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EXPLORING GLOBAL TRENDS AND FUTURE PROSPECTS IN FISHING TECHNOLOGY RESEARCH: AN INNOVATIVE BIBLIOMETRIC APPROACH

Riska Fatmawati[1]*, Romie Jhonnerie[1], Andri Hendrizal[2], Desi Rahmadani Siagian[3]

[1]*Department of Fisheries Resources Utilization, Faculty of Fisheries and Marine Sciences, University of Riau, Binawidya Campus KM 12.5, Pekanbaru, Riau, Indonesia 28293*
[2] *Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, University of Riau, Binawidya Campus KM 12.5, Pekanbaru, Riau, Indonesia 28293*
[3] *Department of Aquaculture, Faculty of Fisheries and Marine Sciences, University of Riau, Binawidya Campus KM 12.5, Pekanbaru, Riau, Indonesia 28293*

**Correspondence*: riskafatmawati@lecturer.unri.ac.id

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ABSTRACT

Fishing technology has undergone rapid development in response to sustainability challenges; however, a comprehensive global synthesis of its research progress and future directions remains lacking. To address this gap, this study explores global trends and prospects in fishing technology research using an innovative bibliometric approach. A total of 164 Scopus-indexed documents published between 2009 and 2023, authored by 179 researchers across 33 countries, were analyzed. Bibliometric analysis was conducted using the Biblioshiny application in the Bibliometrix R package, complemented by knowledge domain visualization (KDV) to map scientific structures, collaboration networks, and citation patterns. The results indicate an annual publication growth rate of 12.3%, reflecting increasing global interest in fishing technology. China was identified as the most productive country, with the strongest record of international collaboration, while Cooke SJ emerged as the most influential scholar, with a PageRank score of 0.0204 and accounting for 18.25% of global citations. Keyword mapping revealed research hotspots centered on sustainable development, selective fishing gear, and the integration of digital technologies, including artificial intelligence and electronic monitoring. This study concludes that bibliometric synthesis not only provides a strategic overview of global knowledge gaps and thematic evolution but also highlights the critical role of interdisciplinary collaboration and technological innovation in shaping the future of sustainable fisheries management.

Keywords: *Bibliometrics analysis, fisheries, fishing technology*

INTRODUCTION

Research in fishing technology has evolved substantially over recent decades, propelled by the dual pressures of sustainability and technological innovation (Balaji *et al*. 2023). This multidisciplinary field integrates advancements in fishing gear, vessel design, monitoring systems, and management frameworks to enhance operational efficiency and reduce environmental impacts (Miller and Virmani 2023; Lucchetti *et al*. 2023). With over 150 million people globally relying on fisheries for their livelihoods (FAO 2024), research in this area is critical for ensuring food security, optimizing gear performance, and supporting community resilience (MacLennan 2017; Cerbule *et al*. 2023).

The sector faces pressing challenges, including overfishing, climate change, and habitat degradation, which demand innovative technological solutions. Recent studies have highlighted the pivotal role of selective fishing technologies—such as biodegradable nets and bycatch reduction devices—in minimizing ecological footprints (Antonelo *et al*. 2023; Bhanja *et al*. 2024; François 2024). Digital tools, including electronic monitoring systems and AI-driven analytics, have further transformed fishery management by enhancing data accuracy

and policy implementation (Cooke *et al*. 2021; Singh *et al*. 2024; Sahu *et al*. 2025). Despite a growing body of literature, a consolidated, global-scale synthesis of fishing technology research remains limited (Hilborn *et al*. 2020).

Bibliometric analysis offers a systematic approach for mapping research landscapes, identifying knowledge gaps, and tracing the evolution of themes (Xie *et al*. 2023). Tools like Biblioshiny and VOSviewer facilitate the visualization of publication trends, collaboration networks, and key research clusters in fishing innovation (Prabakusuma *et al*., 2023; Rowan, 2023). Prior studies, including those by Prabakusuma *et al*. (2023) and Qin *et al*. (2024), have explored sustainable aquaculture and innovative fisheries development, while others have examined the intersections of renewable energy (Malatesta *et al*. 2023), circular economy (Gonçalves and Maximo 2023), and eco-friendly fishing gear (Lucchetti *et al.* 2023), revealing thematic shifts and strategic research priorities.

The absence of a consolidated assessment has limited the ability of scholars and policymakers to understand how fishing technology innovations evolve across geopolitical and sustainability contexts. Without such synthesis, it is challenging to identify dominant research trajectories, evaluate the role of influential authors and institutions, and understand how international collaboration drives sustainable technological development. This lack of integration underscores the need for a comprehensive bibliometric analysis that can capture global trends and provide strategic insights. Accordingly, this study explores international trends and prospects in fishing technology research through an innovative bibliometric approach. By analyzing publications from 2009 to 2023, the study maps scientific structures, collaboration patterns, and thematic developments, providing evidence-based insights that can inform future research priorities, industry practices, and policy frameworks for advancing sustainable fisheries.

METHODS

To explore global trends and future directions in fishing technology research, particularly in the context of climate change adaptation, this study employed a bibliometric approach. Building on the methodologies of Mejia *et al*. (2021), Malatesta *et al*. (2023), and Gonçalves and Maximo (2023), the research adopted systematic bibliometric techniques to extract and analyze quantitative data from a broad range of peer-reviewed journal articles, as outlined by Marzi *et al*. (2024). Knowledge domain visualization (KDV) was conducted using Biblioshiny within the Bibliometrix R package to construct a scientometric profile of the field, enabling the identification of sub-themes related to adaptation strategies and adaptive management in fishing technology. This method provides a more efficient and scalable alternative to traditional manual reviews, particularly when dealing with extensive literature corpora (Gan *et al*. 2022; Qin *et al*. 2024) and facilitates a comprehensive understanding of how technological innovation intersects with sustainability imperatives in global fisheries.

Data Collection and Data Acquisition

This study employed advanced bibliometric tools to conduct a comprehensive analysis of global fishing technology research. Specifically, the *Bibliometrix* R package and its web-based interface, *Biblioshiny*, were utilized to perform bibliometric evaluations (Aria and Cuccurullo, 2017). *Biblioshiny* provides an interactive platform that supports importing, converting, filtering, and analyzing bibliographic datasets, while also enabling visualization of scientific structures through knowledge domain mapping (Cuccurullo *et al*. 2025). The metadata for this analysis were extracted from the Scopus database, which is widely recognized for its extensive coverage of multidisciplinary, peer-reviewed journals (Joffre and Schmitt 2019; Pranckute 2021). Scopus was selected due to its reliability, structured metadata, and frequent use in bibliometric research. The search strategy applied Boolean operators to capture relevant literature. The initial search string was:

TS = ("fish capture technology" OR "fishing technology" OR "fishery capture" OR "innovation" OR "advancement" OR "development" OR "techniques").

The query was later refined to:

TS = ("fish capture technology" OR "fishing technology" OR "fishery capture" OR "techniques").

The time frame was restricted to 2009–2023 to capture the most recent developments in fishing technology, reflecting

both technological advancements and sustainability imperatives. From each relevant publication, bibliographic and bibliometric information was systematically gathered and standardized, including publication metadata (title, year, journal, DOI), authorship and institutional details (author names, order of authorship, affiliations, country of origin, and corresponding author), and citation and impact data (total and annual citations, as well as author-level indicators such as h-index, PageRank, and closeness centrality). The dataset also incorporated keyword and thematic information (author and indexed keywords, keyword co-occurrence frequencies, and thematic clusters), journal and source metrics (ISSN, subject categories, and impact indicators such as CiteScore and quartile rankings), collaboration and networking data (single-country and multiple-country publications, co-authorship across authors, institutions, and countries), as well as temporal and trend data (annual publication output, keyword evolution, and identification of emerging or declining themes).

