



## The Issue of Microplastics (MPS) in Coastal Area Indonesia: Bibliometric Network Analysis

Zamdial

*Marine Science Study Program, Faculty of Agriculture, University of Bengkulu, Indonesia*

Yenni Putri Sari  

*Laboratory of Fisheries, Faculty of Agriculture, University of Bengkulu, Indonesia*

Siti Ayu Ulfadillah

*Institute of Food Safety and Risk Management, National Taiwan Ocean University, Taiwan*

Rindiani Puja Listari

*Institute of Marine Biology, National Taiwan Ocean University, Taiwan*

Elsa Vandana

*Laboratory of Fisheries, Faculty of Agriculture, University of Bengkulu, Indonesia*

Yar Johan

*Marine Science Study Program, Faculty of Agriculture, University of Bengkulu, Indonesia*

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### Abstract:

This research aims to present a comprehensive bibliometric literature evaluation on microplastic in Indonesia. Google Scholar database of articles discovered by the Publishing or Perish (PoP) software. In this study, 151 out of 678 papers retrieved in the Google Scholar database from 2010 to 2022 were evaluated. The selected references were then manually maintained in Excel. After administering the database, the VOSviewer program was used to classify and visualize the data. Overall, this analysis serves as a suitable point of reference for future research on microplastics in Indonesia.

**Keywords:** *Bibliometric, Microplastic, Database, VOSviewer, PoP.*

### Introduction

Each year, millions of tons of plastic are created globally, and more than eight million metric tons end up in the ocean. Plastic pollution is already pervasive in the ocean ecosystem.

Worryingly, it is anticipated that by 2050, the weight of plastics in the water would surpass that of fish (Roscha, 2018). According to their size, plastics are categorized as macroplastics (more than 25 mm), mesoplastics (5–25 mm),

microplastics (5 mm), and nano plastics (100 nm) (Stock et al., 2019). In the early 1970s, the early marine microplastics investigations were published in scholarly journals (Buomocore et al., 2019). Since that day, there is an increasing interest in the issue of microplastic pollution, but there is still a dearth of research regarding how they can impact the diversification and operation of ocean ecosystems, as well as the indirect provision of ecosystem services (ES) (D'Alessandro et al., 2018). In this context, the



existence and concentration of microplastics in fish is the subject of a contemporary debate, a crucial concern given that over Forty million individuals worldwide depend on fish for subsistence (National Research Council, 2008). In order for fish to provide an ecological service, lower trophic levels and energy transfer between trophic levels must be considered (Troost et al., 2018), in addition to the diversity and organization of marine biota (Buonocore et al., 2018).

Current findings on microplastics has focused on the genetic, subcellular, and epithelial toxicological impacts they have on individual organisms or genera (Fastelli et al., 2016). However, further research is required to understand the possible detrimental ecological implications of microplastics. Ecological system management strategies, such as the Ecological Approach to Fisheries (EAF), acknowledge the close connection between sustainable and successful coastal environment and biodiversity welfare (Hill et al., 2006). Described EAF as a strategic plan that "recognizes quite clearly the interconnection between human very well ecology health, combined with the ability to establish produce a wide variety for current generations, such as by maintaining suitable environment, minimizing contamination, minimizing waste, and defending native wildlife." Given the significance of microplastics in coastal environments and the international policy pushing scientific research on the matter,

it is anticipated that the academic evidence on coastal plastic particles will continue to increase in the next few years (Ward et al., 2002).

In light of the preceding justification, the goal of this study is to address the research gap by undertaking a thorough bibliometric analysis of the literature on microplastics in Indonesia. On the basis of their author distribution and affiliation, Google Scholars (GS)-indexed articles were evaluated and categorized. This analysis can determine which study topics are the subject of an increasing number of publications and which future microplastic in Indonesia themes present potential for additional research. The method utilized to perform statistical test is bibliometrics, comprising the methodological procedures associated with the application of Google Scholars (GS) data-based software and the publish or perish dictum (PoP). Then, using the bibliometric analysis performed, Using VOSviewer, show the results, followed by the literature review's discussion and conclusions.

