Abstract

Introduction: We approach the problem of “predatory” journals and publishers from the perspective of small scientific communities and small journals that may sometimes be perceived as “predatory”. Among other characteristics of “predatory” journals two most relevant are their business model and the quality of the editorial work.

Materials and methods: We analysed 444 Croatian open access (OA) journals in the Hrčak (portal of Croatian scientific journals) digital journal repository for the presence of article processing charges as a business model and the transparency of editorial policies.

Results: The majority of journals do not charge authors or require submission or article processing charges, which clearly distinguishes them from “predatory” journals. Almost all Hrčak OA journals have publicly available information on editorial boards, including full names and affiliations, and detailed contact information for the editorial office at the Hrčak website. The journal names are unique and cannot be easily confused with another journal or intend to mislead about the journal’s origin. While most journals provide information on peer review process, many do not provide guidelines for reviewers or other editorial and publication ethics standards.

Conclusion: In order to clearly differentiate themselves from predatory journals, it is not enough for journals from small research communities to operate on non-commercial bases, but also to have transparent editorial policies.

Key words: predatory journals; open access; small scientific communities

Introduction

Importance of transparency

Almost USD 2 trillion is globally invested in research and development (R&D), according to the 2016 Global R&D Funding Forecast (1). The scientific community published over 50 million peer-reviewed articles since the appearance of the first scholarly journals in 1665 (2). In 2014, there were 28,100 active scholarly journals in English and 6450 in other languages, collectively publishing about 2.5 million articles a year (3). A significant portion of the research is funded by the public (i.e., taxpayers’ money), but five commercial companies have published more than half of the publications since 2006: Reed-Elsevier, Springer, Taylor & Francis, Wiley-Blackwell, and Sage (4). This means that a large portion of scientific knowledge produced primarily through public funding has been kept behind paywalls of commercial companies.

Maybe more worrying is the fact that 70% research results are irreproducible, mostly due to selective reporting, pressure to publish, low statistical power and poor analysis, insufficient replication by the original research group, inadequate oversight/mentoring, poor experimental design, poorly described methods, unavailability of codes or raw...
data, as well as fraud and poor peer review (5). Peer review, as the backbone of the scholarly publishing system, has been criticized for slowing down publication process, as well as for having different kinds of biases, unreliability, competing interests of peer reviewers, inability to detect errors and fraud, etc. (6).

Transparent research and publishing as a solution to many of those problems is strongly advocated by the open access (OA) and open science (OS), where the research process is facilitated by ensuring access to research results, thus enabling the community to build upon them and participate in scholarly communication (7). In their early phase, free and unrestricted access to the publications, mainly journal articles, was in the focus of the OA initiatives, and arguments for improved visibility, discoverability and citation advantage were broadly accepted (8). Today, open access initiatives have grown into an open science movement that calls for the openness of the entire research process, including the availability of research data and transparency of the peer review process (9).

Strong impact of the OA movement, logic behind its arguments and its clear benefits led to the transition of subscription journals towards OA and the appearance of many new OA journals. The number of open access articles since 2000 has grown at a rate of 30% per year (10). To cover their publishing costs and to keep their high profit margins, major publisher introduced the article processing charge (APC) business model, but kept the subscriptions model that was a secure way of income for decades – the so-called hybrid OA model (11). Beside APC-based journals (full OA or hybrid ones) scholarly publishing also includes OA journals without publishing fees and subscription journals, which make their digital version freely available after some period of time. A negative consequence of the rapid growth of scholarly open access publishing funded by APCs, supported by high annual revenues generated by publishing industry (12), has been the emergence of publishers and journals with questionable marketing and peer review practices (13).

“Predatory” journals

The term “predatory” was introduced by Jeffrey Beall, librarian at the Auraria Library of the University of Colorado in Denver, who created a list of journals and publishers engaged in unprofessional or unethical practices (14). Although unethical practices have always been present, even in the print era of scholarly publishing, they have been intensified by technological advances, as the ease of starting an online journal, combined with the APC business model, allows some publishers or organizations to take advantage of researchers who are eager to publish (15).