Data Screening Initial

Initially, a systematic search of the Scopus database yielded 2,782 publications. As a result, the search was narrowed to 631 documents published between 2009 and 2023. After further refinement, 467 articles were selected for a detailed analysis on December 27, 2024. To ensure the focus and quality of the dataset, exclusion criteria were rigorously applied. A total of 303 documents were excluded; 300 non-relevant publication types, such as non-scholarly documents, were removed, and three non-English articles were excluded to maintain consistency and clarity in the analysis. Ultimately, 164 high-quality articles directly aligned with the study's objectives were retained.

Data Cleaning and Validation

The data cleaning process was meticulously executed to ensure consistency, accuracy, and completeness of the dataset. This involved several steps: (1) normalization of author names to address variations in name spellings and abbreviations, (2) standardization of institutional affiliations, (3) harmonization of keywords by merging synonyms and correcting inconsistencies, and (4) removal of incomplete entries and duplicate records. Each entry was cross-verified with the original Scopus metadata to minimize errors. The validation process further involved double-checking document metadata—such as publication year, journal name, and DOI—ensuring alignment with Scopus indexing standards. These rigorous data curation procedures were crucial in preserving data integrity and minimizing analytical bias, as emphasized by recent bibliometric studies (Yeoh *et al*. 2025).

Bibliometric Analysis

Two primary tools for data visualization and analysis, VOSviewer and Biblioshiny, were used for the analysis. VOSviewer is sophisticated software designed for constructing and visualizing complex bibliometric networks. It facilitates the analysis of various entities, including authors, institutions, countries, and thematic areas (McAllister *et al.* 2022). The key features of VOSviewer include co-occurrence keyword analysis, source network visualization, author collaboration mapping, country analysis, thematic mapping, and trend topic analysis (Nurhayati *et al*. 2024; Yeoh *et al*. 2025). Its versatility makes it an indispensable tool for uncovering relationships and trends in the scientific literature.

Biblioshiny, an R-based web application in the Bibliometrix package, complements VOSviewer by offering an interactive and accessible platform for bibliometric studies. It supports the retrieval of bibliographic data from multiple sources, including Scopus, Web of Science, and Dimensions. Biblioshiny provides a suite of analytical tools, including annual publication trends, highly cited articles, prominent authors and affiliations, geographic data analysis, and keyword cloud generation. Its widespread adoption in prior studies underscores its reliability in extracting meaningful insights from bibliographic datasets (Malatesta *et al.* 2023; Gonçalves and Maximo 2023). Together, VOSviewer and Biblioshiny provided a robust and comprehensive approach to bibliometric analysis, enabling researchers to effectively visualize and interpret the scientific landscape.

The analytical process encountered several challenges, including inconsistencies in author name formats, variable keyword terminologies, and missing metadata entries. These challenges were systematically addressed through iterative standardization protocols, including the application of uniform naming conventions, harmonization of keyword variations using controlled vocabularies, and filling metadata gaps

through manual verification and cross-referencing with the Scopus database. Additionally, the use of multiple bibliometric

indices such as PageRank, co-authorship centrality, and citation counts provided cross-validation to ensure analytical robustness and mitigate potential biases.

The careful justification of keyword selection and the 2009–2023 timeframe aligned with the study's focus on identifying global trends, research gaps, and collaborative patterns within contemporary fishing technology research. This approach enhances the validity and relevance of findings, offering critical insights for both academic researchers and practitioners seeking evidence-based strategies to advance sustainable fishing technologies. The research methods, processes, data analysis, and tools used in this study are illustrated in Figure 1.

RESULTS

Scientific production, productive and geographical analysis

The most productive authors

The analysis of the most productive authors in the field of fishing technology, as shown in Figure 2, identified a group of influential scholars who have made significant contributions to the body of knowledge. Cooke SJ, Hinch SG, Lucchetti A, and Patterson DA each authored three publications, representing the highest individual productivity in this analysis. This collective contribution accounts for 12 publications, highlighting their substantial role in shaping the research landscape. The authors' consistent output suggests a dedication to advancing critical topics within the field and highlights their leadership in driving innovation and scholarly dialogue in the field of fishing technology. The data also indicated potential collaboration among these authors, further amplifying their influence within the scientific community.

Additionally, several other contributors, including Al-Mousa A, Amir F, and Andalecio MN, have authored two publications each, collectively contributing six additional documents to the domain. Their contributions, although fewer in number, provide critical insights that likely address specific subfields or regional perspectives. The contributions from the top 10 authors amounted to 18 publications, reflecting a concentrated authorship pattern in this field. This distribution emphasizes the importance of both leading and emerging researchers in

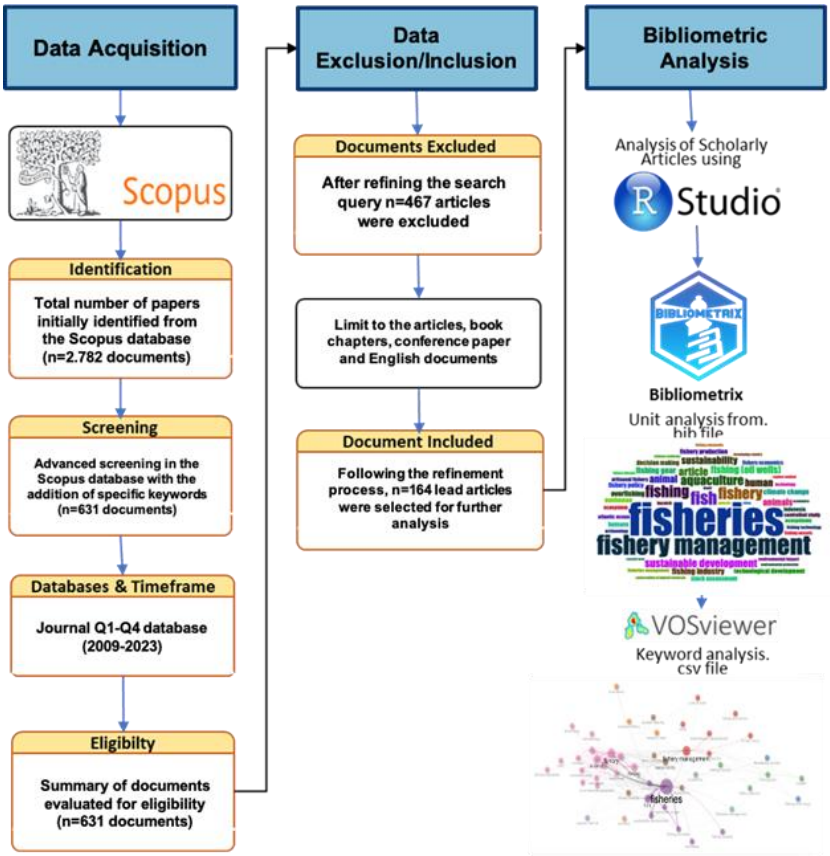


Figure 1 Research process, methods, and instrument.