## Materials and Methods

This bibliometric review is based on a methodical and detailed procedure (Garza-Reyes et al., 2015) or a mind mapping technique that highlights the scope (Tranfield et al., 2003). This research methodology employs a five-stage approach (Setyaningsih et al., 2018) as in Figure 1.



Figure 1. Method of Five Steps for Bibliometric Analysis

### Determine the Search Terms

In May 2022, a literature search using the term "microplastic" was conducted in Indonesia. Literature Review was selected because it is the largest database currently available, and Publish or Perish (PoP) software was chosen because it

has shown to be the most effective strategy for looking for publications on Google Scholar (Baneyx, 2008). The initial investigation using PoP database schema with the keyword phrase "microplastic in Indonesia."

## Initial Results of a Search

This filter is restricted to 'publications', 'title words', and the time range '2010-2022'. The initial search returned 678 results. All relevant article details, including paper titles, abstracts, author, references, affiliation names, and keywords are assembled in Research Information Systems (RIS) format.

## Precision of Search Results

The GS database is filtered for indexed entries that are relevant. The following are excluded from these statistics: proceedings, book reviews, books, newspapers, and book chapters. Only journal articles were included in the selection. After making the necessary edits, the file is subsequently saved as a RIS file. That file output is used for extra processing of data.

## Assemble Initial Data Reports

The gathered information was stored as RIS. Initially, the complete elements of the journal articles (publication year, page, number, volume, etc.) were verified, and missing information was added if necessary. Articles were categorized by publication year, publication source, and publisher based on a study of the data.

## Data Analysis

In this study, PoP software was used for bibliometric analysis (Baneyx, 2008). To study and visualize bibliometric networks, however, VOSviewer software is employed (Martinez *et al.*, 2020). VOSviewer is utilized as a result of its capacity to work rapidly with big data sets and deliver a number of intriguing visualizations, analyses, and investigations (Van Eck & Waltman, 2010). VOSviewer is also capable of producing publication maps, author maps, and journal maps based on co-citation networks, as well as keyword maps based on shared networks.

## Results

### Publications and Citation Formats

On the basis of the PoP software and the VOSviewer program, the output is examined to discover the most often occurring keywords.

However, the quantity of often occurring keywords is modified according to the requirements of data collecting and analysis. VOSviewer is used for bibliometric map visualization. This program presents bibliometric mapping using three separate visual representations: tissue visualization, overlay visualization, and density visualization. Before narrowing the search, the GS database yielded 678 items. After refining, 151 articles from the GS database were aggregated. This data has been thoroughly checked using the search term 'microplastic in Indonesia' in the GS collection from 2010 to 2022. There are approximately 678 papers with 6531 citations (544.25 citations per year) in the preliminary data. Results refinement produced 151 articles; data on citations also changed, with 729 citations and 91.13 citations per year. Table 1 includes the comprehensive results of a review of data source from the first and improved searches.

Table 1. Comparison Metric Data

Metric data	Initial search	Precision search
Term	Issue of microplastic	Issue of microplastic
Publication year	2010-2022	2010-2022
Papers	678	151
Citations	6531	729
Cites/year	544.25	91.13
Cites/paper	9.63	4.83
Author/paper	3.32	3.12
h-index	36	15
g-index	68	23
hI, norm	18	8
hI, annual	1.50	1.00
hA-index	26	9

The researcher attempts to highlight the most significant contributions to this work. The first step is to identify the 151 publications with the highest citation count that contain the keyword "microplastic in Indonesia" the ten most-cited works. As shown in Table 2, obtained findings.

