How To Make Biodiversity Articles Highly Cited?

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Abstract

Previous research showed that Indonesia produced the highest number of papers in biodiversity among three mega-diverse Southeast Asia countries, including Indonesia, Malaysia and Philippines. However, among them Indonesia papers received the smallest number of citation. This research aims to identify and compare the characteristics of Indonesian biodiversity papers to Malaysia and Philippines. Firstly, the paper reviewed a set of papers collected from Scopus systematically to find factors for making highly cited articles. Then, the paper applied the factors to find various reasons of low citations. Resulting showed that there are 12 aspects to produce articles highly cited, namely Funding; Number of articles; Subject; Journal; Authorship; Collaborator; Methodology; Pages, tables, illustrations and References; Editorial Factor; Language; Source type; and Getting Award. This paper provides a receipt to Indonesian researchers in creating articles that are potential to be highly cited articles.

Keywords

Biodiversity; Research impact; Indonesia; Malaysia; Philippines; Highly Cited Articles

Introduction

Indonesia is one of the seventeen-mega diverse countries, which become host to the most of various species on the Earth. Science and research of Indonesian biodiversity become important since Indonesia is home of 17 percent of the total species of birds fifth rank in the world, 12 percent of the world's mammals second rank, 270 species of amphibians sixth ranks in the world, 16 percent of the world's reptiles, 35 species of primate fourth ranks in the world, 10 percent of

the world's flowering species with 55 percent is endemic, and the world's centers for agro biodiversity of plant cultivars and domesticated livestock (Secretariat, 2017). Moreover Indonesia also home to around 80 percent of the world medicinal plants (Elfahmi et al., 2014).

Comparing to other mega diverse Southeast Asia countries, Philippines and Malaysia, Indonesia lies on the first ranking in number of publication in biodiversity. However, Indonesia is at the second in the total citations of publications with at least one local author and at the last with a local author as the first author (Yoganingrum, 2018). Highly cited publications give predicate to authors as distinction and claim as the most active research, visible, and important topics in the specialty areas (Clarivate Analytics, 2017). Articles highly cited also indicate high contribution in the development of methods and concepts (Barbosa & Schneck, 2015; Ciliberto et al., 2009; Peter, 2009; Viglietto, 2009), as well as become fundamental reference of a certain topic.

Recent works had identified several factors to make Highly Cited Articles (HCA) in biodiversity. However, they focused only on six factors namely number of articles (Parker et al., 2013), kind of subject (Barbosa & Schneck, 2015; Ma et al., 2013; Nardi et al., 2016; Ríos-Saldaña et al., 2018), level and/or specific title of journal (Parker et al., 2013; Pyšek et al., 2006), kind of journal (Parker et al., 2013), number of authors (Barbosa & Schneck, 2015; Parker et al., 2013), and study design/method (Westgate et al., 2013). Nevertheless, there are still many important factors should be explored to provide comprehensive data to make article highly cited in biodiversity. According to Tahamtan et al. (2016), who conducting literature review conveyed that there were twenty eight factors affecting articles to be cited. It means that there can be other factors excluding six factors that making HCA in biodiversity. Hence, it is required to gather and summarize the characteristics of HCA from different disciplines to accomplish factors that influence HCA in biodiversity.

To fulfill the gap this paper aims to explore factors making articles highly cited and identify the factors making Indonesian biodiversity articles slightly cited. The research questions are what factors do make article highly cited? And what factors do make Indonesian biodiversity articles slightly cited? Outputs of this paper are factors to make HCA in the field of biodiversity and factors to make HCA in Indonesian biodiversity articles. The first output will accomplish existing factors identified for making HCA in biodiversity. The second will be benefit to be hints for Indonesian biodiversity researchers in publishing articles highly cited.

Materials and Methods

This research consisted of two steps. Firstly, identifying factors that making HCA in biodiversity by adopting a literature review method. The method consisted of three steps: (i) Determining keywords, (ii) Searching references, and (iii) extracting data. The paper explored factors making HCA from various disciplines including biodiversity. The researcher applied a different strategy

in searching references between other and biodiversity disciplines. Then the factors making HCA were extracted from both groups of references. Afterwards, the paper analysed the characteristics of Indonesian biodiversity articles by comparing the factors influencing HCA to other megadiverse Asian, Malaysia and Philippines.

