

# JLSC

ISSN 2162-3309 | JLSC is published by the Pacific University Libraries | <http://jls-public.org>

**Volume 6, General Issue (2018)**

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Burggren, W., Madasu, D., Hawkins, K.S., & Halbert, M. (2018). Marketing via E-mail Solicitation by Predatory (and Legitimate) Journals: An Evaluation of Quality, Frequency, and Relevance. *Journal of Librarianship and Scholarly Communication*, 6(General Issue), eP2246.  
<https://doi.org/10.7710/2162-3309.2246>

This article underwent fully-anonymous peer review in accordance with JLSC's peer review policy.



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# Marketing via E-mail Solicitation by Predatory (and Legitimate) Journals: An Evaluation of Quality, Frequency, and Relevance

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**INTRODUCTION** Open access (OA) journals have proliferated in recent years. Many journals are highly reputable, delivering on the promise of open access to research as an alternative to traditional, subscription-based journals. Yet some OA journals border on, or clearly fall within, the realm of so-called “predatory journals.” Most discussion of such journals has focused on the quality of articles published within them. Considerably less attention has been paid to the marketing practices of predatory journals—primarily their mass e-mailing—and to the impact that this practice may have on recipients’ perception of OA journals as a whole. **METHODS** This study analyzed a subset of the 1,816 e-mails received by a single university biology faculty member during a 24-month period (2015 and 2016) with an update from December 2017 and January 2018. **RESULTS** Of those e-mails sent in 2015, approximately 37% were copies or near-copies of previous e-mail messages sent to the recipient, less than 25% of e-mails from predatory journals mentioned publication fees, only about 30% of soliciting journals were listed in DOAJ, and only about 4% had an identifiable impact factor. While most e-mails indicated a purported familiarity with, and respect for, the recipient, more than two thirds of the e-mails did not, implying use of mass-e-mailing methodologies. Almost 80% of the e-mail solicitations had grammar and/or spelling mistakes. Finally, and perhaps most importantly, only a staggeringly small 4% of e-mails were judged highly relevant to the recipient’s area of expertise. **DISCUSSION AND CONCLUSION** In light of the marketing practices of many predatory journals, we advocate specific instructions for librarians, faculty mentors, and administrators of legitimate OA journals as they interact with new researchers, junior faculty, and other professionals learning how to discern the quality of journals that send direct e-mail solicitations.

Received: 03/19/2018 Accepted: 10/09/2018

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## IMPLICATIONS FOR PRACTICE

1. This article quantitatively analyzes journal e-mail solicitations from the perspective of a single e-mail recipient over a three-year period and comments on the effects these e-mails might have on attitudes of prospective authors toward open access journals.
2. E-mail solicitations received by a single scientist increased overall more than twofold from the two-year period of January 2015 through December 2016 and more than sevenfold from the months of January to December 2015 to these months in 2018, pointing to the rapid and accelerating growth of this marketing practice by predatory journals charging significant article-processing fees.
3. Of the analyzed e-mail solicitations received by this scientist, almost all had both very low relevance and low quality. We view e-mail solicitations from such journals as contributing to some scholars' increasingly low opinion of the process of solicitation by e-mail by any journal—legitimate or not. Thus, the increasing volume of e-mail solicitations from such journals is actually devaluing legitimate attempts to communicate and collaborate by e-mail.
4. We have generated specific recommendations for librarians, faculty mentors, and publishers of legitimate journals that center on the necessity to understand in some depth the marketing practices of less legitimate journals.

## INTRODUCTION

Open access (OA) journals have proliferated at a breathtaking rate over the last several years. Many of these journals are highly reputable and have delivered on the promise of providing OA to research as an alternative to subscription-based journals. Unfortunately, large numbers are bordering on, if not clearly within, the domain of lower-quality journals that solicit manuscripts, sometimes with a false sense of urgency, through e-mail solicitations, then collect article-processing charges (APCs) and publish the manuscripts without proper (or any) peer review. These are perhaps the most salient features of what are commonly referred to as “predatory journals” (K. Anderson, 2012; R. Anderson, 2015; Beall, 2016b; Berger & Cirasella, 2015; Hansoti, Langdorf, & Murphy, 2016; Sorokowski, Kulczycki, Sorokowska, & Pisanski, 2017; Stratford, 2012), though the appropriateness of this term has

been questioned.<sup>1</sup> In response, numerous articles, blogs, and websites have commented on the number and origins of such journals (see Literature Review). These valuable, if somewhat disheartening, studies have focused primarily on the provenance and quality of the predatory journals themselves. Fewer studies have focused on how scholars actually come to view journals associated with e-mail solicitations to submit manuscripts and/or join the journal's editorial board. As will be demonstrated in this study, the relevance of these e-mail solicitations to individual authors' work is generally quite low, and their volume is increasing, which may diminish scholars' views on OA publishing.

## LITERATURE REVIEW

Much interest has arisen regarding predatory journals and the effect they have on the publishing industry as a whole. Numerous authors have commented on the emerging confusion and concern among scholars and librarians alike regarding the proliferation of these journals. In particular, concern has been expressed that the comingling of such journals with legitimate OA journals is, or already has, compromised or even "corrupted" the reputation of OA journals as a whole (Beall, 2012; Bjork, Shen, & Laakso, 2016; Bjork & Solomon, 2012; Butler, 2013; Christopher & Young, 2015; Ferris & Winker, 2017; Gasparyan, Yessirkepov, Diyanova, & Kitas, 2015; Harzing & Adler, 2016; Manca et al., 2017; Natarajan & Nair, 2016; Shahriari, Grant-Kels, & Payette, 2016; Shen & Bjork, 2015; Xu & Chau, 2014). Past analyses have included both broad analyses of the characteristics of predatory journals, including longitudinal studies of the volume of articles, and analyses of the journals' marketing, article reviewing practices, and journal longevity, sometimes even including "exposés" of specific suspect journals (Hansoti, Langdorf, & Murphy, 2016; Bjork et al., 2016; Manca, Martinez, Cugusi, Dragone, & Dvir, 2017; Manca, Martinez, Cugusi, Dragone, & Mercuro, 2017; Memon, 2017; Moher & Srivastava, 2015; Petrișor, 2016; Ray, 2016; Shamseer et al., 2017; Shen & Bjork, 2015; Wicherts, 2016). In these studies, most authors describe questionable publishing characteristics in at least half of the journals they have investigated.