When an author chooses a journal for the manuscript submission, there are many factors influencing this decision, like journal’s target audience, journal reputation and potential article impact, reliable peer-review process, timeliness of publishing in the case of manuscript acceptance, accessibility and visibility of the journal, and retention copyright or self-archiving rights. An important factor is also the likelihood of manuscript acceptance, which is heavily exploited by publishers using the APC business model, where publishers’ revenues directly correlate with the number of published articles.

“Predatory” publishers are defined as “unscrupulous publishers who set up bogus publishing operations and trick authors into thinking that they are legitimate scholarly publishing outlets” (16). There are different sets of criteria helping in identifying “predatory” publishers, most of them also present on the Beall’s list of criteria (17):

- Editorial bodies – editorial board is either missing or is very small, or is “coming soon”; editors are not named; and named editors do not have affiliations;
- Contact – missing or fraudulent contact information (e-mail, postal address, phone number);
- Fees – costs associated with publishing are hidden or unclear;
- Journal name and scope – the journal name doesn’t reflect the scope; journal name often imitates name of a prestigious, well-known journal; journal title contain the national or in-
ternational affiliation that does not match information on publisher’s location; journal scope is too broad;

- Indexing and metrics – false information on indexing, false metrics;
- Peer review – missing information on the peer review process, sometimes without peer review;
- Spam e-mails – journal sends e-mails requesting submissions or inviting researchers to be members of the editorial board.

To help authors identifying unethical “predatory” journals, various blacklists and whitelists have been created. The most popular blacklist of allegedly “predatory” publishers and journals, maintained by Jeffrey Beall at http://scholarlyoa.org, was closed recently (18). The Directory of Open Access Journals (DOAJ) has developed its own set of criteria, guaranteeing the inclusion of “high quality, open access, peer-reviewed journals” (19). The DOAJ inclusion requirement is that journals have editor(s) or an editorial board, quality control (peer review) and author guidelines, clearly displayed charges, and open access statement including copyright, licensing and publishing rights.

Challenges for OA journals in small scientific communities

During their 352-year long history, scholarly journals were mostly published by the scientific societies and universities, and only after World War II the number of journals increased significantly, with commercial publishers taking over a larger share (20). In the present global setting, where more than half of the published articles are published by a few big commercial publishing houses and where more and more OA journals are published by different companies focusing on profit, local journals from small scientific communities (21,22) are somehow left out of focus, even in the OA community.

Journals in Croatia share their most common problems with other “local” or “regional” journals coming from small countries, or “scientific periphery”: low visibility and readability, difficulties with distribution, insufficient finances, poor infrastructure and low citation impact (22). Those were the main reasons for establishing the national repository of OA journals Hrčak in 2006, which currently has more than 400 Croatian scholarly, professional and popular OA journals (23,24). Hrčak was initially designed as a common platform for the Croatian online journals and open access was not mandatory, only recommended. During its development the benefits of the open access become more visible and embraced by many journals. Nowadays, open access in Hrčak is mandatory and described in Hrčak’s Ethics Code, and only journals with a full access to the published content can be included.

To be eligible for the inclusion in the Hrčak repository, a journal needs to have an owner or publisher with a headquarter in the Republic of Croatia. Hrčak can accept also the journals issued by the Croatian diaspora or published in Croatian. The evaluation process for every title is taken by the Hrčak Advisory board according the data provided during application:

- information about journal (title, ISSN, publishing frequency, first year of the publication, journal scope, assigned disciplines)
- information on journal publisher
- information on peer-review
- type of published papers
- information on APC
- additional documents (masthead, instructions for authors, last published issue or URL address of the content)
- already published content.

Only the journals with all mandatory data in the application form are considered for the inclusion. Additional criteria include institutional diversity of the editorial board, published papers classified, transparent dates of submission and acceptance, author’s affiliation, abstract, key words and literature. Published articles for all journals need to have authors’ affiliation, abstract, keywords and literature. The journals must also comply with the Hrčak Ethics Code, providing open access to all published content.

There is also a set of recommended criteria like compliance with the international publishing standards, ethics policies, declared rights and li-
censing issues, geographical diversity of the editorial board, instructions for peer reviewers, etc.

In view of the growing problem of “predatory journals”, the Open Access Scholarly Publishing Association (OASPA) recommended that “the publishing community needs stronger mechanisms to help identify reliable and rigorous journals and publishers, regardless of access or business model” (26). To assess how Croatian open access journal satisfy this recommendation, we performed an analysis of the use of the APC business model and the level of transparency of editorial policies in journal available in the Hrčak repository.