Identification of factors making HCA

- Data collection of other disciplines

This research included a set of publication consisted of 130 papers. A literature search was conducted between August 4 – September 23, 2018 in the Scopus database. A list of keywords was generated based on studying to articles in Scopus, who discussing about making articles highly cited. Result showed that most articles use term of "highly cited" or "top cited". In order to get appropriate articles, the paper used search strategy "highly cited" IN Title or "top cited" IN Title. Then the results were scoped by publishing year (2013-2017), article and review document type, as well as English language.

- Data collection of biodiversity discipline

This paper involved a set of publication consisted of 10 papers. The search strategy was "highly cited" IN (Article title, Abstract and Keywords) OR "top cited" IN (Article title, Abstract and Keywords) AND Biodiversity IN (Article title, Abstract and Keywords).

- Data analysis

By reading the abstracts and articles one by one this paper analyzed and extracted qualitative aspects and abandoned the quantitative aspects of data. This provision was applied since this paper identified HCA from other disciplines that will implement to biodiversity articles. Therefore, the quantitative aspects in the context of biodiversity articles should be further determined.

Analysis the characteristics of Indonesian biodiversity articles

This step adopted collecting data and analysis method applied by Yoganingrum (2018). Author collected total publications with at least one local author from Scopus with following retrieval strategy: Biodiversity in Title-Abs-Key AND (country name) in Title-Abs-Key AND (country name) in Affiliation country. The period publication was from the beginning to 2017. Then author identified some factors based on information provided by Scopus such as subject area, document type, source title, funding sponsor, source type and language. Author also compared the characteristics among three countries. Since there is no data provided by Scopus on following factors: gender, number of pages and cited references, editorial factor, and getting award, the paper did not show and discuss those factors.

Results

Factors that making HCA

This paper identified twelve categories consisting of fifteen factors making HCA. Four categories with six factors were already identified. Therefore, this paper proposes twelve factors with ten factors to accomplish existing factors. Table 1 presents those categories and factors. Note that the majority of previous studies conducted in this area used bibliometric techniques to investigate the characteristics of highly cited articles. Generally, they studied the characteristics of 100 articles with the highest citations. Most HCA from some disciplines were written by authors from the United States. Moreover, most researchers used Scopus and Web of Science (WoS) as the data resources.

Table 1. Categories and factors for making articles highly cited

No	Categories	Factors	References from other disciplines	References from discipline of biodiversity
1.	Funding		(Azer, 2016; Azer, 2017; Azer & Azer, 2016; M. S. Khan et al., 2017; Munzer et al., 2017; Noorhidawati et al., 2017)	
2.	Number of articles		(Azer, 2016; Ding et al., 2016; Tang et al., 2016)	(Parker et al., 2013)
3.	Subject		(Ahmad et al., 2017; Bauer et al., 2016; Bohl & Ponce, 2017; Buta et al., 2016; Chen et al., 2015; Chuang & Ho, 2014; Dong et al., 2016; Fardi et al, 2017; Farr et al., 2017; Fu & Ho, 2015; Fu & Ho, 2016; Gong et al., 2017; Halverson et al., 2014; Hong et al., 2017; Huo et al., 2015; Hussain et al., 2014; İpekçi et al., 2017; Khan et al., 2017; Lenzi et al., 2016; Liu et al., 2016; Mazhari, 2013; Pagni et al., 2014; Pu et al., 2017; Rangel et al., 2017; Shao & Zheng, 2016; Sharma & Lawrence, 2014; Tang et al., 2016; Thelwall et al., 2017; Yang et al., 2014)	(Barbosa & Schneck, 2015; Ma et al., 2013; Nardi et al., 2016; Ríos-Saldaña et al., 2018)
4.	Journal	Published period	(Azer, 2015; Azer, 2017; Brown et al., 2017; Chuang & Ho, 2015; Elango & Ho, 2017; Fu & Ho, 2016; González-Betancor & Dorta-González, 2017; Khan et al., 2017; Kolle et al., 2017; Pu et al., 2017; Wilcox et al., 2013; Yang et al., 2014)	
		Level and/or specific title of journal	(Branch & Linnell, 2016; Brown et al., 2017; H. Chen & Ho, 2015; Chuang & Ho, 2014, 2015; Fardi et al., 2017; Fu & Ho, 2015, 2016; Gong et al., 2017; Ho, 2014; Ho & Kahn, 2014; Hsu & Ho, 2014; Khan et al., 2017; Khan et al., 2015; Lenzi et al., 2016; Liu et al., 2016; Mazhari, 2013; Munzer et al., 2017; Pu et al., 2017; Shao & Zheng, 2016; Tang et al., 2016; Yang et al., 2014; Yi et al., 2013; Yoon et al., 2013; Zhang et al., 2017)	(Parker et al., 2013; Pyšek et al., 2006)
		Kind of journal	(Ding et al., 2016; Gutman, Brown, & Ho, 2017; Ho, 2013; Kolle et al., 2017)	(Parker et al., 2013)