When considering the quality of a journal, scholars sometimes seek an objective metric

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<sup>1</sup> The adjective *predatory* has been questioned for its appropriateness, and the term *bad faith* suggested as a substitute (R. Anderson, 2015). More recently, it has been suggested that the practices of such journals be viewed as *parody* rather than predation, in the interests of developing a more nuanced view of conventional journals, or what Bell (2017) and Ferris and Winker (2017) refer to as "legitimate" journals. In the present article we retain the adjective *predatory* simply because of the broad recognition of the general concept; it is not for this article to resolve that debate. However, we wish to stress that we do not believe that journals actually fall into binary categories of *predatory* or *nonpredatory*; rather, legitimacy and other qualities of a journal are gradients on a spectrum.

that can be used for any journal in any field. The most well-known is the journal impact factor, yet the meaning and significance of a journal's impact factor has been extensively debated since this metric was first developed decades ago (Bjork & Solomon, 2012; Chen, Chen, & Jhanji, 2013; Citrome, 2007; Colquhoun, 2003; Ha, Tan, & Soo, 2006; Jones, 2003; Lariviere & Sugimoto, 2018; Lee & Bardin, 2009; Makeham & Pilowsky, 2003; Moed, 2002; Nielsen & Seitz, 2016; Smith, 2007; Waheed, 2003). Despite sustained criticism of the impact factor over the years, it continues to be used not only as a measure of a journal's importance but also as a proxy for measuring the quality of individual publications, especially when assessing a case for academic promotion (Hecht, Hecht, & Sandberg, 1998; Holden, Rosenberg, Barker, & Onghena, 2006; Moher et al., 2018; *PLoS-Medicine*, 2006).

Highlighting the quality-control issues in numerous journals, considerable attention has been directed toward various "sting" operations, building on a history of publishing hoaxes such as the "Sokal affair" (Bricmont, 1999; Hadi, 2016). Most notably, fabricated manuscripts, sometimes with obvious or even glaring errors, have been accepted in journals charging fees for publication but offering little or no peer review, for example, the "Bohannon Sting" (Bohannon, 2013).<sup>2</sup> In a recent study, a fake CV was sent to 360 journals, with the "sender" soliciting membership on each journal's editorial board (Sorokowski et al., 2017). Approximately one third of the journals accepted the "fake, subpar candidate" as a member of their editorial board.

Against this backdrop of skepticism toward newer publishing venues, several scholars have counseled prospective authors on navigating the complex options for publishing their research in the age of predatory journals (Hansoti et al., 2016; Beall, 2016a; Christopher & Young, 2015; Masten & Ashcraft, 2016; Reid & Cress, 2016; Shahriari et al., 2016; Shamseer et al., 2017). Additionally, some researchers have proposed a series of tools for evaluating the transparency of the peer-review process (Laine & Winker, 2017; Wicherts, 2016).

In short, the literature to date has taken a broad, analytic view that has focused on assessing the legitimacy and quality of journals. Less attention has been paid to the specific e-mail marketing practices of journals, although such practices are coming under increasing scrutiny because of how they may shape the perception of these journals by potential authors. A very small subset of studies of predatory journals indeed focus on the "consumer" side of these practices, analyzing how authors are recruited. Notable for this approach is a study that analyzed a subset of e-mail solicitations sent to a cohort of five researchers (specific

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<sup>2</sup> Interestingly, some journals published by recognized, established publishing houses also accepted the "sting" article.

disciplines not identified) (Grey, Bolland, Dalbeth, Gamble, & Sadler, 2016). That study focused on invitations to publish articles and to attend conferences sent over a three-month period in 2014. In their informal and entertaining article, the authors describe a study focused more on the subjective qualities of various forms of spam e-mails rather than on longer-term trends, objective assessments of quality, or—most importantly—the future implications of such e-mail solicitations. A few other studies have analyzed e-mail solicitations sent to a single individual over approximately one year for factors such as frequency of receipt of e-mails, use of an OA model by the publisher, the charging of fees to fund journal operations, and misrepresentation of operating locations (Kozak, Lefremova, & Hartly, 2015; Moher & Srivastava, 2015). These studies found that publishers were sending multiple e-mails from sometimes undisclosed locations and charging, in some instances, high APCs.

Given the continuing proliferation of predatory journals since studies by Grey et al. (2016), presumably based on e-mail solicitations received during or before 2013, and Kozak et al. (2015) analyzing e-mails from 2012 to 2013, we considered it essential to conduct a more contemporary linear analysis over a longer period of time. We used a combination of objective and subjective measures to determine the quality and impact of the e-mail solicitations. Moreover, to our knowledge no study has directly assessed the *relevance* of the solicitations from the perspective of the recipient, as opposed to the qualities of the e-mail solicitation or its sender, and how these e-mail solicitations, which so often relate to OA journals, may affect “consumer” views of OA publishing in general.

## METHODS

### Profile of E-mail Recipient

E-mail messages sent to the first author of this paper, a biology professor (hereafter “recipient”) inviting him to submit a manuscript to a journal and/or join an editorial board (hereafter “e-mail solicitations”) were preserved and analyzed according to criteria described in the Evaluation Criteria section below. Because only a single individual’s e-mails were analyzed, we report here characteristics of both the recipient and his institution, should these emerge as important for future studies.