Methods

To investigate the transparency of editorial policies in Croatian open access journals we first identified 444 journals on the Croatian Repository of Open Access journals Hrčak (http://hrcak.srce.hr).

To differentiate Hrčak journals according their regularity of publication and compliancy with the Ethical codex, every journal has a status: active, non-active, new journal, stopped publishing a journal, and suspended, which helps Hrčak not to represent the journals without accurate and current content. Active, non-active and journals which stopped publishing are publicly visible, and new and suspended journals are visible only to Hrčak administrators.

We collected the data on the journal title, Hrčak status of the journal, p-ISSN, e-ISSN, Hrčak URL address, discipline, government subsidize, peer review, contact information, masthead and APC. Data were verified by one of the authors (JS). We also assessed the presence of guidelines for authors and peer reviewers in the public domain, which contribute to the transparency of the editorial policies. The data on government financial support were taken from the Ministry of Science and Education web site (http://public.mzos.hr/Default.aspx?art=15180&sec=3804) and all other data were collected from the Hrčak repository. The data on APC was collected from publishers’ websites.

Among OASPA principles, peer review process is described as the most important aspect of a reliable journal, and OASPA requires that “all of a journal’s content, apart from any editorial material that is clearly marked as such, shall be subjected to peer review” (26). OASPA also defines peer review process as a tool for obtaining advice on individual manuscripts from disciplinary experts who are not a part of the journal’s editorial staff (26). We collected detailed information on the peer review level (editorial, external), location (national, international), type (single blind, double blind, open), type of papers undergoing peer review process (original scientific articles, original scientific and professional articles, all published papers), and number of peer reviewers (one, two, three or more).

The data was collected from 20 March to 25 March 2017, and updated on 10 May 2017.

Results

At the time of data collection, out of total 444 indexed journals 340 journals had active status, 79 journals non-active status, 3 journals had a new journal status, 19 journals stopped publishing, and 3 journals were suspended.

In 2016, 158 scholarly and 17 popular journals received financial support by the Croatian Ministry of Science and Education. Among those, only 2 scholarly and 9 popular journals were not included in the Hrčak repository. The total amount invested in all 175 journals was 1.38 million euros, which was about 64% of the requested amounts from the journals during the application process.

All 444 Hrčak OA journals stated the information on their publishers. Out of those, 402 had detailed editorial’s contact information (postal address and phone) and 395 editorial’s e-mail address. The latter refers to the structured information on the journal page in Hrčak. However, if we also count the information from the journal’s masthead, stored usually as a PDF file in Hrčak, which contains information on the editorial board, advisory board and other journal bodies, together with board members’ names, titles and affiliations, 315 Hrčak journals had this information available in Croatian or English, usually both. Journal mast-
heads included some or all of the following items: journal title, URL address, ISSN print, ISSN online, scientific field classification (UDK), indexing databases, publisher, editor-in-chief, with full address and e-mail, editorial board members with affiliations, secretary of the editorial board, statistical consultant, scientometric consultant, web editor, web administrator, Croatian/English language editor or proof reader, CrossRef assistant, administrative secretary, cover design, technical editor, printing company (for the printed edition of the journal), aim and scope, frequency, print subscription fees, rights and licenses, and financial support.

Authors’ guidelines in Croatian and/or English were available for 88.5% of Hrčak journals. Only 30.2% had instructions for reviewers (Table 1).

Table 1 presents data on the peer review policies in Hrčak journals. As many as 45% of Hrčak journals did not provide information on peer review or had “without peer review” mark in Hrčak (Table 1). Other 242 journals had such a statement, with most of them claiming to have external peer reviewers; and 15 journals employed editorial peer review. Considering journals employing external peer review, peer reviewers came from Croatia for about half of them and the others used reviewers only from outside of Croatia or a combination of domestic and international peer review. The majority of Hrčak OA journals stated that they required two peer reviewers per submitted manuscript. Regarding the type of manuscripts sent out for peer review, about a third stated that they sent all submissions to peer reviewers. Most Hrčak journals stated that they used double blind peer review.