5.	Authorship	Number of authors	(Antonakis et al., 2014; Azer, 2016; Azer, 2017; Azer & Azer, 2016; Branch & Linnell, 2016; Chen et al., 2015; Chuang & Ho, 2015; Elango & Ho, 2017; Ho & Kahn, 2014; Jin & Hakkarinen, 2017; Liu et al., 2016; Mazhari, 2013; Noorhidawati et al., 2017; Yang et al., 2014)	(Barbosa & Schneck, 2015; Parker et al., 2013)
		Gender	(Azer, 2016; Azer, 2017; Azer & Azer, 2016; Khan et al., 2017)	
6.	Collaborator	Collaborator countries	(Ahmed et al., 2017; Azer, 2017; Azer & Azer, 2016; Elango & Ho, 2017; Noorhidawati et al., 2017)	
7.	Methodology	Study design/ method	(Antonakis et al., 2014; Azagra-Caro et al., 2017; Azer, 2017; Eshraghi et al., 2013; Gong et al., 2017; Halverson et al., 2014; Hui et al., 2013; İpekçi et al., 2017; Mitchell et al., 2017)	(Westgate et al., 2013)
		Type of paper	(Antonakis et al., 2014; Azer, 2015; Fardi et al., 2017; Farr et al., 2017; Hussain et al., 2014; Zhang & Guan, 2017)	
8.	Pages and references	Number of pages and references	(Antonakis et al., 2014; Branch & Linnell, 2016; Mazhari, 2013)	
9.	Editorial Factor		(Lin et al., 2016)	
10.	Language	English	(Buta et al., 2016; Dong et al., 2016; Huo et al., 2015; Martín-Martín et al., 2016; Shao & Zheng, 2016)	
11.	Source type		(Martín-Martín et al., 2016)	
12.	Getting Award		(Azer, 2016; Chuang & Ho, 2014; Mroz et al., 2016)	

Following are the descriptions of the factors:

1. Funding

Publications receiving funding from private or government in their research process became HCA (Khan et al., 2017; Noorhidawati et al., 2017). Likewise, conveyed by Munzer et al. (2017) that a number of top cited articles in emergency medicine education literature included external funding sources. Otherwise, some researchers said that there was no significant correlation between the number of top cited articles and grants received (Azer, 2016; Azer, 2017; Azer & Azer, 2016).

2. Number of articles

In the field of environment and ecology highly cited researchers were also highly productive, publishing on average well over 100 articles each (Parker et al., 2013). The more number of articles published, the greater the chance of having an HCA (Azer, 2016; Ding et al., 2016; Tang et al., 2016).

3. Subject

Researchers argued that particular subjects in a discipline of biodiversity were potential to be HCA (Barbosa & Schneck, 2015; Ma et al., 2013; Nardi et al., 2016; Ríos-Saldaña et al., 2018). For example, organisms and vegetation were the hottest research topics in wetland research (Ma et al., 2013). Likewise for other disciplines: Bauer et al., (2016) identified that papers that has subject of collection and exploitation of information in clinical practices; use of the Internet in public communication and commerce; and scientometrics are top cited of the field of Library and Information Science in Web of Science (WoS). Other example highly cited papers on Antarctic field in Science Citation Index Expanded had subject of sea ice, southern ocean, climate change, and ozone depletion (Fu & Ho, 2016). Meanwhile, fracture was the most discussed topic in orthopedic surgery and its subspecialties (Huo et al., 2015). Moreover, top-cited articles in the islet transplantation field focused on antirejection immunotherapy, biocompatible encapsulations, prolong graft survival, islet transplants efficacy assessments, and islet allografts.