The recipient in this study is a research-active full professor specializing in comparative animal physiology whose career has spanned 40 years. He has published more than 250 articles, book chapters, and books; has garnered an h-index (as calculated by Google Scholar) of 56; and has served as editor-in-chief and editorial board member for several biology journals published in print, online, or both. The recipient is a University Distinguished

Research Professor at his institution, an R1 university according to the Carnegie Classification. We state these characteristics to highlight, in part, that this analysis is based on an individual with a long-standing career.<sup>3</sup>

### **Collection of E-mail Solicitations**

All e-mail solicitations relating to journals sent to the recipient during the two-year period from January 1, 2015 to December 31, 2016 were identified and stored electronically. No preliminary assessment was made until after all e-mails were collected—i.e., none were deleted prior to the subsequent evaluation of the entire body of e-mails. An e-mail message was considered an e-mail solicitation if it came from a publisher clearly identified in the body of the e-mail and requested that the recipient submit an article manuscript to a specific journal and/or included an invitation to join an editorial board of a journal. Analysis according to the criteria below was carried out either on all collected e-mails or just on e-mails from 2015, as noted below for each criterion. Additionally, the months of December 2017 and January 2018 were analyzed for e-mail frequency only.

It is important to note that not all e-mails received were analyzed for all characteristics described below, as some e-mails had incomplete or ambiguous information for one or more of the characteristics analyzed.

### **Evaluation Criteria**

#### **Objective Criteria**

The number of e-mail solicitations received during the 24-month period of 2015 and 2016 and from December 2017 through January 2018 was determined and expressed on a monthly basis.

Receipt of duplicate and near-duplicate e-mail solicitations (hereafter “repeats”) and the frequency of repetition of sending of such messages were analyzed for the year 2015 only.

E-mail solicitations received during 2015 were evaluated for whether the journal mentioned was included in one or more of the Directory of Open Access Journals (DOAJ), *Index Medicus*, or MEDLINE, as searched through PubMed. Journal titles were verified in these databases even when the e-mail solicitation already claimed their inclusion. Important to note is that the DOAJ database underwent changes during the years 2015 and 2016 (the analysis period of the present

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<sup>3</sup> It would be fascinating in a future study to see if journal e-mail solicitations are disproportionately targeting senior faculty, or will begin to focus on more junior (and potentially more vulnerable) faculty.

study) in response to the Bohannon Sting (DOAJ, 2016, 2017). Exclusion was based on failure to reapply, using more stringent application criteria. Indeed, almost 40% of the nearly 10,000 journals in DOAJ were subsequently removed for failing to reapply for admission following the implementation of stricter criteria for membership. As a consequence, journals that may have been in DOAJ at the start of this study in January 2015 may have been absent at the end in December 2016.

Impact factor was not assessed, but whether an e-mail solicitation mentioned the impact factor of the journal was recorded.

E-mail solicitations received during 2015 were also analyzed to determine whether they indicated the cost to publish an article in the journal (the cost of the APC). E-mails were searched for the presence of at least one of the following terms: *processing fee*, *processing charge*, *publication fee*, *publication charge*, *discount*, and *waiver*. Overlapping terms in a single e-mail (e.g., both *processing fee* and *waiver*) were not accounted for.

Since all e-mail solicitations were for English-language journals, we felt that the journal staff should exhibit the ability to write and edit technically accurate English, but we also wanted to allow for the significant variation in English usage and expression around the world. This is consistent with another recent study, which suggests that readers of solicitation e-mails “determine whether the words in the e-mail are congruent with their dictionary definitions” (Lewinski & Oermann, 2018). Solicitations with serious “absolute” mistakes in English grammar or spelling (for example, clear misspellings, verb misconjugations, or other clear and unequivocal grammar errors) that could be objectively assessed were scored a low value of 1. Those with significant numbers (>3) of grammar/spelling mistakes but less disruptive mistakes earned a score of 2, while error-free e-mails were scored with a 3.

### Subjective Criteria

All e-mail solicitations received in 2015 were graded on a scale of 1 (low, poor) to 5 (high, excellent) in each of the following categories:

- *Relevance* – Is the subject matter relevant to the recipient’s area of research?
- *Opening Salutation* – Is the opening salutation accurate or inaccurate? Is it specific or general? Does the salutation reflect an accurate degree of familiarity with the recipient’s research? (Table 1)
- *Journal Age* was evaluated – Does the journal indicate that it is new, by using terms such as *new*, *initial*, or *inaugural* to describe upcoming issues, or by indication of a journal “launch”? A score of Yes/No was assigned.



Opening Salutation (Beginning “Dear...” or “Dr...”)	Score Assigned (5 highest)
Burggren	5
Warren Burggren Warren W. Burggren	4
Burggren, Warren Burggren, W Burggren Warren W	3
Dr. Warren Misspelled version – e.g. “Bergen” Extra initial – e.g. “W.W.W. Burggren”	2
Professor Colleague Researcher Mail sort Any other highly impersonal opening	1

**Table 1.** Scoring System for E-mail Solicitations Salutations to Warren W. Burggren

Note that additional subjective measures of the “professionalism” of the solicitation were initially considered in our analysis. For example, an overly obsequious approach (e.g., “Dear Esteemed Profesor” [*sic*]) or, at the other end of the spectrum, a highly familiar approach (e.g., “Hi! Hope you are having a good day!”) might be construed as unprofessional, especially in the context of scholarly communication today. Ultimately, however, it was felt that a scoring system free of our own cultural biases could not easily be developed, and a “professionalism score” (other than the aforementioned characteristics) was not pursued.