We identified 10 Hrčak journals charging submission or article processing charges. Five journals were published by InTech, who had been listed among other “predatory” publishers at Beall’s list until 2015, and was bought recently by Sage. Three journals were formally published by De Gruyter, although the editorial office is still located in Croatia. One journal did not actually ask for formal APCs, but asked “for donations”, and the amount stated was €200 per article. One journal had APC charges, in the amount of €100.

### Table 1. Declared characteristics of the peer review process in 444 Croatian open access journal in the Hrčak repository

| Characteristic                                      | Journals, N (%) |
|-----------------------------------------------------|-----------------|
| Guidelines for peer reviewers (N = 444)             | 134 (30.2)      |
| Have statement on peer review policy (N = 444)      | 242 (54.5)      |
| Number of peer reviewers per submission (N = 242):  |                 |
| One                                                 | 16 (6.6)        |
| Two                                                 | 214 (88.4)      |
| Three or more                                       | 12 (5.0)        |
| Submissions sent out for peer review (N = 242)      |                 |
| Original articles only                              | 73 (30.2)       |
| Original and professional articles                  | 92 (38.0)       |
| All articles                                        | 77 (31.8)       |
| External peer review (N = 242)                      | 227 (93.8)      |
| Source of external reviewers (N = 227):             |                 |
| National                                            | 121 (53.3)      |
| International                                       | 40 (17.6)       |
| National and international                          | 66 (29.1)       |
| Type of peer review (N = 242):                      |                 |
| Double-blind                                        | 166 (68.6)      |
| Single-blind                                        | 70 (28.9)       |
| Open                                                | 6 (2.5)         |

**Discussion**

Our analysis of Croatian OA journals showed that the majority of them did not charge authors or require submission or article processing charges. This clearly distinguishes them from “predatory” journals. However, the transparency of publishing and editorial policies is not always clear.

Our study showed that there were only 340 Hrčak journals with an active status and with regular publication frequency. This indicates problems with regular publishing, which is mostly related to insufficient support for scholarly journals without stable sources of income as only 60% of the stated financial needs were covered by the public funds. Editors of Croatian journals are usually not professionals, but researchers and teaching staff from the universities, who typically volunteer their time and expertise for the benefit of the research community. It is important to mention that the ad-
advancement criteria in Croatian academic and research community are mostly based on the number of papers, favouring prestigious journals with high journal metrics indicators in general (27). The advancement criteria have a strong influence on the researchers’ publishing habits, and consequently on Croatian journals. The motivation of Croatian authors to publish in Croatian journals in the fields of science, biomedicine and technical sciences is therefore weak. The situation is different in social sciences and humanities, but recent changes in the advancement criteria are diminishing the importance of Croatian journals even more. On the other hand, editorial work is recognized as just one among less relevant advancement criteria, and there is lack of motivation in many editorial boards.

Related to the transparency of the editorial work, almost all Hrčak OA journals have publicly available information on editorial boards, including full names and affiliations, and detailed contact information for the editorial office at the Hrčak website. The journal names in Croatian and English are indeed unique and cannot be easily confused with another journal or intend to mislead about the journal’s origin. Also, the majority of Hrčak journals have instructions for authors. According the 2014 study of author guidelines of the Croatian OA journals (28), the majority of these guidelines addressed authors’ responsibilities, requiring authors to submit manuscripts with original content not being published elsewhere, but they very rarely addressed publication integrity and other ethical standards. These findings are similar to journals not only in Croatia but in most Central and Eastern European countries (29).

On the other side, the transparency of the peer review process was not high. Almost half of the Hrčak journals did not provide information on peer review or were marked in Hrčak as “without peer review”. One of the reasons for such a high proportion of missing information on peer review is that Hrčak introduced the data on peer review at a journal level only in 2016, and journals may need more time to update this information. The majority of the journals with the information on peer review publicly available used external peer review, but over a half of them used exclusively reviewers from Croatia.

Our study confirmed that Croatian journals follow general standards of 2-4 reviews per manuscript (30). Most of the Hrčak OA journals also use double blind peer review. Six journals claimed to use “open peer review” but it is not clear whether this is true open or single-blind review. We expected that the availability of guidelines for peer reviewers would improve since the 2015 study (31), but Croatian journals do not seem to be paying sufficient attention to the importance of the guidelines for peer reviewers.