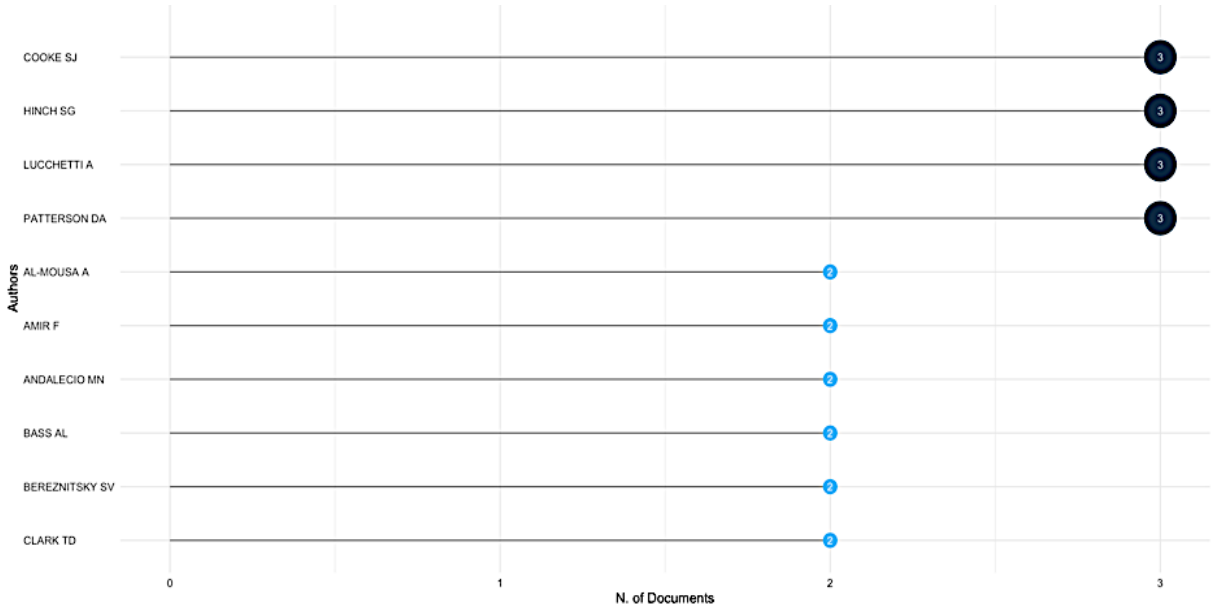


Figure 2 The most productive authors in the field of fishing technology.

advancing their disciplines. Moreover, it highlights opportunities for expanding the research network, encouraging new contributors, and fostering collaborative efforts to diversify and enrich the global discourse on fishing technology.

The authors over time

The temporal analysis of authors' contributions to the field of fishing technology, as shown in Figure 3, highlights the consistent scholarly output from key researchers over the years. Cooke SJ exhibited sustained productivity from 2010 to 2023, with a total of three publications, peaking in recent years, and demonstrating continued engagement with emerging topics. Similarly, Hinch SG, Patterson DA, and Lucchetti A each contributed three articles, reflecting steady involvement in advancing the field over a comparable timeframe. Meanwhile, emerging contributors, such as Al-Mousa A, Amir F, and Andalecio MN, published two articles each, primarily concentrated between 2015 and 2020, suggesting a focus on specific research themes during this period. The overlapping publication timelines of the leading authors indicate potential collaboration, which may have driven innovation and strengthened the field's development. This temporal pattern highlights the critical role of both established researchers, who provide consistent contributions, and emerging scholars, who offer fresh perspectives, in fostering the dynamic growth of fishing technology research. These findings emphasize the importance of sustaining a balance between senior researchers' long-term engagement and the inclusion of new voices to ensure the continuous innovation and diversification of scholarly discourse.

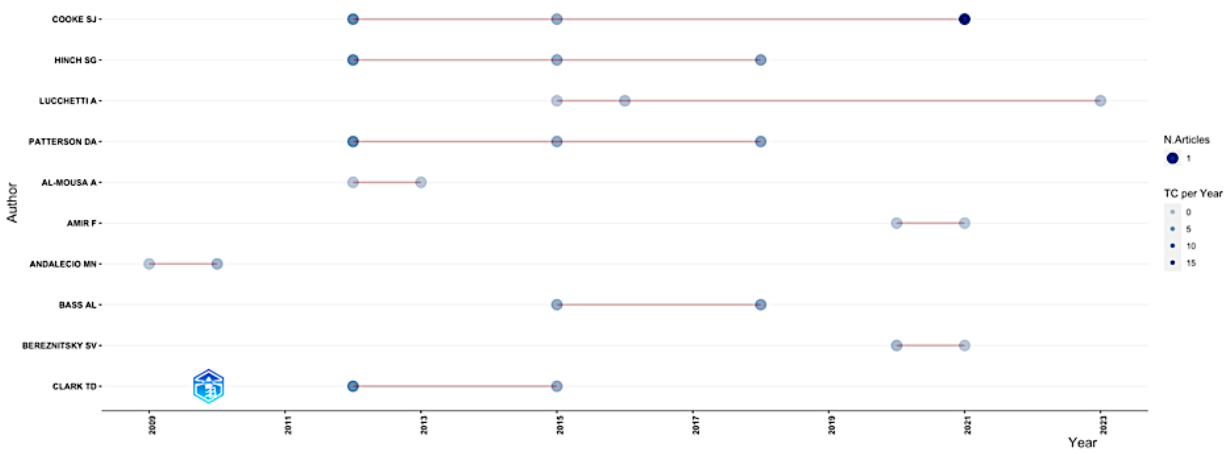


Figure 3 The authors over time.

The most globally cited documents

An analysis of the most globally cited documents in the field of fishing technology, as illustrated in Figure 4, underscores the significant impact of several key studies. The publication by Miller and Virmani (2023) in Marine Drugs stands out as the most influential, with 226 citations, reflecting its profound contribution to the field. Similarly, Garcia (2005) and Kennelly (2002), both published in Philosophical Transactions of the Royal Society B: Biological Sciences and Fish and Fisheries, respectively, have garnered 117 citations, highlighting their pivotal role in advancing theoretical and practical knowledge. Cooke SJ's 2012 article in Philosophical Transactions of the Royal Society B has received 109 citations, further emphasizing its substantial influence on subsequent research.

Other notable works include Engård OR (2014) with 89 citations, Cooke SJ's 2013 article with 74 citations, and contributions by Frick LH (2009) and Varjopuro R (2011), accumulating 61 and 50 citations, respectively. The results showed that Cookie SJ, with a PageRank of 0,0204, 18.25%, three total publications from 2009 to 2023, and closeness values of 0,0105, was the most productive author within the field. These documents collectively indicate a concentration of high-impact research that addresses critical issues, such as sustainable fisheries, technological innovation, and policy frameworks. The dominance of these publications in terms of citation count highlights their foundational role in shaping discourse and providing robust frameworks for future studies on fishing technology. These findings underscore the crucial role of citation analysis in identifying seminal works and their significant contributions to academic and practical advancements in the field.

The most productive countries

The most productive countries in fishing technology research highlight the significant contributions from both single-country publications (SCP) and multiple-country publications (MCP). China emerged as the leading contributor, with a total of 22 publications, comprising a strong proportion of SCPs, showcasing its robust domestic research efforts. Indonesia closely followed 19 publications, demonstrating a balanced combination of SCPs and MCPs, which indicates its active involvement in international collaboration. The United States ranks third, contributing 17 publications with a significant share of MCPs, reflecting its strong engagement in global research networks.

Other notable contributors include Canada and Italy, each with 12 publications, and Australia, with 11 publications, all displaying a mix of SCPs and MCPs. These countries underscore the increasing importance of international partnerships in addressing the complex challenges in fishing technology. Spain and Denmark, each with eight publications, and Finland and India, each contributing six publications, further underscore the global distribution of research activities. The data revealed a significant interplay between national and international efforts, emphasizing the critical role of collaboration in advancing this multidisciplinary field. These trends highlight the importance of cultivating international networks to drive innovation and develop sustainable solutions for fishing technology (Figure 5).