### Statistical Analyses

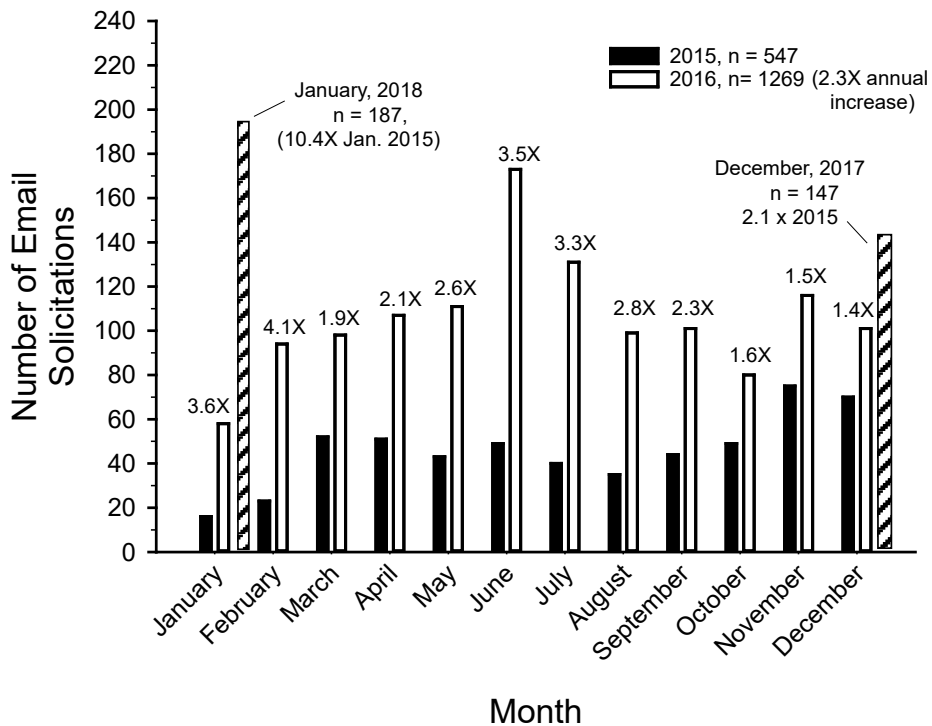
Comparison of the number of e-mail solicitations received in each of the two years, in each of the 12 months (see Objective Criteria below), was assessed with a two-way analysis of variance (two-way ANOVA) followed by a Holm-Sidak method to test month-by-month differences. A significance threshold of  $p < 0.05$  was used for all statistical analyses.

## RESULTS

### Objective Criteria

#### Total Number of E-mail Solicitations Received in 2015 and 2016

The recipient received a total of 1,816 e-mail solicitations in the 24-month period between January 1, 2015, and December 31, 2016—an average of 908 per year, 76 per month, or nearly four e-mails per business day. The total number of received e-mail solicitations (including repeats from the same journal—see below) was a significant ( $p < 0.001$ ) 2.3 times higher in 2016 (1,269 e-mails) than in 2015 (547 e-mails; Figure 1). However, there was considerable variability between comparable months in e-mails received in each of the two years. Consequently, there were no statistically discernable differences between months of the year for either year ( $p = 0.139$ ).

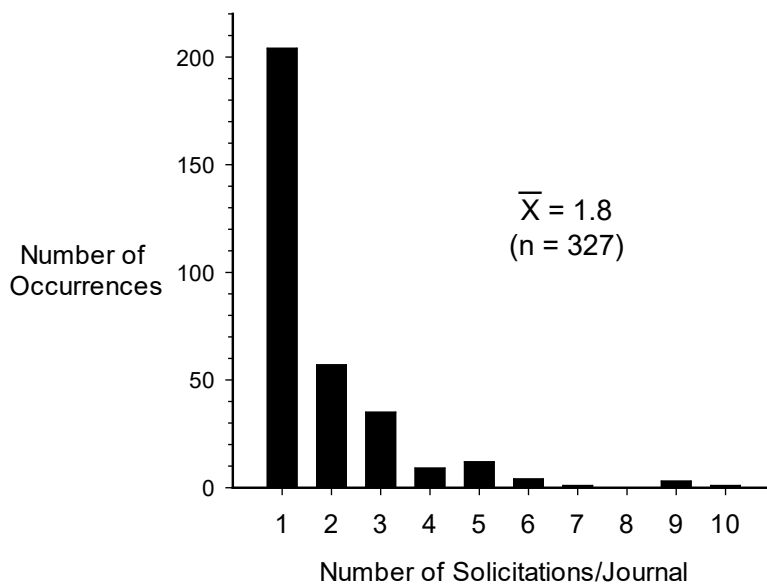


**Figure 1.** Email solicitations by month for the years 2015 and 2016, as well as for December 2017 and January 2018. The factorial increase from year 2015 to 2016 is indicated above the values for 2016 each month.

While revising the manuscript of this article following initial peer review, we were able to collect additional data for the months of December 2017 and January 2018. Confirming our suspicions based on anecdotal evidence of increasing solicitation frequency during the months of December 2017 and January 2018, the recipient was sent an astonishing 334 e-mail solicitations during these two months—an increase of nearly 400% compared with December 2015 and January 2016.

### Repeated (Duplicated) E-mail Solicitations

In the 2015 analysis period, 326 e-mail solicitations were analyzed for repeat solicitations. The average e-mail solicitation was sent from the same source a mean of 1.8 times ( $n = 326$ ). However, the large majority of publishers (>200) sent the recipient only a single e-mail solicitation (Figure 2). In total, 122 e-mails (about 37%) were repeats (with identical or very similar content to another message), and one publisher sent ten identical e-mails to the recipient in the 12-month analysis period. Typical of the repeated e-mails was a query from the sender as to whether the recipient had received and read the first e-mail solicitation, often conveyed with a sense of urgency accompanied by an upcoming deadline for journal article submission. In fact, one journal, perhaps seeking authors with annual productivity quotas, sent an e-mail on December 27 promising peer review and publication by December 31!

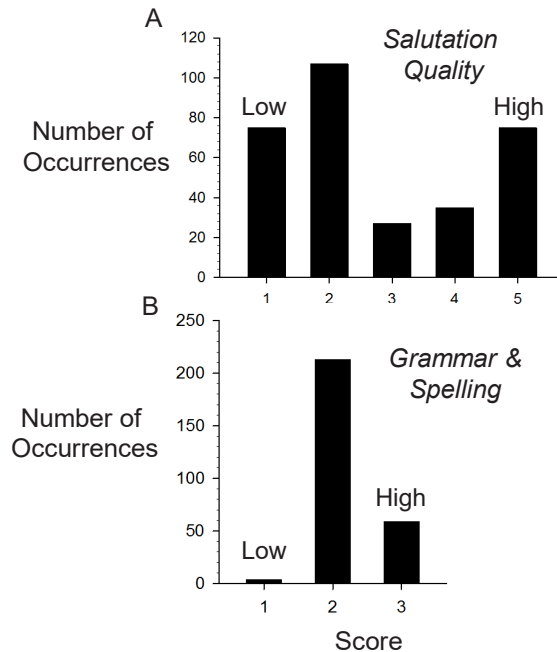


**Figure 2.** Frequency distribution showing number of solicitations received in 2015 per journal

## Journal Presence in Databases and Impact Factor

Of 274 soliciting journals analyzed in the 2015 analysis period, 86 (31.4%) and 84 (30.7%) were listed in DOAJ or MEDLINE as searched through PubMed, respectively. Noteworthy is that only two of 274 journals (0.7%) were listed in *Index Medicus*, a database that ceased publication in 2004 with its conversion to MEDLINE. Thus, the very low percentage for inclusion in *Index Medicus* (that is, pre-2004) is an indicator of how few of the soliciting journals had been established for more than a decade.