4. Journal

Previous researches showed that period of publication influenced articles highly cited. Khan et al. (2017) showed that articles in angioplasty published recently can be a top cited in Scopus. Meanwhile, Fu & Ho (2016) conveyed that Antarctic articles need three years to obtain citations. Reported electrocardiogram-related articles (Yang et al., 2014) and four journals in the fields of Information Science & Library Science, Operations Research & Management Science, Ophthalmology, and Physics Condensed Matter (González-Betancor & Dorta-González, 2017) need two years to be cited. According to Brown et al. (2017) and Wilcox et al. (2013) each examined occupational therapy and pediatric neurosurgical studied that it was need 4-5 years for a publication to gain citations. Moreover, it needs more than a decade to be HCA in horticulture in Science Citation Index Expanded (Kolle et al., 2017). Then, Chuang and Ho (2015) and Elango and Ho (2017) argued that highly cited papers might not have high citations in early years for Taiwanese and Indian respectively. In contrast, two researchers, who studied the top-cited articles in the discipline of problem-based learning (PBL) reported that no significant correlations were found between number of citations and number of years since published (Azer, 2017; Azer, 2015). Meanwhile, Tahamtan et al. (2016) proposed that older and younger papers should be considered in analysis to avoid bias.

Researchers argued that one of characteristics of HCA was published in high impact factor journal (Brown et al., 2017; Gong et al., 2017; Khan et al., 2017; Tang et al., 2016). In the contrary, Chuang and Ho (2015), who identifying Taiwanese articles in SCI-Expanded database and Chuang and Ho (2014) who studying top cited of single authored publication argued that HCA can be published in journals with low impact factors. Similarly, to Pu et al. (2017), who determining the top cited articles in the islet transplantation field and Mazhari (2013) in psychiatry reported that it was no correlation between a journal's impact factor and the number of

citations. Meanwhile, some researchers prefer to say that HCA of a specific discipline are appeared in specific journals (Branch & Linnell, 2016; Chen & Ho, 2015; Dong et al., 2016; Fardi et al., 2017; Fu & Ho, 2015; Fu & Ho, 2016; Ho, 2014; Ho & Kahn, 2014; Hsu & Ho, 2014; Khan et al., 2015; Lenzi et al., 2016; Liu et al., 2016; Mazhari, 2013; Shao & Zheng, 2016; Yang et al., 2014; Yi et al., 2013; Yoon et al., 2013; Zhang et al., 2017), although most of those specific journals are categorized as high impact factor journals. For example, most HCA of Electrocardiogram was in journal categorized in cardiac and cardiovascular systems.

Some researchers (Ding et al., 2016; Gutman et al., 2017; Kolle et al., 2017) identified that HCA were found particularly not in general journals. This opinion was supported by Parker et al. (2013) from biodiversity field. In contrast, based on the top-cited articles published in the Science Citation Index Expanded from 1991 to 2010 HCA were obtained in both, journal with multidisciplinary and general scopes (Chen et al., 2015; Chuang & Ho, 2014; Ho, 2013).

5. Authorship

Multi-authored articles would be potential to be HCA. In the field of biodiversity, the opinion was conveyed by Barbosa and Schneck (2015) and Parker et al. (2013). Meanwhile, articles written by multi-authors in the field of Electrocardiogram in Science Citation Index Expanded were categorized as HCA (Yang et al., 2014). Moreover, Branch and Linnell (2016) showed that papers with 5-6 authors were likely highly cited. Likewise, the number of authors exceeded six in 50 studies in the TB research were top cited (Chen et al., 2015). Additionally, Antonakis et al. (2014) explored that articles with multi-authors from highly ranking institutions were highly cited. Subsequently, 100 top cited articles in acute kidney injury were published by teams involving more than 3 authors (Liu et al., 2016). However, some researchers argued that no correlation was found between the number of citations obtained and number of authors (Azer, 2016; Azer & Azer, 2016). Furthermore, Jin and Hakkarinen (2017) reported that more than half of top cited articles in bioethics were composed by single authors.