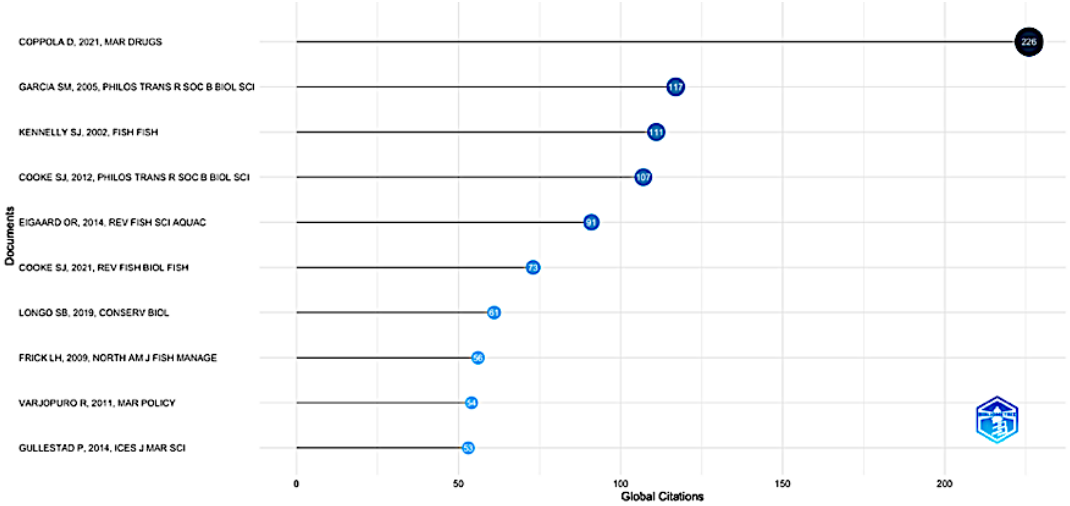


Figure 4 The most globally cited documents

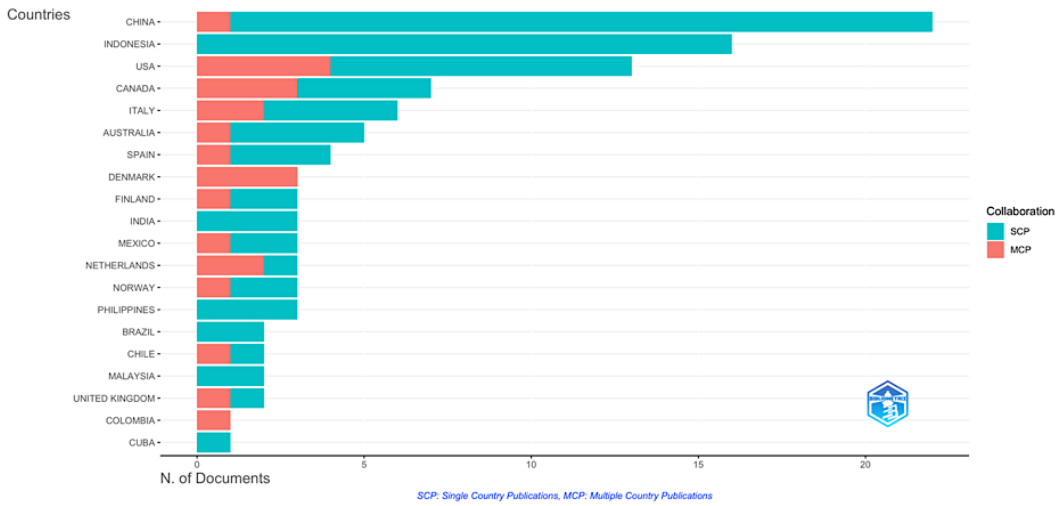
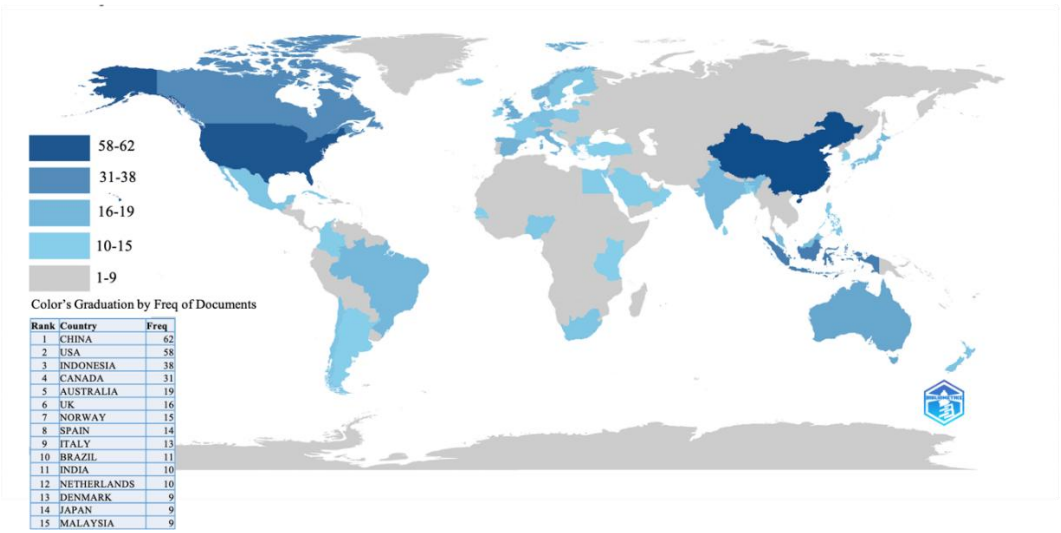


Figure 5 The most productive countries

Global collaboration map based on the location of authors, the number of scientific publications, and the strength of networking links strength

The global collaboration map, depicted in Figure 6, highlights the geographic distribution and collaborative networks in fishing technology research. Countries with darker shades of blue, such as China, the United States, and Indonesia, have emerged as the most productive countries, reflecting their substantial contributions to scientific production in this field. China has 22 publications, followed by the United States and Indonesia with 17 and 19 publications, respectively, indicating their pivotal roles in shaping global research output. The map also underscores the strong collaborative networks of these nations, particularly the United States, which exhibits significant multiple-country publications (MCP), demonstrating robust international partnerships.

It is further interesting to note that, in addition to these leading nations, countries such as Canada, Italy, and Australia, each with 12 to 11 publications, also play critical roles in fostering regional and global collaboration. The spread of lighter blue shades across regions, such as Europe, South America, and parts of Asia, suggests a growing interest in fishing technology research among emerging contributors, such as Brazil, Malaysia, and the Philippines. This map illustrates not only the concentration of research productivity in key countries but also the strengthening of global networks, emphasizing the importance of collaborative efforts in addressing complex and interdisciplinary challenges within the domain of fishing technology. These findings underline the need to further expand international partnerships to ensure equitable contributions and dissemination of innovative solutions worldwide.



Rank	Country	Freq
1	CHINA	62
2	USA	58
3	INDONESIA	38
4	CANADA	31
5	AUSTRALIA	19
6	UK	16
7	NORWAY	15
8	SPAIN	14
9	ITALY	13
10	BRAZIL	11
11	INDIA	10
12	NETHERLANDS	10
13	DENMARK	9
14	JAPAN	9
15	MALAYSIA	9

Figure 6 Global collaboration map

Co-occurrence Network and Keywords Analysis

The co-occurrence network analysis of keywords, visualized through VOSviewer and depicted in the figures, offers a comprehensive understanding of the conceptual structure and thematic landscape in fishing technology research. From 164 articles analyzed, a total of 2,935 keywords were initially extracted. After applying a threshold of 11 occurrences, 73 keywords were retained for detailed analysis, ensuring the focus remained on terms with significant relevance and influence across the dataset.

The co-occurrence mapping reveals six primary clusters, each representing distinct thematic domains within the field. The purple cluster, which dominates the network, is anchored by terms such as fisheries, fish, ecosystems, environmental impacts, sustainable development, Indonesia, and fishing vessels. This cluster reflects the foundational pillars of fisheries science, emphasizing ecological considerations, resource sustainability, and the socio-economic contexts of fishing communities. The inclusion of Indonesia highlights the country's growing prominence in global fisheries research, particularly in the context of small-scale and tropical fisheries (Figure 7).