Given the inherent difficulty of determining bias-free indicators of journal quality, with numerous studies having investigated this (see above), no detailed assessment of the quality of the soliciting journal was made. Thus, we did not assess impact factor or other metrics for quality, but regarded as more important whether the e-mail solicitation even mentions having an impact factor. Of the 274 e-mail solicitations analyzed, a search of *Journal Citation Reports* indicated a calculated impact factor for only ten (3.6%) of the soliciting journals. We did not authenticate claimed impact factors in the e-mail solicitations.



**Figure 3.** Quality of salutation of e-mail solicitations received in 2015, based on (A) personalization and correctness of salutation and (B) English grammar/spelling

## Fees Charged

As explained in “Collection of E-mail Solicitations” (above), the study included all e-mail messages that came from a publisher clearly identified in the e-mail and were requesting submission by the recipient of a journal article to a specific journal and/or included an invitation to join an editorial board of a journal. While we assumed that all such messages relate to fee-charging journals rather than other types of journals, we found that for the 2015–2016 analysis period, a “processing fee” or “processing charge” was specifically mentioned in only 176 of 910 (19.3%) of the e-mail solicitations examined for this characteristic. A “publication fee” or “publication charge” was indicated in just 228 of 910 e-mail solicitations analyzed (23.1%). A “discount” was indicated in 59 of 910, or 5.5% of e-mail solicitations analyzed, and in this same group a “waiver” of some portion of the publication charges was indicated in 10.4% (75 of 910).

## Spelling and Grammar

Spelling and grammar was rated as adequate in only approximately 20% of e-mail solicitations. Spelling and grammar were inadequate (some mistakes – a score of 2) to poor (numerous mistakes – a score of 1) in 217 of 276 (almost 80%) of the e-mail solicitations from 2015 (Figure 3B).

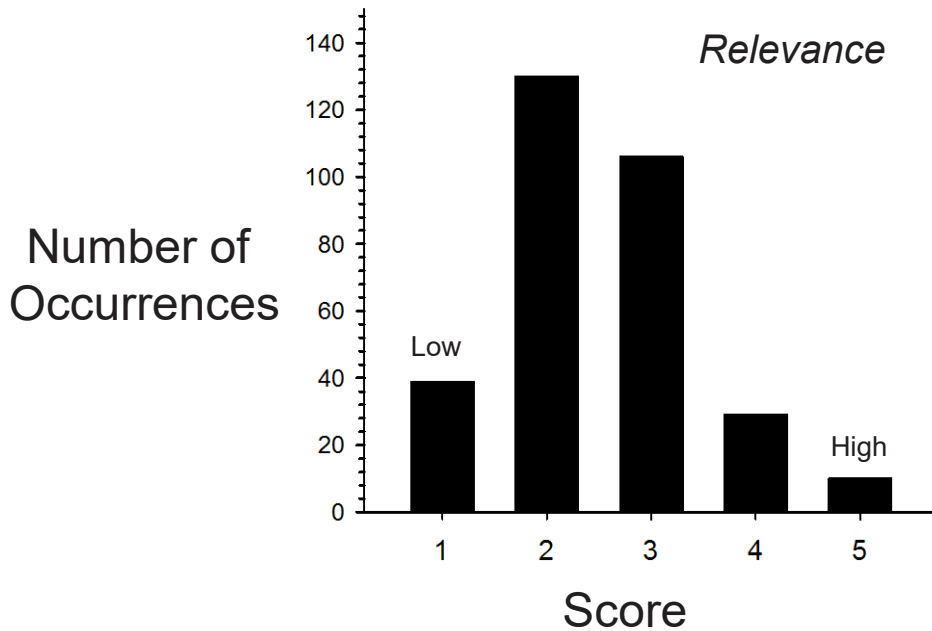
## Subjective Criteria

### Relevance of E-mail Solicitations

Relevance of the soliciting journal to the recipient’s area of expertise and prior publishing history is shown in Figure 4. Of key importance, only 3.2% (10 of 314) of analyzed e-mail solicitations from 2015 were scored as having the highest relevance to the recipient. On the other end of the spectrum, nearly 80% of the solicitations were scored as having minimal to no relevance to the recipient’s area of expertise—relating either to other specializations within the life sciences or to disciplines further afield, such as medicine or even engineering, urban planning, economics, or transportation.

### Journal Age: New vs. Established Journals

Of the 272 e-mail solicitations assessed in the 2015 analysis period, 43 (15.8%) used verbiage indicating that they were a new journal publishing or “launching” an “initial” or “inaugural” issue. Though not quantified in this study, an alternative approach used by many journals was wording and phrasing in the solicitation that suggested that the journal being promoted was an established, even venerable, journal.



**Figure 4.** Relevance of e-mail solicitations received in 2015 to the recipient's research interests and publishing history

### Quality of E-mail Solicitations

Two measures of the quality of the e-mail solicitations, and thus indirectly the perceived value of the e-mail by the recipient, were assessed: characteristics of the salutation and correctness of grammar and spelling (Figure 3A). Approximately two thirds (209 of 309, or 67%) of e-mail solicitations in the 2015 analysis period began with highly impersonal, inaccurate, or generic salutations, while only 24% included salutations directed specifically to the recipient. It is understandable that mass e-mails might not be personalized. Yet a large proportion (not determined) of the e-mails with an impersonal or even incorrect salutation came from senders who purportedly knew and even admired the recipient's work, who indicated that it was important and highly relevant to the field, and/or who otherwise indicated a personal knowledge of the recipient that was belied by the informality or lack of personalization of the salutation.