Khan et al., 2017) and Azer and Azer (2016) showed that male authors receive more citation than those of female authors. Furthermore, Zhang et al. (2018) found that projects with male Principle Investigators (PI) tended to produce more publications, patents, and total SNIP. On the contrary, no significant correlations were found between the top cited articles and females in authorship (Azer, 2017)(Azer, 2016). Furthermore, the long time being a writer, gender, and well-known authors/organizations/countries had to be considered in analysis (Tahamtan et al., 2016).

6. Collaborator

International collaboration papers were prospective to be highly cited (Chuang & Ho, 2015; Elango & Ho, 2017; Noorhidawati et al., 2017). Strong correlations were found between the top-cited articles and number of countries involved (Azer, 2017; Azer & Azer, 2016). In contrast, Ho & Kahn (2014) studied number of highly cited review written by international collaborative team

were less than those of single country team. Moreover, no correlation was found between the top-cited articles and number of countries/institutions involved (Azer, 2016).

Country of collaborators led to produce articles highly cited. Elango and Ho (2017) showed that articles of Indian researchers, who collaborate with US researchers in Science Citation Index Expanded were highly cited. Likewise, publication of Indian authors in the field of clinical pharmacology, who cooperate with US researchers in Scopus database categorized as HCA (Ahmed et al., 2017). Meanwhile, Noorhidawati et al. (2017) identified that papers of Malaysian researchers in Web of Science that cooperate with researchers from Iran, Australia and UK became HCA.

7. Methodology

The methodology applied was one of characteristics of HCA. Using empirical study potential became HCA (Gong et al., 2017; Jin & Hakkarinen, 2017; Mitchell et al., 2017). Moreover, Antonakis et al. (2014) showed that articles which employ quantitative method such as SEM, meta-analysis, and theoretical approaches showed the most HCA. Additionally, applying descriptive (mean, median) and inferential statistics (experiment, causal, correlation, ANOVA, Chi-Square, t-tests, p-value, factor analysis, component analysis) made HCA (Halverson et al., 2014). Furthermore, problem-based learning (PBL) articles were assessed and reported mainly in questionnaire-based studies (Azer, 2017). However, Westgate et al. (2013) argued that empirical studies were no more highly cited than qualitative articles in the field of biodiversity.

In the field of urology and orthodontics case series were the most common study design applied (Hui et al., 2013; İpekçi et al., 2017). The majority of the top cited articles in acute kidney injury, orthopedic surgery, implant dentistry and digestive system disease were clinical studies (Fardi et al., 2017; Huo et al., 2015; Liu et al., 2016; Tang et al., 2016). Moreover, majority of HCA in limb prosthetics reviews used experimental studies (Eshraghi et al., 2013). Meanwhile, Azagra-Caro et al. (2017) argued that applying developed method in patent analysis in knowledge transfer channels resulted HCA. Articles in the form of review were cited most. This factor was supported by Farr et al. (2017), who conducting research on sexual minority parent families, Hussain et al. (2014), who studying articles highly cited in journal of Nutrition & Metabolism, and Antonakis et al. (2014), who exploring characteristics of HCA in high-impact social sciences journal, The Leadership Quarterly. Reviews and articles type dominated the majority of top cited articles (Azer, 2015). Tang et al. (2016) reported that type of review articles became the second total number of HCA.

8. Number of pages and references

Mazhari (2013) said that there were no correlations between the number of times articles were cited and the number of pages. Meanwhile, Branch and Linnell (2016) and Antonakis et al. (2014) conveyed that using cited articles in references will increase number of citations.

9. Editorial Factor

Lin et al. (2016) studied that the shorter editorial process, the larger probabilities of becoming highly cited papers in journal Nature, Science and Physical Review Letters.