Wedge between hybrid journals from well-established publishers, APC-based OA journals from commercial publishers and “predatory” publishers, small journals have many problems with journal promotion (25), finding ways to convince the scientific community of the quality of their editorial work and establishing their position in the publishing environment where “gold OA journal” has become a synonym for an OA journal with the APC model. Even if they are not charging authors, which keeps them out of the potentially “predatory” circle, they need to pay a lot of attention to keep high-quality editorial standards so that they can attract good authors but also clearly demonstrate that their journal does not have other characteristics of a “predatory” journal.

Research assessment criteria based on strictly numerical indicators leaves room for publications from “predatory” journals, as assessment criteria do not define or recognize potentially “predatory” journals or define a reliable scientific journal. The environment where advancement criteria are based on outside appearance and not on the quality of content, often push authors towards the journals with questionable editorial policies, publishing also low-quality research for the adequate fee.

The world of scholarly publishing is not black and white. We cannot rely any more on lists of “predatory” journals and publishers made on a judgment of a single person, even when these are made with the best of intentions. All stakeholders, and particularly those in small scientific communities, should
take responsibility for integrity and transparency of the publication process to avoid its misuse. Authors should take on the burden to check carefully the journal intended for submission of their manuscript, focusing on journal characteristics reflecting best open access publishing practices. The editors should embrace full transparency of their editorial structures and policies – this will demonstrate the rigour and quality of their journal and thus clearly differentiate it from the “predatory” journals. Indexing databases and journal repositories, such as DOAJ, should have publicly available, clear criteria which will not permit registration of journals misusing OA publishing solely for financial gains. Finally, the research and academic community should revise criteria for research assessment so that they recognize and honour high-quality authentic OA journals vs. “predatory” journals.

**Acknowledgment**

We thank Draženko Celjak (University Computing Centre, University of Zagreb) for the provision of the data on peer review from Hrčak, the members of the Hrčak Technical team and Hrčak Advisory Board for all their efforts in the improvements of the Hrčak platform and Croatian OA journals, and to four anonymous reviewers for their helpful comments. This study was supported by the COST Transdomain Action TD1306 New Frontiers of Peer Review (PEERE).

**Potential conflict of interest**

J. Stojanovski in on the Advisory Board of Hrčak.

**References**

1. Industrial Research Institute. 2016 Global R&D funding forecast. A Supplement to R&D Magazine. Available at: https://www.iriweb.org/sites/default/files/2016GlobalR%26DFundingForecast_2.pdf. Accessed April 7th 2017.

2. Jinha AE. Article 50 million: an estimate of the number of scholarly articles in existence. Learned Publishing 2010;23:258–263. https://doi.org/10.1087/20100308

3. Ware M, Mabe M. The STM report. The STM Report: An overview of scientific and scholarly journal publishing Celebrating the 350th anniversary of journal publishing. 2015. Available at: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1008&context=scholcom. Accessed April 7th 2017.

4. Larivière V, Haustein S, Mongeon P, Price D de S, Haustein S, Tenopir C, et al. The oligopoly of academic publishers in the digital era. Plos One 2015;10:e0127502. https://doi.org/10.1371/journal.pone.0127502

5. Baker M. Is there reproducibility crisis? Nature 2016;533:452-4. https://doi.org/10.1038/533452a

6. Walker R, Rocha da Silva P. Emerging trends in peer review - a survey. Frontiers in Neuroscience 2015;9:1-18. https://doi.org/10.3389/fnins.2015.00169

7. Tennant JP, Waldner F, Jacques DC, Masuzzo P, Collister LB, Hartgerink CHJ. The academic, economic and societal impacts of Open Access: an evidence-based review. F1000Research 2016;5:632. https://doi.org/10.12688/f1000research.8460.3

8. Harnad S, Brody T. Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals. D-Lib Magazine 2004;10. Available at: http://www.dlib.org/dlib/june04/harnad/06harnad.html. Accessed April 7th 2017.

9. EU project. Facilitate Open Science training for European research – Open Access, Open Science Open Data, Research Data Management. Available at: https://www.fosteropenscience.eu/. Accessed April 7th 2017.