## DISCUSSION

### Limitations of the Study

While hundreds of e-mail solicitations were analyzed, it could be argued nonetheless that  $n = 1$  — that is, that the e-mails of only a single biology professor were analyzed, and that either this particular professor was nonrepresentative with respect to e-mail solicitations or that the field of biology is nonrepresentative with respect to e-mail solicitations overall. The former could only be refuted by having a statistically significant number of biology professors at the same career stage at similar universities each agree to such an analysis of e-mail solicitations that they receive, all in the same analysis period. The study by Grey et al. (2016) points out a similar concern about their study, which might be categorized as broad (including e-mails received by five researchers) but brief (covering only three months), as opposed to the current study that investigates e-mail solicitations sent to only a single researcher (narrow) but over a much longer period. Similar methodology was employed in the analyses of e-mails to small numbers of recipients (Kozak et al., 2015; Moher & Srivastava, 2015). However, we argue that studies covering brief data collection periods (weeks, a few months), even if involving numerous researchers, may be no more representative of e-mail solicitations than studies of solicitations received by an individual over a year or longer. For example, the current study has documented a threefold increase in e-mail solicitations over the course of 2016, suggesting that the best sampling would occur over a period of time longer than a few months.

By virtue of the recipient's lengthy career, with his e-mail address widely available online, it could be argued that this individual might attract a larger number of e-mail solicitations than, for example, an early-career scientist. While this would skew the number of e-mail solicitations, we view it as unlikely to affect their quality distribution in any systematic way, especially since so few of the e-mail solicitations demonstrated any real knowledge of the recipient or his research area, as Grey et al. (2016) have also reported.

While objective criteria (for example, the number of e-mail solicitations relating to the journal received during the period of study or the presence or absence of the journal in DOAJ) are straightforward to score, subjective criteria (for example, relevance to the recipient's field of study or the quality of salutation) are of course open to interpretation. The subjective experience of the recipient is one of the central concerns of this study. Among the questions we are asking are: would a recipient regard the e-mail solicitations as informative, and would the e-mail solicitations draw the recipient to the journal? As we noted at the outset, most research has focused on assessing the quality of journals, not upon how the recipient regards these e-mail solicitations.

A final note is that doubtlessly the results of this study would differ (albeit slightly, we believe) with a different choice of search terms. For example, we searched for terms such as *publication fee*, *processing charge*, etc. (see Objective Criteria in Methods), but did not search for *dollars*, *euros*, or the symbols for these currencies.

### Interpretation of Results and Comparison with Previous Studies

Numerous interesting trends, plus differences from the results of previous studies, emerge from our analysis. First and foremost, the sheer number of e-mail solicitations more than doubled from 2015 through 2016 and, at least for the months of December and January, increased about fourfold from January and December 2015 to December 2017 and January 2018, during which the recipient received an average of more than five e-mail solicitations per day. In terms of sheer numbers of e-mails, it is interesting to compare the yearly averages of 547 for the year 2015 (1.49/day) and 1269 for the year 2016 (3.47/day) from this study with previous work. Moher and Srivastava (2015) report analyzing 311 e-mail solicitations to publish in journals over a one-year period (0.85/day). It is not clear from their methodology whether this number of e-mails came to both authors or to just one, but in either case the numbers of e-mails to the recipient in the present study is considerably larger and, more importantly, grew over time. Similarly, the recipient in Kozak et al.'s (2015) study received 796 e-mails over 391 days, for a yearly average of 743 e-mail solicitations or 2.0 /day.

Our analysis indicates that the problem of e-mail solicitations from predatory journals has grown rapidly in recent years, as confirmed anecdotally by conversations with numerous recipients of e-mail solicitations in the life and basic sciences. It is unlikely that this increase in the present study was due to any reputational change of the e-mail recipient, whose h-index increased only modestly and whose research and publishing activity remained constant during this period of time.

The present study also reveals that there is no statistically significant monthly pattern or trend in e-mail solicitations (Figure 1), with any month as likely to produce solicitations as any other. This lack of pattern contrasts with the data from Moher and Srivastava (2015), who observe a monthly increase of solicitations during the period from April 2014 to March 2015. The pattern they report is more likely a function of a steady overall increase in solicitations during the mid-2010s, as borne out by our own finding of an overall 2.3-fold increase in solicitations since the 2015–2016 period.

As found in other studies, there are “repeat offenders” among e-mail solicitations received by the recipient, with similar or identical messages being repeatedly sent by the same pub-



lisher. We report that an e-mail solicitation is sent to the recipient an average of 1.8 times (Figure 2), compared to a higher average of 2.9 from Kozak et al.'s (2015) study.

Moreover, the degree of personalization of the e-mail is an indicator of purported personal knowledge of the recipient's research program. Kozak et al. (2015) reports that approximately 83% of e-mails had a nonpersonalized salutation. This compares with 60–70% of the salutations in the present study having nonpersonal or inaccurate solicitations.

Grammar and spelling errors in e-mail solicitations have been seen by others as criteria for assessing the quality and impact of e-mail solicitations sent by predatory online journals. Moher and Srivastava (2015) allude to spelling mistakes in e-mail solicitations but do not quantify them. Shamseer et al. (2017) do not report on spelling mistakes in e-mail solicitations but identify such mistakes in 66% of the websites of suspected predatory journals that they examined. Nguyen et al. (2018) actually used the Flesch Reading Ease and Flesch-Kincaid Grade Level assessments, and quantified the difficult readability understandability of the e-mail content. The present study reveals wide variation in usage of English. While there are cultural and regional sensitivities that should be set aside when assessing the accuracy of English spelling and grammar, we view absolute errors in spelling (e.g. “. . . publish your reseach [*sic*] article . . .”) or in verb conjugation (e.g. “. . . your article was be published . . .”) as objective criteria. In any event, what we define as “absolute” errors in English were replete in the e-mail solicitations, with only about 20% of solicitations having technically perfect English spelling and grammar.