10. Language

Articles written in English were more cited than those of articles in other language. Buta et al. (2016) reviewed that publications in the field of frailty-related research using English were more cited than those of articles not in English. Likewise, top cited articles in orthopedic surgery and its subspecialties were written in English (Huo et al., 2015). Additionally, all articles of the 100 top-cited articles published in emergency medicine journals were written in English (Shao & Zheng, 2016). Then, the most-cited articles in fracture surgery by Chinese authors were written in English (Dong et al., 2016). Similarly, to Martín-Martín et al. (2016), who studied highly-cited documents in Google Scholar conveyed that the average HCA was written in English.

11. Source type

Generally highly-cited document in Google Scholar were published in journal and available online in PDF format (Martín-Martín et al., 2016).

12. Getting Award

Mroz et al. (2016) studied that articles that getting award in proceeding were articles highly cited. Similarly, receiving the Karolinska Institutet Prize for research in medical education made top cited publications (Azer, 2016).

The characteristics of Indonesian biodiversity articles

Table 2 shows the comparison of biodiversity articles characteristic among three countries, Indonesia, Malaysia, and Philippines.

Table 2. The comparison of biodiversity articles characteristics of Indonesia, Malaysia, and Philippines

No	Categories	Factors	Indonesia	Malaysia	Philippines
1.	Funding	- Number articles with undefined funding sponsor	560	393	195
		- Number articles with funding sponsor	148	102	190
		- Percentage of total articles with funding sponsor	20.50	20.61	69.85
2.	Number of articles	- Total articles with at least one local author	722	495	272
		- Total of cited articles	517	395	209
		Percentage of the cited articles	71.61	79.80	76.84

3.	Subject	- The first highest of subject	Agricultural and Biological Sciences	Agricultural and Biological Sciences	Agricultural and Biological Sciences
		- The second highest of subject	Biochemistry, Genetics and Molecular Biology	Environmental Science	Environmental Science
		- The third highest of subject	Environmental Science	Biochemistry, Genetics and Molecular Biology	Biochemistry, Genetics and Molecular Biology
4.	Journal: title level of JIF and H Index, and scope disciplines of the highest journal	- The first highest of journal title	Biodiversitas JIF: - H Index: 5 Scope: all biodiversity aspects of plants, animals and microbes at the level of gene, species, and ecosystem	Journal of Tropical Forest Science JIF: 0.655 H Index: 25 Scope: tropical forest biology, ecology, chemistry, management, silviculture, conservation, utilization and product development.	Zootaxa JIF: 0.931 H Index: 66 Scope: animal taxonomists
		- The second highest of journal title	AIP Conference Proceedings H Index: 55 Scope: physical sciences, including physics, math, chemistry, materials science, and engineering.	Biodiversity and Conservation; specific JIF: 2.828 H Index: 106 Scope: biological diversity, wide and multi disciplinary	AACL Bioflux JIF: - H Index: 10 Scope: Aquaculture, Fish Genetics and Improvement, Aquarium Sciences, Fisheries, Ichthyology, Aquatic Ecology, Conservation of Aquatic Resources and Legislation
		- The third highest of journal title	Plos One JIF: 2.766 H Index: 241 Scope: the natural sciences, medical research, engineering, and the related social sciences and humanities	Forest Ecology & Management JIF: 3.169 H Index: 147 forest ecology, forest management, and forest ecosystems of the world.	Asia Life Sciences JIF: - H Index: 4 Scope: Life Sciences and related disciplines
5.	Authorship	- Percentage of articles with single author	6.37	4.44	7.72
		- Percentage of collaborative articles	93.63	95.56	92.28
		- Gender	Not discussed	Not discussed	Not discussed