Conceptually, the purple cluster encapsulates a systems-oriented perspective, where fisheries are viewed not merely as extractive activities but as integral components of coupled human-natural systems. The presence of environmental impacts and sustainable development indicates a growing scholarly focus on the trade-offs and synergies between fisheries productivity and ecological integrity, aligning with global sustainability agendas.

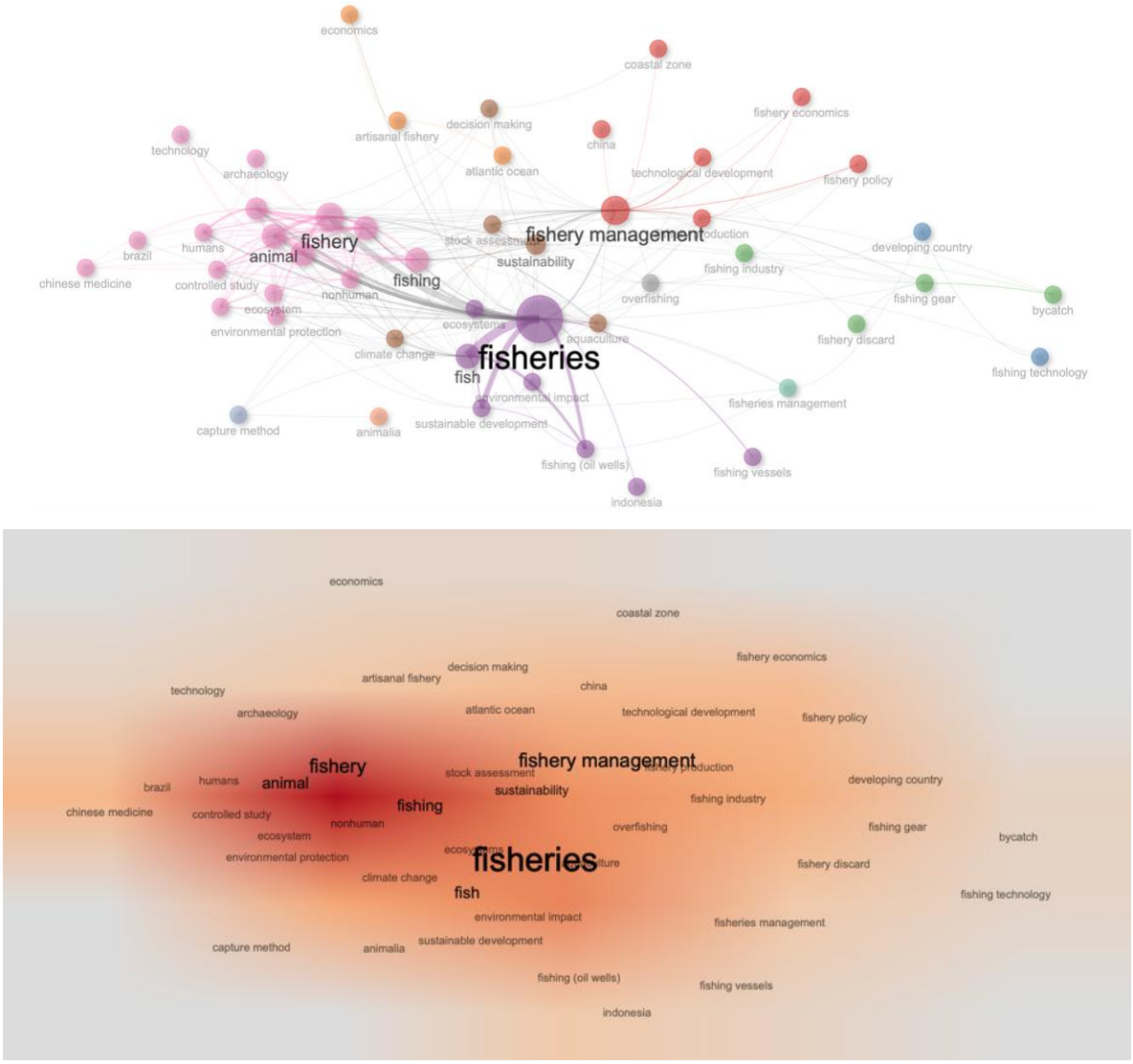


Figure 7 Keywords Analysis

The pink cluster represents an interdisciplinary nexus that connects fisheries, fishing, humans, articles, environmental protection, conservation of natural resources, and ecosystems. This cluster suggests an emergent thematic frontier in fisheries research: the integration of human dimensions and biodiversity conservation within fisheries science. It highlights the growing recognition that effective fisheries management must consider socio-cultural factors, stakeholder engagement, and the ethical implications of resource use. The co-occurrence of environmental protection and conservation of natural resources underscores a shift from traditional stock assessment approaches toward ecosystem-based and rights-based fisheries governance.

The red cluster centered on fishery management, technological development, fishery policy, fishery economics, and China signifies the policy and innovation frontier of the field. This cluster illustrates a conceptual focus on institutional frameworks, governance models, and economic drivers of fisheries sustainability, emphasizing the global relevance of technological advancements and policy reforms in driving equitable and effective resource management.

Other clusters, blue (fishing gear, bycatch, fishing technology, orange (atisana fishery, economics, decision making), gray (capture method, overfishing), and brown (climate change, aquaculture, sustainability, decision-making), represent specialized sub-domains. These clusters highlight targeted research areas, including the development of selective fishing gear, the socio-economic implications of artisanal fisheries, the mitigation of bycatch and overfishing, and the adaptation of fisheries to climate change impacts.

The thematic novelty of this analysis lies in its ability to capture the multidimensional evolution of fishing technology research. It reveals a field in transition from a predominantly gear-centric and ecological focus toward a more integrative, transdisciplinary perspective that bridges technological innovation, environmental stewardship, and human well-being. The prominence of clusters addressing climate change, sustainability, and decision-making indicates an increasing alignment of fisheries research with broader global priorities, emphasizing adaptive management, resilience building, and equitable access to technological benefits.

These findings suggest that future research in fishing technology must move beyond isolated technical innovations to embrace a systems-thinking approach integrating ecological data, technological tools, socio-economic considerations, and participatory governance to address the complex, multi-scalar challenges of sustainable fisheries management in the Anthropocene.

The cloud mapping

The word cloud analysis generated through Biblioshiny (Figure 8) offers a macro-level visuaization of dominant terms in fishing technology research, with a minimum threshold of 100 occurrences. Key terms such as fisheries, fishery management, and sustainable development emerge as central, underscoring the field's strong orientation toward sustainability. This reflects a consistent alignment with global policy frameworks, particularly the UN Sustainable Development Goal 14, which advocates for the conservation and sustainable use of marine resources.

Figure 8 The cloud mapping

Conceptually, the prominence of management-related terms suggests that much of the discourse is grounded in policy and governance, addressing both ecological sustainability and socioeconomic resilience. The frequent occurrence of sustainable development suggests an increasing scholarly focus on integrating environmental stewardship with the livelihoods of fishing-dependent communities. In parallel, the emergence of keywords like fishing gear, bycatch, aquaculture, and climate change signals a thematic broadening toward technological innovation and ecological challenges, with growing attention to ecosystem-based management and data-driven assessments such as stock assessment and environmental impact.

Furthermore, the appearance of interdisciplinary terms such as "decision making, "economics," and "human " alongside technical terms like "technological development" illustrates the integration of fisheries science with socio-political and economic dimensions. The word cloud complements co-word network analysis by offering a high-level thematic snapshot that reflects both continuity and emerging trends. This mapping emphasizes a paradigm shift from isolated gear-focused studies to systems-thinking approaches, highlighting the need for future research to bridge the gap between innovation and its governance, ensuring practical applicability and equity in marine resource management.