Article processing charges were directly mentioned in only about 20% of the e-mail solicitations received. However, a recent study indicates that approximately one third of OA journals charge APCs (Morrison et al., 2017). These authors did not consider differences in discipline but rather provided an overall assessment of all fields in large journal databases, finding APCs averaging \$2,000 USD or more. Such fees are highly prevalent in the life and basic sciences, medicine, and engineering, where one study indicates that approximately 80% of all APCs paid to roughly 4,500 journals were for journals in these fields (Solomon & Bjork, 2016).

The low number of journals sending out solicitation e-mails that were actually included in the MEDLINE database, which has relatively “loose” criteria for inclusion, speaks to the low quality of many of the predatory journals we analyzed.

Finally, a unique contribution of the present study is not just a quantitative analysis of the numbers and patterns of e-mail solicitations but also an analysis of the *relevance* of the e-mails (a lack of which is perhaps the defining feature of spam). Relevance is, of course,

a subjective measure, but it is important because it has implications to online publishing beyond issues of quality. Perhaps most startling, given the sheer number of e-mail solicitations received, is how very few of them (~3%) were deemed “highly relevant” to the disciplinary specialization of the e-mail recipient. The large majority of invitations to publish were from journals whose content bore little or no relevance to the recipient’s area of research.<sup>4</sup>

## Methodological Considerations for Future Studies

Several observations emerge from this and previous studies focusing on e-mail solicitations that are pertinent to methodology for future studies. First, the number of e-mail solicitations going to any single recipient is likely to vary as a result of several factors, including academic discipline, degree of interdisciplinarity of the researcher, and the “academic footprint” of the researcher. Different publishers targeting different disciplines might use slightly varying practices for attracting authors (for example, the use of repeat e-mails). Thus, from a methodological point of view, comparing absolute numbers of solicitations is less productive than comparing trends occurring within a data set.

Second, while several studies have taken the “single-recipient” approach (including the present study), we advocate movement toward analysis of groups of e-mail recipients from very similar subdisciplines (e.g., physiology within biology, or organic chemistry within chemistry). This would allow investigators to identify specific trends both within and between disciplines.

Third, assessment should also focus on how publishers of predatory journals acquire the e-mail addresses they use. By understanding this, it may be possible to better protect sensitive e-mail information, or at least make it too laborious and expensive to, for example, individually harvest names from university websites. However, this approach may be futile since Google Scholar is increasingly a source for e-mail addresses (Petrişor, 2016). Finally, future studies on the topic of APCs should delve deeper into discipline-specific patterns because, at least in the field of basic plant and animal biology, the senior author’s experience—corroborated in part by Solomon and Bjork (2016)—is that even the most respected of legacy journals publishing OA articles routinely charge substantial publication fees.

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<sup>4</sup> The recipient received only a handful of requests to review submissions to any of the journals from which he received e-mail solicitations. Since he is a senior researcher who is otherwise often approached to conduct peer review for legitimate journals, this alone raises questions about the quality of the peer review conducted for these predatory journals.

## Unintended Consequences of the Increasing Number of E-mail Solicitations

The recipient reported two major consequences to receiving frequent e-mail solicitations. First, he rapidly developed a tendency to delete suspected e-mail solicitations before even opening them (or, for the purposes of this study, sending them to a separate file for storage during the period of study). The consequence of this is that legitimate publishing (or editorial board membership opportunities) were overlooked.

A second consequence is that e-mails sent by the one of this study's authors to potential colleagues inviting them to participate in publishing projects (for example, to write a chapter for a book or to collaborate on projects) are much more frequently ignored than in the past. When ultimately contacted by telephone, the potential collaborators in these legitimate publishing opportunities commented, "Oh, I thought it was just spam" or "Oh, I guess I must have deleted it without even looking at it since I get so many e-mail invitations from predatory journals these days."

Another serious consequence is that the recipient, even while enthusiastically interacting with university library staff promoting the advantages of open access journals, and while serving on an advisory board on open access for his university's provost, has had to overcome a personal bias against OA journals resulting from the daily deluge of annoying spam from predatory publishers. The recipient admits his double standard because several legacy journals in which he has published have transitioned in part or in whole to an OA business model in which authors are charged a fee to publish. We mention these attitudes, admittedly of an established researcher, because we feel that they are illustrative of what even informed senior faculty members may be thinking, regardless of their field of research. As a way of helping to overcome these (mis)perceptions, some authors writing on the characteristics of predatory journals have wisely counseled that newer, online-only journals should not be automatically be considered to be predatory (Hansoti et al., 2016; Singer, 2017). It is also advised that researchers understand that rigorous peer review can still be conducted under an author-pays model, and that there are evolving financial aid and waiver mechanisms meant to ensure equitable access for authors.

## The Burden of Journal Assessment Is Shifting to the Reader

Prior to the onslaught of predatory journals, most journal readers had a certain assumption about a published article: that the study was reasonably performed, the results were carefully analyzed, and the conclusions were sound. Put differently, the reader assumed (correctly or incorrectly, given recent criticisms of the peer review system) that the research was sound and could focus instead on what the article actually meant. However, major alterations in

the publishing landscape have occurred in the past decade or so, with implications for the readership. First, it is easier than ever to create a journal website and send e-mail solicitations to compiled lists of e-mail addresses of researchers from all over the world. Second, search engines and databases now cast an extraordinarily broad net. For example, PubMed currently includes well in excess of 28 million journal articles. As back issues of journals are increasingly made available online, the total amount of information at a searcher's fingertips is staggering. We believe that researchers today attempting to monitor the literature in their research area are less inclined to monitor the tables of contents (in print or online) of key journals and are more inclined to search databases as needed or receive automatic notifications of articles on a certain topic in databases. This loss of primacy for journal titles or "decontextualization" of the journal is likely even more evident in today's early-career researchers, who likely have never personally subscribed to a journal or received mail-delivered paper copies of journals. Consequently, early-career researchers are less likely to know the reputation of particular journals in their field and therefore might be more vulnerable to e-mail solicitations from low-quality journals (see also Nicholas et al., 2015).