10. Björk B-C, Solomon D. Open access versus subscription journals: a comparison of scientific impact. BMC Medicine 2013;10:73. https://doi.org/10.1186/1741-7015-10-73

11. Björk B. The hybrid model for open access publication of scholarly articles – a failed experiment? J Assoc Inf Sci Technol 2012;63:1496-1504. https://doi.org/10.1002/asi.22709

12. Association of American Publishers. U.S. Publishing Industry’s Annual Survey Reveals Nearly $28 Billion in Revenue in 2015. July 11, 2016. Available at: http://newsroom.publishers.org/us-publishing-industries-annual-survey-reveals-nearly-28-billion-in-revenue-in-2015. Accessed April 7th 2017.

13. Shen C, Björk BC. “Predatory” open access: a longitudinal study of article volumes and market characteristics. BMC Medicine 2015,13:230. https://doi.org/10.1186/s12916-015-0469-2

14. Beall J. Predatory publishers are corrupting open access. Nature 2012;489:179. https://doi.org/10.1038/489179a

15. Beaubien S, Eckard M. Addressing faculty publishing concerns with Open Access journal quality indicators. J Libr Sch Commun 2014;2:1-11. https://doi.org/10.7710/2162-3309.1133

16. Bornemann E. Exposing Predatory Publishers. Information Today 2013;30:13.

17. Beall J. Criteria for Determining Predatory Open-Access Publishers. J Chem Inf Model 2013;53:1689-99.
18. Beall’s list of “predatory” publishers and journals no longer available. Editage Insights 2017. Available at: http://www.editage.com/insights/bealls-list-of-predatory-publishers-and-journals-no-longer-available. Accessed April 7th 2017.
19. Directory of Open Access Journals. Available at: https://doaj.org/. Accessed April 5th 2017.
20. Tenopir C, King DW. The growth of journals publishing. In: Cope B, Phillips A, eds. The future of the academic journal. Oxford: Chandos Publishing; 2014. p.159-178. https://doi.org/10.1533/9781780634647.159
21. Marušić A, Marušić M. Small scientific journals from small countries: breaking from a vicious circle of inadequacy. Croat Med J 1999;40:508-14.
22. Marušić A, Sambunjak D, Marušić M. Journal quality and visibility: Is there a way out of the scientific periphery? Prilozi 2006;27:151-61.
23. Stojanovski J, Petrak J, Macan B. The Croatian national open access journal platform. Learned Publishing 2009;22:263-73. https://doi.org/10.1087/20090402
24. HRČAK – Portal znanstvenih časopisa Republike Hrvatske. Available at: http://hracak.srce.hr. Accessed 5 April 2017.
25. Marušić A, Marušić M. Promotion of journals, especially small scholarly journals. In: Smart Maisonneuve HP, Polderman A, eds. Science Editors’ Handbook (pp. 10–12). Exeter: European Association of Science Editors; 2013.
26. Open Access Scholarly Publishers Association. Principles of transparency and best practice in scholarly publishing. Available at: http://oaspa.org/principles-of-transparency-and-best-practice-in-scholarly-publishing/. Accessed 7 April 2017.
27. Cvek M, Hren D, Sambunjak D, Planinc M, Mačković M, Marušić A, Marušić M. Medical teachers’ attitudes towards science and motivational orientation for medical research. Wien Klin Wochenschr 2009;121:256-61. https://doi.org/10.1007/s00508-009-1148-0
28. Stojanovski J. Do Croatian open access journals support ethical research? Content analysis of instructions to authors Jedranka. Biochem Med (Zagreb) 2015;25:12-21. https://doi.org/10.11613/BM.2015.002
29. Broga M, Mijaljica G, Waligora M, Keis A, Marušić A. Publication ethics in biomedical journals from countries in Central and Eastern Europe. Sci Eng Ethics 2014;20:99-109. https://doi.org/10.1007/s11948-013-9431-x
30. Kriegeskorte N. Open evaluation: A vision for entirely transparent post-publication peer review and rating for science. Front Comput Neurosci 2012;6:1-18. https://doi.org/10.3389/fncom.2012.00079
31. Stojanovski J. Transparency of peer review process in Croatian OA journals. Available at: https://zenodo.org/record/19739#.WOpul4IGMdV. Accessed April 7th 2017.