Research Trend Topics

The temporal mapping of fishing technology research (Figure 9) reveals a rich and evolving landscape, reflecting both enduring themes and emerging frontiers. Foundational topics such as climate change, controlled study, and sustainable development have remained central since the late 1980s, demonstrating a long-standing commitment to environmental stewardship and resilience. These enduring themes have shaped the discourse around fisheries governance, influencing policy frameworks and aligning with broader global imperatives such as the United Nations Sustainable Development Goal (SDG) 14.

Entering the early 2000s, the research focus expanded to include terms like fisheries management, fishing gear, and technological development. This marked a shift toward addressing operational and engineering aspects of fisheries sustainability, particularly in response to practical challenges such as overfishing and bycatch. The clustering of these terms signals a conceptual evolution in which ecological concerns are now deeply intertwined with innovation in fishing gear design, selective harvesting techniques, and data-driven decision-support systems.

Since 2015, there has been a notable surge in research surrounding fishing technology, decision-making, and bycatch, reflecting increased attention to governance, participatory management, and the socio-ecological complexity of marine systems. The frequency of terms related to environmental impact and overfishing also highlights a heightened urgency in mitigating anthropogenic stressors, underscoring the need for holistic and adaptive approaches that balance productivity with sustainability.

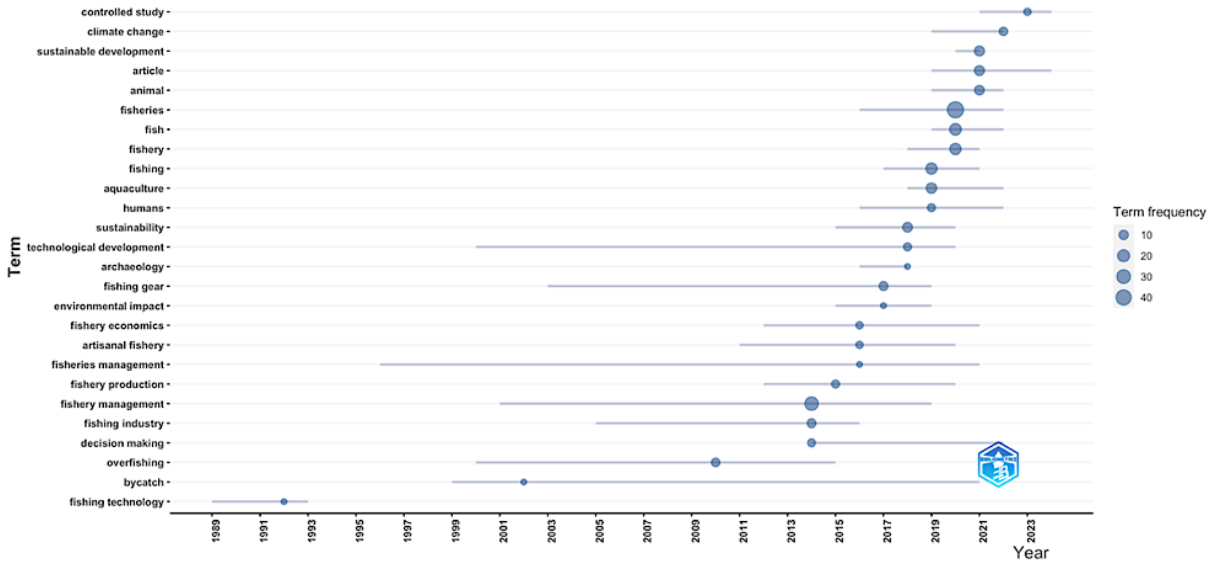


Figure 9 The Research trend topics

Thematically, this trajectory illustrates the maturing of fishing technology research from a gear-centric focus to a systems-oriented paradigm. The integration of technological development, ecosystem modeling, and climate adaptation with socio-economic and governance dimensions represents a significant epistemological shift. This interdisciplinary convergence underscores the importance of transdisciplinary strategies that integrate innovation, equity, and environmental responsibility.

Finally, the study identifies key contributors and trends that define the global research landscape. Cooke SJ stands out as the most influential author (PageRank = 0.0204; 18.25% of global citations), while China emerges as the most productive country, contributing 164 documents and exhibiting the strongest international collaboration network. These findings align with the study's objectives to map research dynamics, identify thematic priorities, and evaluate leadership in the field. Despite limitations—including reliance on Scopus and English-only publications—the study offers actionable insights for researchers, practitioners, and policymakers striving toward sustainable, inclusive, and technologically advanced fisheries management.

The best reference articles on the topic

Several supporting articles on the trend topic of fishing technology are presented in Table 1.

Table 1 References articles on the topic

No.	Author(s)	Year	Title	Journal	Citations (as of 2025)	DOI
1	Lucchetti, A. *et al.*	2023	Innovations in fishing technology aimed at sustainable fishing	*Frontiers in Marine Science*	65	10.3389/fmars.2023.1310318
2	François, B.	2024	Innovative fishing technologies as alternatives to bottom trawling	*European Parliamentary Research Service*	40	10.2861/357645
3	Rowan, N. J.	2023	The role of digital technologies in fisheries and aquaculture	*Aquaculture and Fisheries*	55	10.1016/j.aaf.2022.06.003
4	Sahu, A. *et al.*	2025	AI and GPS for revolutionizing fisheries management	*International Books & Periodicals*	30	N/A
5	Qin, Q. Y. *et al.*	2024	Development trends of smart fisheries in China	*Fishes*	25	10.3390/fishes9070258
6	Yang, W. *et al.*	2025	Sustainable marine fisheries policy reflections from China	*Marine Policy*	22	10.1016/j.marpol.2024.106439
7	Xiong, M. *et al.*	2024	Policy evolution and challenges for small-scale coastal fisheries	*Fishes*	18	10.3390/fishes9110451
8	Bhanja, A. *et al.*	2024	Selectivity of different fishing gears: A case study	*Indian J. Pure & Applied Biosciences*	15	10.18782/2582-2845.9072
9	Marzi, G. *et al.*	2024	Guidelines for bibliometric-systematic literature reviews	*Int. J. Management Reviews*	12	10.1111/ijmr.12381
10	Miller and Virmani	2023	Advanced marine technologies for ocean research	*Deep-Sea Research Part II: Tropical Studies in Oceanography*	5	10.1016/j.dsr2.2023.105340

DISCUSSION

The findings from this study reveal the dynamic and evolving nature of research on fishing technology, emphasizing its critical role in addressing global challenges related to sustainable fisheries management and resource conservation. The analysis of productive authors, countries, and collaborative networks highlights the contributions of leading scholars and nations in the advancement of this field. For example, Cooke SJ, Hinch SG, and Lucchetti A, with three publications each, represent key contributors to scholarly discourse, whereas countries such as China (22 publications), Indonesia (19 publications), and the United States (17 publications) play pivotal roles in driving innovation and collaboration. These insights underscore the importance of sustained research efforts and international partnerships in effectively addressing interdisciplinary challenges (Jyoti 2024). China was determined to be the most powerful country in the world in this field, with the strongest collaboration network. China has a strong interest in improving its research in all aspects of fisheries (Yu and Han 2021). China is the world's largest producer, processor, and re-exporter of fish, making its fisheries sector crucial for both domestic food security and the global seafood trade (He 2016; Su et al. 2020. The fisheries sector makes a significant contribution to China's economy by providing employment and supporting livelihoods, particularly in coastal regions (Xiong et al. 2024).