Furthermore, the authors of this study find, anecdotally, that university students even at the graduate level are not very familiar with advanced database search techniques, such as the use of Boolean operators. Moreover, they are more likely than past generations of students to cite articles having only read the abstract. While this may reflect a lack of motivation to hunt down the original source, it may also be a consequence of the cost of and time of gaining access to that body of scholarship that is not available through OA.<sup>5</sup>

Essentially, the burden of quality assessment of the available literature no longer rests primarily with journal editorial staff and peer reviewers. Instead, the individual scholar sitting in front of their computer, who has access to a journal articles covering the full spectrum of quality, now must show even more skepticism in the articles they read, compared to an earlier age when they could reasonably trust most anything found in their academic library's collection. We share the concerns of Nicholas et al. (2015) about the level of development of that skepticism in trainees and early-career researchers, possibly leaving them more susceptible to e-mail solicitations from predatory journals than more senior colleagues.

## Recommendations from Lessons Learned

The current study, combined with others that have examined the burgeoning problem of

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<sup>5</sup> Sci-Hub is, of course, lowering the cost and inconvenience barriers to accessing non-OA literature, with its massive collection (~70 million academic articles) available for instant download. At this same time, access to this resource has not been without interruption as the Sci-Hub team responds to legal challenges and criticism (see <https://en.wikipedia.org/wiki/Sci-Hub>).

predatory online journals, provides the opportunity to offer several concrete recommendations.

### Specific Recommendations to University Librarians and Administrators

While many academic librarians are relatively well informed about the general issue of predatory publishing, data provided by this and other related studies puts academic librarians in a better position than ever to make the case for inserting discussion of predatory publishing practices into orientation events for beginning faculty and graduate students. Such events should include frank panel discussions involving librarians and faculty members regarding publishing in OA journals, joining their editorial boards, and contributing to conferences in response to e-mail solicitations. While orientation sessions are already packed with presentations covering all aspects of university life, we feel that it is critical to provide time for this issue. After all, most universities expect demonstration of scholarship from their faculty. They provide faculty with laboratories, studios, libraries, and other tools to help them succeed. So why wouldn't they want to prevent their faculty from falling victim to predatory publishing practices? Such panel discussions also provide an opportunity for the librarians to inform researchers about other services and areas of expertise of academic libraries today—reminding these researchers that librarians do more than maintain a building with study space but can also help researchers select appropriate venues in which to publish. In fact, given that orientation sessions are already so full of important information, a more robust approach would be to integrate discussion of scholarly publishing into the curriculum of graduate programs, such as by having librarians visit methods courses to speak about predatory publishing.

### Specific Recommendations to Faculty and Staff Mentors

In many ways, faculty and staff mentors who advise on “getting published” are the first line of defense against the naïveté of early-career researchers. Many of these potential mentors are, themselves, bombarded by journal e-mail solicitations and have for better or worse formed a biased opinion regarding OA publishing and then share this opinion with their mentees. To provide a balanced perspective, mentors should familiarize themselves with the latest developments in OA publishing and prevalent marketing practices so that they can provide sound advice to their mentees who are considering such outlets for their research. An understanding of how and why junior faculty choose the journals they do would be advisable as well (see Nicholas et al., 2015 for an entry into that literature). This advice extends to evaluation committees for merit, promotion, and tenure: if such committees are to avoid problematic metrics and instead actually evaluate the quality of work, then an understanding of criteria for inclusion in journal indexes and the varying marketing practices of journals will be crucial.

## Specific Recommendations for Journal Publishers, Editors, and Editorial Boards

Those involved with legitimate journals should make themselves well aware of the specific marketing practices of predatory journals. Rather than simply ignoring the competition as not worthy of their attention, legitimate publishers should realize the implications that these predatory practices have on how their own marketing communications and how they may be perceived. Any invitations to publish in legitimate journals should be clear and straightforward in addressing the recipient, where the journal is indexed, how its authenticity has been established (including but not limited to impact factor and inclusion in DOAJ), and what fees (if any) are charged for publishing. Additionally, they should avoid any sense of time urgency for submission, which is a hallmark of aggressive marketing (“Be among the first 25 callers . . .”) and rarely if ever used by legitimate publishers. Indication of a deadline for submission to an issue is certainly appropriate, but it should allow sufficient time to recognize the thought and effort put into papers by the typical author (particularly if data is to be collected).

## CONCLUSION

OA publishing is transforming the publishing industry in many predictable and some unpredictable ways. Emerging from the shift to OA is the predatory journal’s aggressive marketing strategies based primarily on e-mail solicitations promising high-quality, fast review, and broad distribution. A qualitative and quantitative analysis of journal e-mail solicitations suggests that even a “personal touch” and accompanying flattery regarding the recipient’s achievements and reputation in e-mail solicitations rarely reflect an understanding of the recipient’s research area. Instead, e-mail solicitations appear to be broadcast to long lists of researchers, leading to a biologist, for example, being asked to serve on the editorial board of journals whose subject matter includes everything from urban planning to materials science to gynecology. Indeed, the willingness of predatory journals to build their “editorial boards” has been recently exposed (Sorokowski et al., 2017). Further evidence of bulk e-mailing is revealed in messages with clumsy or blank salutations (Table 1).

Online publishing and OA are noble goals, and we should continue to direct our efforts toward the wide dissemination of information. At the same time, however, we need to create specific opportunities for early-career researchers—and even their more senior colleagues—to be properly skeptical, not cynical, in critically assessing and analyzing opportunities to publish.

We join with Grey et al. (2016) in suggesting that additional research in this field be conducted with larger sample sizes over longer periods. Such studies should involve a variety

of types of institutions and involve both qualitative and quantitative research. Additionally, perceptions of practicing academics should be assessed broadly in the field to allow us to move from anecdote to data with respect to the impact of predatory journals on the publishing field as a whole, as well as on individual researchers.

Finally, we call for additional qualitative and quantitative research specifically on predatory publishing. Particularly lacking at the present time is an assessment of quality that goes beyond the contentious metric of journal impact factor and truly explores the value to the author of publishing their work in a particular journal.

## AUTHOR NOTE

We thank the anonymous reviewers of this manuscript for their references to additional relevant literature, and we thank the reviewers and our colleague John Edward Martin for useful suggestions for clarifying our writing.

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