**Table 2. Top 10 Cites Articles**

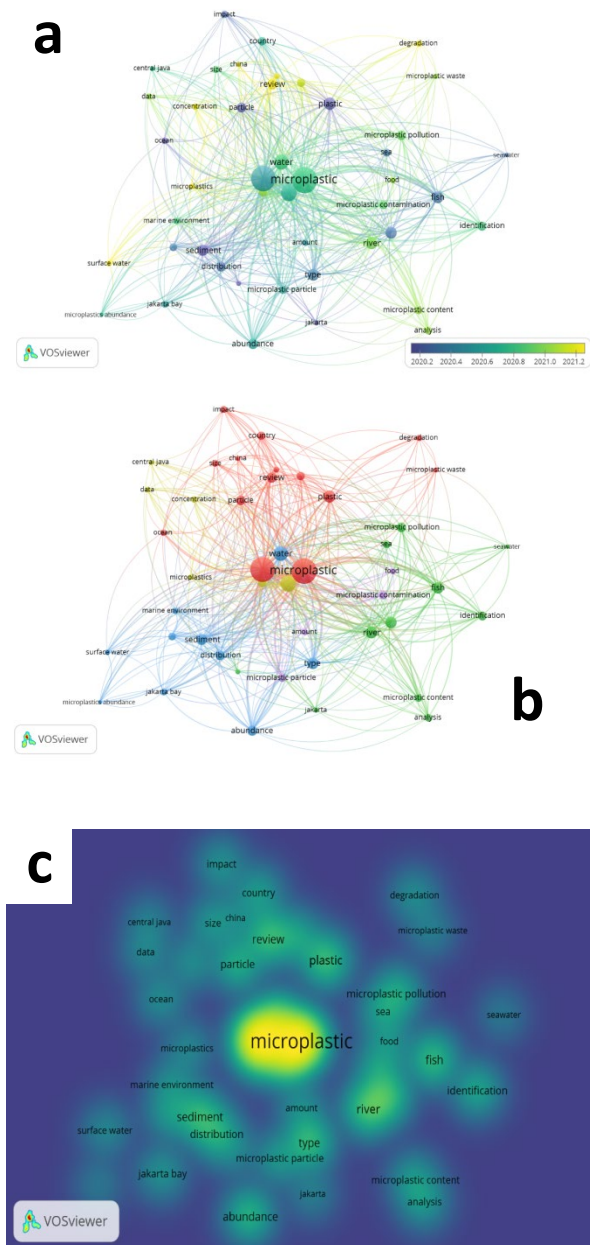
Authors	Cites	Title	Year	Source	Publisher
WC Ayuingtyas, D Yona, SH Julinda	59	Abundance of Microplastics in Water, Banyuurip, Gresik Banyuurip, Gresik, East Java	2019	Journal of Fisheries and..	jfmr.ub.ac.id
Ayur Hastuti, DTF L.	50	The presence of microplastics in the digestive tract of commercial fishes off Pantai Indah Kapuk coast, Jakarta, Indonesia	2019	Biodiversitas Journal of ...	smujo.id
CI Yudhantari, IG Hendrawan	36	Microplastic content in the digestive tract of lemuru fish (Sardinella lemuru) caught in the Bali Strait	2019	Journal of marine ...	ojs.unud.ac.id
AK Forrest, M Hindell	36	Ingestion of plastic by fish destined for human consumption in remote South Pacific Islands	2018	Australian Journal of Maritime & Ocean ...	Taylor&Francis
DIW Handyman, NP Purba, WS Pranowo	34	Microplastics Patch Based on Hydrodynamic Modeling in The North Indramayu, Java Sea.	2019	Polish Journal of ...	pjoes.Com
A Khoironi, S Anggoro	33	Evaluation of the interaction among microalgae Spirulina sp, plastics polyethylene terephthalate and polypropylene in freshwater environment	2019	Journal of Ecological Engineering	yadda.icm.edu.pl
NP Purba	28	Spatial Distribution of Microplastics in Sediment, Pangandaran Beach- West Java	2018	Jurnal Geomaritim Indonesia (Indonesian Journal of ...	Sematic scholar
YM Assuyuti, RB Zikrillah, MA Tanzil	27	Distribution and types of marine debris and their relationship to the coral reef ecosystems of Pramuka, Panggang, Air and Kotok Besar in the Kepulauan Seribu.	2018	... A Scientific Journal	journal.bio.unsoed.ac.id
Ayur Hastuti, F. Yulianda	25	Spatial distribution of marine debris in mangrove ecosystem of Pantai Indah Kapuk, Jakarta	2014	International Journal of ...	smujo.id
SB Kurniawan, SRS Abdullah, MF Imron	24	Current state of marine plastic pollution and its technology for more eminent evidence: A review	2021	Journal of Cleaner ...	Elsevier

