median value of \$2,752 is significantly lower than the mean value of \$8,399, indicating a large poor-rich

divide in the financial conditions of predatory publishing.

An interesting finding is that there is no correlation between the level of APCs and the number of articles published in a journal. The calculations above are for the purpose of comparison only because mega-journals may set a low APC rate, while a small journal may charge a high fee to authors. The income of a journal is determined by the volume of its articles rather than by the amount of its APCs.

Although predatory journals have shown greedy practices in general, numerous authors still pay the required fees to publish their articles. Some predatory journals have become mega-journals that produce thousands of articles a year, while many other journals experienced a rapid increase in the number of articles over the course 2013. In another study, Xia *et al.* found that predatory journal authors are predominantly from developing countries, particularly from the country in which the journal is operated.¹⁴ The proliferation of OA journals may represent an interesting supply-demand case. According to data released by the Royal Society,¹⁵ some non-Western countries, including China, India, Brazil, and South Korea, have dramatically increased their expenditure on research and development, and employ an ever-growing number of researchers who are pressured by various policies to publish in English-language and indexed journals.^{16,17} China now produces the largest number of doctorates by country, and India is ranked fourth. The current model of scholarly publishing simply cannot satisfy the rising demand. We can expect even more OA journals adopting the author-pays model and competing with not-for-profit and commercial publishers.

Kozak and Hartley¹¹ also discussed disciplinary practices and their impact on OA journals charging publication fees. According to their findings, hard science journals tend to require APCs and charge more than journals in soft sciences. Such an analysis is difficult to compare with the dataset used herein as the majority of the predatory journals in the list claim to be multidisciplinary. Some of them cover a broad range of disciplines from science and engineering to business and medicine, and even to social science and the humanities.

Beall's criteria for determining predatory

about 72% of the predatory journals charge an APC

numerous authors still pay to publish in predatory journals

OA journals also include analyses of ethical standards, publishers' qualifications, business management, scientific integrity, etc.³ However, it remains unknown if a journal is labeled predatory because it meets all these criteria or is categorized on only one or a few measures. In practice, some of the analyses are easy to make, while others are not so straightforward. It is relatively simple to identify suspicious journals that hide the location of their managing office or hide the amount of APCs. Some of the journals do present a lax peer-review process as examples of scholarly misconduct.⁷ However, the scientific integrity of a journal may require complex assessment. We should be careful about distinguishing those that lack experience in publishing from those that are too avaricious to care about the quality of publications. The academic community needs to optimize measures of publishing quality and bring sociocultural perspectives into the discussion of the diverse practices of OA publishing.

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