This study also highlights the significance of citation impact in understanding foundational research. Citation analysis revealed that publications with high impact, such as those by Miller and Virmani (2023) and Garcia (2005), continue to influence current research directions. Trends over the past decade have shown an increasing emphasis on sustainable practices, with 117 citations serving as benchmarks for advancing theoretical frameworks and practical applications in fishing technology. Furthermore, the analysis of research trends reveals a shift in focus from foundational themes, such as "sustainable development" and "climate change," to more specialized topics, including "fishing technology," "decision-making," and "bycatch," since 2015. This evolution reflects a growing emphasis on integrating technological innovation with sustainability principles to mitigate overfishing and environmental degradation (Sissenwine et al. 2014). The adoption of eco-friendly fishing gear and practices, as seen in the Bajo community in Indonesia, helps protect marine environments while supporting local economies (Syarif et al. 2024). Effective environmental governance, including stringent regulations and enforcement, is crucial for mitigating the impact of overfishing and environmental degradation. Technological innovation plays a mediating role in enhancing the effectiveness of these governance measures (Hou et al. 2021; Yang et al. 2025).

Digital tools, particularly AI, remote sensing, and IoT devices, have become instrumental in enhancing fisheries management. These technologies enable real-time monitoring, improve regulatory compliance, and enhance the accuracy of stock assessments (Rowan 2023; Sahu et al. 2025). However, disparities in adoption across regions call for increased investment in capacity building and technology transfer, particularly in the Global South.

The importance of fishing technology research lies in its potential to address global priorities such as the United Nations Sustainable Development Goals (SDGs), particularly SDG 14, which advocates for the conservation and sustainable use of aquatic resources. Innovative fishing technologies can significantly reduce bycatch, improve resource efficiency, and enhance the socioeconomic resilience of fishing communities. For example, advancements in sensor-based gear, eco-friendly fishing methods, and data-driven decision-making frameworks have transformed traditional fisheries into more sustainable and adaptive systems. (Fujii et al. 2018; Fatmawati et al. 2020; Lucchetti et al. 2023).

To contextualize the importance of this research, a review of recent literature (2015–2024) provides critical insights. Studies have emphasized the role of technological innovation in reducing ecological footprints (Feng et al. 2022; Yulisti et al. 2024), while contributions have explored the integration of fishing technology with local knowledge for sustainable fisheries management. Similarly, studies (Cámara and Santero-Sánchez 2019; Mohammed et al. 2018) emphasize the socio-economic benefits of sustainable fishing practices, underscoring their relevance to policy and governance frameworks.

CONCLUSIONS

In conclusion, this study showed that Cookie, with a PageRank of 0,0204, 18.25% (74) global citations, three total publications from 2009 to 2023, and closeness values of 0,0105, was the most productive author within the field. China was determined to be the most productive country (164 valid documents) and had the most robust collaboration network. The primary research highlights in fishing technology encompass fisheries, fishery management, sustainability, and fishing practices. The insights presented offer researchers a roadmap for identifying knowledge gaps and advancing interdisciplinary collaboration, while practitioners and policymakers gain evidence-based guidance for implementing sustainable fishing practices and enhancing global fisheries management strategies.

RECOMMENDATION

To enhance sustainability and traceability in fisheries, policymakers are encouraged to develop and allocate funding for programs that integrate advanced fishing technologies, especially in data-poor regions. Such initiatives can bridge the technological gap and support evidence-based management. For researchers, future studies should emphasize the integration of artificial intelligence (AI) and big data analytics into fisheries management, while also promoting interdisciplinary and cross-sectoral collaborations to address complex challenges more effectively. Meanwhile, industry stakeholders are advised to invest in environmentally friendly fishing gear and adopt digital technologies that can minimize ecological footprints while simultaneously improving operational efficiency across the value chain.

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REFERENCES

Antonelo S, Richardson K. 2023. *Fishing Gear Recycling Technologies and Practices.* Rome: The Food and Agriculture Organization of the United Nationts and International Maritime Organization.

Aria M, Cuccurullo C. 2017. Bibliometrix: an R-tool for Comprehensive Science Mapping Analysis. *Journal of Informetrics.* 11(4): 959-975. DOI: https://doi.org/10.1016/j.joi.2017.08.007.

Balaji M, Soumyabrata S, Karunakaran S, Shobiya S. 2023. Technological Innovation in Fisheries Sector. *Trend in Agriculture Science.* 2(6): 411-414. DOI: https://doi.org/10.5281/zenodo.8037283.

Bhanja A, Pijush P, Basudev M. 2024. A Study on the Selectivity of Different Fishing Gear. *Indian Journal Pure Application Bioscience.* 12(2): 8-19. DOI: http://dx.doi.org/10.18782/2582-2845.9072.

Cámara A, Santero-Sánchez R. 2019. Economic, Social, and Environmental Impact of a Sustainable Fisheries Model in Spain. *Sustainability (Switzerland)*. 11(22): 1-16. DOI: https://doi.org/10.3390/su11226311.

Cerbule K, Bent H, Zeljka T, Mirela P, Svjetlana KS, Eduardo G, Roger BL, Jure B. 2023. Use of Biodegradable Materials to Reduce Marine Plastic Pollution in Small Scale Coastal Longline Fisheries. *Journal for Nature Conservation.* 74: 1-10. DOI: https://doi.org/10.1016/j.jnc.2023.126438.

Cooke SJ, Paul V, William MT, Robert JL, Jacob WB, Christian S, Kieran H, Cory D.S, Ben KD, Robert A, Andy JD. 2021. Technological Innovations in the Recreational Fishing Sector: Implications for Fisheries Management and Policy. *Reviews in Fish Biology and Fisheries.* 31(2): 253-88.

Cuccurullo C, Misuraca M, Spano M, D'Aniello L, Gnasso A, Belfiore A, Aria M. 2025. *Bibliometrix*. Italy: Academic Spin-off of the University of Naples Federico II.

FAO. 2024. *The State of World Fisheries and Aquaculture 2022*. Food and Agriculture Organization of the United Nations.

Fatmawati R, Riyanto M, Wahju RI, Sumardi. 2020. Fish Behavior Characterization with an RGB-LED Intensity Based on Pulse Width Modulation (PWM) System in Fixed Lift Net. *IOP Conference*

Series: Earth and Environmental Science. 584: 1-9. DOI:10.1088/1755-1315/584/1/012032.

Feng S, Yu C, Hongjuan Y, Xixi Y, Guoxiang L. 2022. Digital Financial Development and Ecological Footprint: Evidence from Green-biased Technology Innovation and Environmental Inclusion. 380: 135069. DOI: https://doi.org/10.1016/j.jclepro.2022.135069.

François B. 2024. *Exploring the Viability of Innovative Fishing Technologies as an Alternative to Bottom Trawling in European Marine Protected Areas.* Brussels: European Parliamentary Research Service.

Fujii H, Yoshitaka S, Atsushi H, John B, Kiyoshi S, Yoshiki M. 2018. Research and Development Strategy for Fishery Technology Innovation for Sustainable Fishery Resource Management in North-East Asia. *Sustainability (Switzerland).* 10(1): 1-12. DOI: https://doi.org/10.3390/su10010059.

Gan Y, Duo L, Nicola, Jian-ping L. 2022. Practical Guidance on Bibliometric Analysis and Mapping Knowledge Domains Methodology-A Summary. *European Journal of Integrative Medicine.* 56: 102203. DOI: https://doi.org/10.1016/j.eujim.2022.102203.

Gonçalves MLMBB, Maximo GJ. 2023. Circular Economy in the Food Chain: Production, Processing and Waste Management. *Circular Economy and Sustainability*. 3: 1405-1423. DOI: https://doi.org/10.1007/s43615-022-00243-0.

He J. 2016. Enhancing Chinese Law and Practice to Combat Illegal, Unreported and Unregulated Fishing and Trade. *Asia Pacific Journal of Environmental Law*. 19(1): 4-28. DOI: https://doi.org/10.4337/apjel.2016.01.01.