**Table 3. Top 10 Publishers Who Publish Microplastic in Indonesia Topic**

No	Publisher	Total Documents	Cites
1	iopscience.iop.org	19	100
2	search.ebscohost.com	8	18
3	researchgate.net	7	9
4	Elsevier	6	34
5	yadda.icm.edu.pl	5	51
6	ejournal3.undip.ac.id	5	27

7	jfmr.ub.ac.id	5	60
8	smujo.id	5	90
9	Mdpi	4	35
10	ojs.unud.ac.id	4	44

The data network visualization presentation for GS data associated with the keyword "microplastic in Indonesia" has been enhanced. Figure 2 depicts an overlay visualization, whereas depicts a density visualization.



**Figure 2. The Network (a), Overlay (b), and Density (c) of the Leading one Hundred Microplastics Keywords. The Area of the Square Represents the Frequency of Occurrence of the Term, while the Linking Line Represents Their Worldwide Collaboration**

This result was collected from the title, keywords, and abstract, with full computation of the minimum number of events set to 3. Approximately 45 items were discovered that fit the criteria for 1021 items. This list does not

contain common terms. The diameter of the node represents the insertion of each keyword-representing item. In plenty of other words, the size of the node indicates the keyword's co-occurrence frequency. Here, we define five distinct groups. According to Table 4, the phrases that occur in every cluster represent the flow of microplastics research in Indonesia.

**Table 4. Keywords Characterizing Each Cluster**

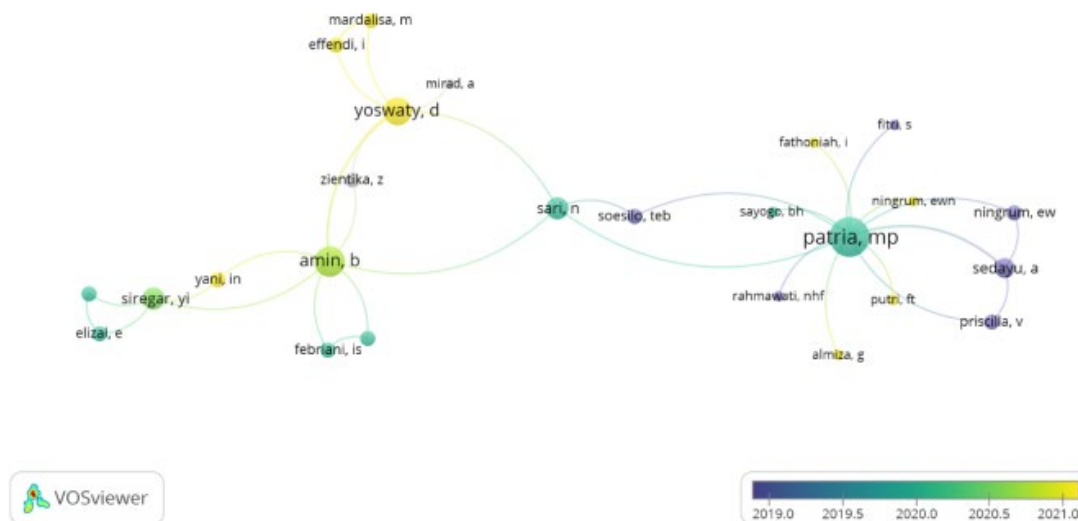
Cluster	Element
The first cluster (red)	cina (12), country (16), degradation (12), impact (14), indonesia (44), microplastic (44), microplastic waste (12), ocean (12), particle (21), plastic (29), plastic waste (23), review (21), size (15), word (17)
The second cluster (green)	analysis (15), fish (27), identification (18), jakarta (13), marine debris (10), microplastic content (17), microplastic pollution (24), research (27), river (29), sea (18), seawater (12)
The third cluster (blue)	abundance (24), distribution (26), jakarta bay (17), marine environment (20), microplastic abundance (21), microplastics abundance (12), sediment (29), surface water (14), type (30), water (39).
The fourth cluster (yellow)	central java (12), concentration (15), data (13), microplastic (17), presence (28), study (40)
The fifth cluster (purple)	amount (18), food (13), microplastic contamination (19), microplastic particle (17)