No.	Category	Factor			
6.	Collaborator	- Percentage of articles with international collaborative	54.43	45.45	53.68
		- Percentage of articles with local collaborative	39.20	29.70	15.44
		- The first highest of collaborator affiliation and country	Universitat Gottingen, Netherlands	National University of Singapore, Singapore	University of Kansas Lawrence, USA
		- The second highest of collaborator country	University of Queensland, Australia	University of Leeds, British	James Cook University, Australia
		- The third highest of collaborator country	National University of Singapore, Singapore	Kyoto University, Japan	University of Oklahoma, USA
7.	Methodology	- Study design/ method	Varied	Varied	Varied
		- Most kind of paper	Articles	Articles	Articles
8.	Number of pages and references		Not discussed	Not discussed	Not discussed
9.	Editorial Factor		Not discussed	Not discussed	Not discussed
10.	Language		English	English	English
9.	Source type	- The first highest of source type	Journal	Journal	Journal
		- The second highest of source type	Conference Proceedings	Conference Proceedings	Book Series
		- The third highest of source type	Books	Books	Conference Proceedings
10.	Getting Award		Not discussed	Not discussed	Not discussed

Discussions

Five of twelve categories namely number of articles, subject, journal, authorship and method are already identified to make HCA in biodiversity discipline. Four categories among them i.e. subject, journal, authorship and methodology are the most factors discussed. This paper proposes seven categories consisting of ten factors. In this section, the paper compared and discussed the characteristics of biodiversity publication based on those factors between Indonesia and others two megadiverse Asian countries, Malaysia and Philippines.

1. Funding

Table 2 shows that Indonesia was on the second of the total number of articles with funding sponsor. Table 3 also shows that Indonesia had the highest total number of cited articles. However, Indonesia position was at the last of the proportion number of cited articles.

Table 3. The data of cited articles

Components	Indonesia	Malaysia	Philippines
Total publications with at least one local author	722	495	272
Total of cited articles	517	395	209
Percentage of the cited articles	71.61	79.80	76.84

Source: Scopus

Funding policy for Indonesian biodiversity is discussed in document of Indonesian Biodiversity Strategy and Action Plan (IBSAP) 2015-2020 (BAPPENAS, 2016). Funding sources are from government, private, public and foreign. However, how much percentage funding for research and publication compared to other activities such as management, training and development for society, ecotourism and SMEs is not described in the document. Since funding is one of factors affecting to citation number and driving HCA, the Indonesian government should calculate carefully in allocating any sources for biodiversity activities.

Nevertheless, most researchers in Indonesia conducted research under the government funding including researchers in the field of biodiversity. Indonesian Ministry of Research and Higher Education is providing various funding and incentives since about last five years for encouraging publication such as funding to present paper in international conferences and publish in international journals. Government also provides funding for local journals indexed in Scopus and receiving high citation rates (Lukman et al., 2018). Moreover, research institutions also provide funding for publication; for example, Center for Scientific Documentation and Information Indonesian Institute of Sciences (PDII LIPI) allocated IDR 112 million in 2018 for publication fees and IDR 90 Million for conference trips.

It shows in Table 2 that the total articles number with funding sponsor of Malaysia was below Philippines. However, Table 3 shows that the total number and proportion of cited articles of Malaysia was higher than those of Philippines. It assumed that funding does not influence the number of citations.

2. Number of articles

Number of Indonesian biodiversity publications in Scopus tended to increase from year to year (Yoganingrum, 2018). The increase was rapid especially in 1995 and 2006 (Handayani et al., 2016). Furthermore, Indonesia had the highest number of publications in 2017 when compared to Philippines and Malaysia (Yoganingrum, 2018). Even though number of Indonesian biodiversity publications increased steadily, the number of citations obtained was under Malaysia and Philippines. It seems that researchers have not paid attention to publish papers that will receive many citations. Researchers should have strategies to make their publications are cited, among others by appearing and monitoring the publications in social media (Jang, 2017).

3. Subjects/topics

This is the most discussed factor in previous papers. Subjects or topics were assumed as one of the most essential factors for making HCAs in biodiversity discipline. Table 2 showed that the highest subjects of biodiversity were similar among Indonesia, Malaysia and Philippines. Probably it is required to be further identified the particular subjects of Indonesia biodiversity that cited most.

4. Journal

Journal categorize is also essential factors for making HCAs in biodiversity discipline. Most Indonesian articles were not published in journal high impact factor. It was different from Malaysia, which published mostly in journal with highly impact factor. However, Some researchers argued that there was no correlation between journal impact factor and number of citation (Chuang & Ho, 2014, 2015; Mazhari, 2013; Pu et al., 2017).