Hilborn R, Amoroso RO, Anderson CM, Baum JK, Branch T, Costello C, De Moor C, Faraj A, Hively D, Jensen O, Kurota H, Little R, Mace P, Mcclanahan T, Melnychuk MC, Minto C, Osio GC, Parma A, Pons M, Segurado S, Szuwalski C, Wilson JR, Ye Y. 2020. Effective Fisheries Management Instrumental in Improving Fish Stock Status. *Proceedings of The National Academy of Sciences of the United States of America*. 117(4): 2218–2224.

Hou N, Zhu Q, Yang J, Zhang D, Liu W, Chang H. 2021. The Impact of Environmental Governance on the Development of Fishery Economy—the Intermediary Role of Technological Innovation. *Sustainability (Switzerland)*. 13(20): 1-15. DOI: https://doi.org/10.3390/su132011378.

Joffre OM, Schmitt K. 2019. A Brief History of Mangrove Distribution and Coastline Development in Soc Trang Province, Vietnam, to Address Coastal Management Strategies. *Advances in Global Change Research*. 64: 67-85. DOI: https://doi.org/10.1007/978-3-319-90400-9_5.

Jyoti DP. 2024. *Interdisciplinary Collaboration in Research*.

Lucchetti A, Valentina M, Jure B. 2023. Editorial: Innovations in Fishing Technology Aimed at Achieving Sustainable Fishing. *Frontiers in Marine Science.* 10: 1-6. DOI: 10.3389/fmars.2023.1310318.

MacLennan DN. 2017. Reflections on Technology and Science in Fishery Research. *ICES Journal of Marine Science.* 74(8): 2069-2075. DOI: https://doi.org/10.1093/icesjms/fsx045.

Malatesta T, Morrison GM, Breadsell JK, Eon C. 2023. A Systematic Literature Review of the Interplay Between Renewable Energy Systems and Occupant Practices. *Sustainability (Switzerland)*. 15(12): 1-27. DOI: https://doi.org/10.3390/su15129172.

Marzi G, Marco B, Andrea C, Massiniliano MP. 2024. Guidelines for Bibliometric-Systematic Literature rEviews: 10 steps to Combine Analysis, Synthesis and Theory Development. *International Journal of Management Reviews.* 27(1): 81-103. DOI: https://doi.org/10.1111/ijmr.12381.

McAllister JT, Lora Lennertz, Zayuris AM. 2022. Mapping a Dicipline: A Guide to Using VOSviewer for Bibliometric and Visual Analysis. *Science and*

Technology Libraries. 41(3): 319-348. DOI: https://doi.org/10.1080/0194262X.2021.1991547.

Mejia C, Wu M, Zhang Y, Kajikawa Y. 2021. Exploring Topics in Bibliometric Research Through Citation Networks and Semantic Analysis. *Frontiers in Ressearch Metrics and Analytics.* 6: 1-16. DOI: https://doi.org/10.3389/frma.2021.742311.

Miller A, Virmani JI. 2023. Advanced Marine Technologies for Ocean Research. *Deep Sea Research Part II: Tropical Studies in Oceanography*. 212: 1-6. DOI: https://doi.org/10.1016/j.dsr2.2023.105340.

Mohammed EY, Dave S, Paul S. 2018. Fiscal Reforms for Sustainable Marine Fisheries Governance: Delivering the SDGs and Ensuring No One is Left Behind. *Marine Policy.* 93: 320-338. DOI: 10.1016/j.marpol.2017.05.017.

Nurhayati S, Alni R, Arni S. 2024. Digitalization of MSMEs: A Bibliometric Analysis Using Biblioshiny and VOSviewer. *Multidisciplinary Reviews.* 7(6): 1-10.

Prabakusuma AS, Budi W, Mochammad F, Armen Z, Mas TDS, Mat S, Mohammed A, Sebastian S, Tenny A, Radityo P. 2023. A Bibliometric Approach to Understanding the Recent Development of Self-Sufficient Fish Feed Production Utilizing Agri-Food Wates and By-Products Towards Sustainable Aquacluture. *Heliyon.* 9(7): 1-18. DOI: https://doi.org/10.1016/j.heliyon.2023.e17573.

Pranckute R. 2021. Web of Science (WoS) and Scopus: The Titans of Bibliographic Information in Today's Academic World. *Publications.* DOI: https://doi.org/10.3390/publications9010012.

Qin QY, Jia-Ying L, Yong-He C, Xin-Ruo W, Ta-Jen C. 2024. Knowledge Mapping of the Development Trend of Smart Fisheries in China: A Bibliometric Analysis. *Fishes.* 9(7): 1-26. DOI: https://doi.org/10.3390/fishes9070258.

Rowan NJ. 2023. The Role of Digital Technologies in Supporting and Improving Fishery and Aquaculture Across the Supply Chain-Quo Vadis?. *Aquaculture and Fisheries*. 8(4): 365-374. DOI: https://doi.org/10.1016/j.aaf.2022.06.003.

Sahu A, Devarshi R, Sagar S, Gowhar I, Neelesh K. 2025. *Revolutionizing Fisheries Management and Conservation: The Role of AI and GPS.* India: International Books and Periodical Supply Service.

Sissenwine MM, Pamela MM, Hans JL. 2014. Preventing Overfishing: Evolving Approaches and Emerging Challenges. *ICES Journal of Marine Science* 71(2): 153-56.

Singh H, Devarshi R, Priyanka V, Aditya KU, Pramod K, Anil S. 2024. Current Issue with Fish and Fisheries Sector: Challenges and Solutions. *Biotica Research Today.* 6(1): 39-45. DOI: https://doi.org/10.54083/BioResToday/6.1.2024/39-45

Su S, Tang Y, Chang B, Zhu W, Chen Y. 2020. Evolution of Marine Fisheries Management in China from 1949 to 2019: How did China Get Here and Where Does China Go Next?. *Fish and Fisheries*. 21(2): 435-452. DOI: https://doi.org/10.1111/faf.12439.

Syarif E, Marlina, Saputro A. 2024. Environmental Friendship Levels of Bajo Fishers to Build a Blue Economy in Achieving the 2030 SDGs. *Environment Asia*. 17(2): 38-49. DOI: https://doi.org/10.14456/ea.2024.19.

Xie J, Zhihe B, Qiang Wu, Lin T, Feng Wu, Tian L. 2023. Global Knowledge Domain and Prospects in Tuna Research: A Bibliometric Analysis. *Aquaculture and Fisheries* 8(2): 202-210. DOI: 10.1016/j.aaf.2021.09.005.

Xiong M, Wu Z, Qi G, Jiang K, Zhao N, Jiang W. 2024. Exploring Policy of Small-Scale Coastal Fisheries in China: Evolution, Challenges and Prospects. *Fishes*. 9(11): 1-20. DOI: https://doi.org/10.3390/fishes9110451.

Yang W, Chen X, Liu Y. 2025. Recent Developments in Building Sustainable Marine Fisheries in China: Reflections on the 2023 Revision of the Marine Environmental Protection Law. *Marine Policy*. 171: 106439. DOI: https://doi.org/10.1016/j.marpol.2024.106439.

Yeoh RQ, Selvan P, Mathivannan J. 2025. A Bibliometric Analysis: The R-Tool for Analysing the Technology Acceptance Model (TAM) in Scopus. *Multidisciplinary Reviews.* 8(5): 1-10. DOI: 10.31893/multirev.2025149.

Yu J, Han Q. 2021. Exploring the Management Policy of Distant Water Fisheries in China: Evolution, Challenges and Prospects. *Fisheries Research.* 236: 2-10. DOI: https://doi.org/10.1016/j.fishres.2020.105849.

Yulisti M, Agus SH, Carunia MF, Ummi M, Nendah K, Eka N. 2024. Effects of Eco-Friendly Fishing Gears on Fishermen's Welfare and Sustainable Fisheries: Lessons Learned from Indonesia. *Marine Pollution Bulletin.* 198: 2025149. DOI: https://doi.org/10.1016/j.marpolbul.2023.115888.