### Authorship and Co-authorship Connections

The Figure 5 present an examination of co-authors and networks pertaining to forms of collaboration between individuals. In Each node in this network reflects an author's writing connection. This analysis can integrate many parameters to demonstrate groupings and linkages between dimensions or time changes. Figure 3 illustrates an assessment of the author's network during the writers' time together. In this situation, the authors' connection can be

classified as an annual one. Patria has been proved to have the most ties to the other authors. In the meanwhile, the most recent

research, such as one by Yoswaty, are highlighted in yellow.



**Figure 3. Authors and Co-Authorship Relationships in the GS Database are Represented Graphically**

## Discussion

The quantity of citations is the study's most significant contribution. WC Ayuningtyas et alpapers's received the most citations indexed by GS in 2019 according to table 2. This article addresses Abundance of Microplastics in Banyuurip, Gresik, East Java (Ayuningtyas *et al.*, 2019). This article has been cited in 59 academic works. Currently, based on the data, jfmr.ub.ac.id is the publication with the highest frequency of citations.

In addition, the publisher who contributed the most articles to this study was also analyzed. In 151 articles published, 19 articles were published from major publishers namely iopscience.iop.org, followed by search.ebscohost.com 8 articles, researchgate.net publications 7 articles, elsevier 6 articles, for yadda.icm.edu.pl, ejournal3.undip.ac.id, jfmr.ub.ac.id and smujo.id each 5 articles then publisher are mdpi, ojs.unud.ac.id each 3 articles. For other publishers, an average of 1 article is published on this topic.

In addition to the quantity of papers published by each publisher, the importance of each magazine is also taken into account. The results from the top ten journals covering this topic. There are periodicals with the most citations, Journal of Physics: Conference Series being the most cited. This demonstrates that papers pertaining to microplastics in Indonesia are dispersed over a variety of journals, despite the fact that other journals also contain such content.

Analysis overlay visualization and density visualization are utilized to discover significant themes within each study or domain of knowledge. This result is achieved by calculating the co-occurrence of keyword pairs (Liu *et al.*, 2015). Vosviewer software was utilized to do the analysis. Each cluster is linked to other keywords, which can be identified. This suggests that the progression of study on this topic is related. Additionally, network analysis enables the identification of an author's authority (Bilik *et al.*, 2020). Cooperative author analysis is a common bibliometric research technique that studies writers performing joint study in a certain

topic. The density of contributing authors to articles about microplastic in Indonesia can be found in Eastern Asia. This article is able to address the issue of what research trends have been observed in the field of microplastics in Indonesia over the past 12 years as a result of this data. Some seldom-used words can be related and investigated through additional study. As a result, numerous additional topics, such as associations, cities, and countries, can be formed based on these keywords. These aforementioned elements could provide a more thorough examination.

## Conclusion

This study examines journal articles whose topics are associated with the key phrase 'microplastic in Indonesia'. The GS database is mined for articles by the PoP application. Then, 151 of these articles were picked from a wider initial group of 678 articles published over the years 2010 to 2022. To achieve the goals of this study, all discovered papers were categorized by author, year of publication, name of the publisher's journal, citations, authors and co-authorship relations, and affiliation statistics. Microplastic in Indonesia should be a top priority for future research, as indicated by the gap in this study. In Indonesia, the study of microplastics tends to rise from one year to the next. This is also necessary for more inter-regional research collaboration with scientists from Asia and other emerging nations in particular fields.

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## Conflict of Interests

No conflict of interest.

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