This paper assumed that choose journal indexed in particular database become potential to have highly citation. Most researchers in the world used databases such as Scopus, WoS, Springerlink and Google Scholar to find articles as references. Therefore, journals that are not indexed by the database will be difficult accessed by researchers in the world so they will be less cited. Furthermore, choosing journals with particular disciplines scope were potential to have high citation. Table 2 showed that most publication of Malaysia and Philippines were in journals with particular scope of disciplines. Meanwhile, the second and third highest of journal of Indonesian publications were a general journal/proceeding.

5. Authorship

Table 2 shows that most articles of three countries that were categorized as collaborative articles. Based on Barbosa and Schneck (2015) and Parker et al. (2013) this characteristics supported for getting HCA in biodiversity.

6. Collaborators

Table 2 shows that the total number of international collaborative articles of three countries was higher than those of the total number of single author and local collaborative articles. This property was appropriate to have HCA (Azer, 2017; Azer & Azer, 2016; Chuang & Ho, 2015; Elango & Ho, 2017; Noorhidawati et al., 2017).

Handayani et al. (2016) reported that US was the country produced the most publications about Indonesia biodiversity for 26 years, and then followed by Japan, Australia and Germany respectively. Likewise, Trianggoro et al. (2018) showed that US was in the first for several indicators such as number of publication, total publication with at least one Indonesian author, total citation of publication with at least one Indonesian author and total citation of publications with Indonesian author as the first author. However, in proportion value of those indicators, US

was in the lower order compared to other countries. Those data means that US did not involve Indonesian researchers for all publication about Indonesian biodiversity.

Trianggoro et al. (2018) conveyed that the highest number of publications with at least one Indonesian was collaborated with Japan, France and Australia respectively. Furthermore, Indonesia publications collaborated to Canada, Netherland and UK respectively were having the highest number of citations. However, authors, participating institutions, or countries did not influence the number of top cited articles (Pu et al., 2017).

7. Methodology

The paper has to conduct further research to identify the most method employed by Indonesian articles. It seemed that all countries employed varied methodology. By taking the case study of Adaptive Management (AM) in biodiversity and ecosystem management in Web of Knowledge (Westgate et al., 2013) conveyed that HCA in biodiversity was not dominated by articles, which employed empirical studies. However, most articles argued that most HCA employed empirical studies (Antonakis et al., 2014; Azer, 2017; Gong et al., 2017; Halverson et al., 2014; Jin & Hakkarinen, 2017; Mitchell et al., 2017). Furthermore, most Indonesian document type was articles and only a few articles were conference paper and book series. This type of document was potential to have HCA.

8. Language

The most articles of three countries applied English as language. There were only a few articles used language other than English. Meanwhile articles use English were potential to be HCA.

9. Source type

Most Indonesian biodiversity articles published in journals. It was similar to Malaysia and Philippines. This character supports the potential to have HCA.

Conclusion

To conclude that by concerning all factors influencing HCA would be possibility to have HCA in biodiversity. This paper proposed new factors to add existing factors to make HCA in biodiversity. Those factors were (1) funding, (2) collaborator, (3) Journal: Published period, (4) Authorship: gender (5) Methodology: kind of paper (6) Number of pages and cited references (7) Editorial Factor (8) Language (9) Source type, and (10) Getting Award.

The paper assumed that it is required to identify the particular subjects of Indonesia biodiversity that potential to be HCA. Additionally, Indonesian researchers should choose journal high impact factor with particular disciplines scope. The finding of this paper highlighted that the characteristics of Indonesian biodiversity articles were almost similar to Malaysia and Philippines in almost all factors. Factually, Indonesia was outstanding in factors, namely number

of articles and percentage of articles with international collaborative. However, Indonesia was having lower number of citations compared to those countries. In the next research it is important to analysis the detailed factors influencing HCA in Indonesian biodiversity such as kind of funding, period of publication, the level and scope of journals, institutions/countries of collaborator, and the type of methodology.

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Bibliographic information of this paper for citing:

Yoganingrum, A. (2020). "How to make biodiversity articles highly cited?" *Webology*, 17(1), Article 211. Available at: http://www.webology.org/2020/v17n1/a211.pdf