The Journal of Navigation (2025), **78**:2-3 262–279
doi:10.1017/S0373463325101094

CAMBRIDGE UNIVERSITY PRESS

RESEARCH ARTICLE

Maritime piracy bibliometric analysis: A literature overview and map review

Pedro Merino Laso[1,2] and Loïc Salmon[3]

[1]French Maritime Academy (ENSM), Nantes, France
[2]Arts et Metiers Institute of Technology, Ecole Navale, IRENAV EA 3634, BCRM de Brest, CC600, 29240 Brest Cedex 9, France
[3]ISEA, University of New Caledonia, Noumea, New Caledonia
Corresponding author: Pedro Merino Laso; Email: pedro.merino-laso@supmaritime.fr

Received: 18 April 2024; **Revised:** 16 May 2025; **Accepted:** 13 July 2025; **First published online:** 03 September 2025

Keywords: bibliometric analysis; literature overview; maritime piracy; maritime security

Abstract
Maritime piracy represents a significant international challenge, impacting both economic stability and political dynamics. Researchers from diverse disciplines have been drawn to this multifaceted issue, each aiming to understand and address different aspects of piracy's impact and implications. This study offers a comprehensive overview of maritime piracy research based on bibliographic analysis. Its objective is threefold. First, to delineate the key domains of inquiry within maritime piracy research. These domains encompass a wide range of topics, including the socio-economic drivers of piracy, the legal frameworks governing maritime security, and computer science to analyse piracy acts. Second, to identify major contributions in the field, recognising seminal works, influential authors and significant findings related to maritime piracy. Lastly, to discern emerging research trends within maritime piracy, and to identify novel areas of inquiry, innovative methodologies and promising avenues for future exploration. Furthermore, the most popular datasets from these studies that include relevant information are presented in this work.

1. Introduction

Maritime piracy is an ancient phenomenon that has endured through the ages, evolving with the times to adapt to new geopolitical and technological realities. This scourge, characterised by acts of violence, theft and ship hijackings on the high seas, stands as a significant threat to maritime security.

Over the last few decades, maritime piracy has attracted worldwide attention, notably due to repeated attacks off the coast of Somalia, targeting mainly commercial vessels for ransom, creating an international maritime crisis and prompting scientific work on piracy data (Marchione and Johnson, 2013).

Moreover, technological advancements have significantly transformed the landscape of piracy, introducing more sophisticated methods such as cyber piracy. This form of piracy aims to compromise the security of ships' navigation and communication systems, emphasising the necessity to revise security regulations and deploy advanced technologies to address emerging threats (Merino Laso et al., 2021).

The attention given to this issue, the maritime piracy, by international organisations can be evidenced by their investment in European projects. Two such examples of contributions are ISOLA (Innovative and Integrated Security System on Board Covering the Life Cycle of a Passenger Ship's Voyage) and TRUST (Towards Resilient and Sustainable Container Supply Chain). ISOLA aims to enhance the security of cruise ships, addressing concerns such as piracy (Salmon et al., 2021). Meanwhile, TRUST focuses on securing container transportation, particularly in regions where piracy poses a significant challenge (Li and Yang, 2023).

© The Author(s), 2025. Published by Cambridge University Press on behalf of The Royal Institute of Navigation. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

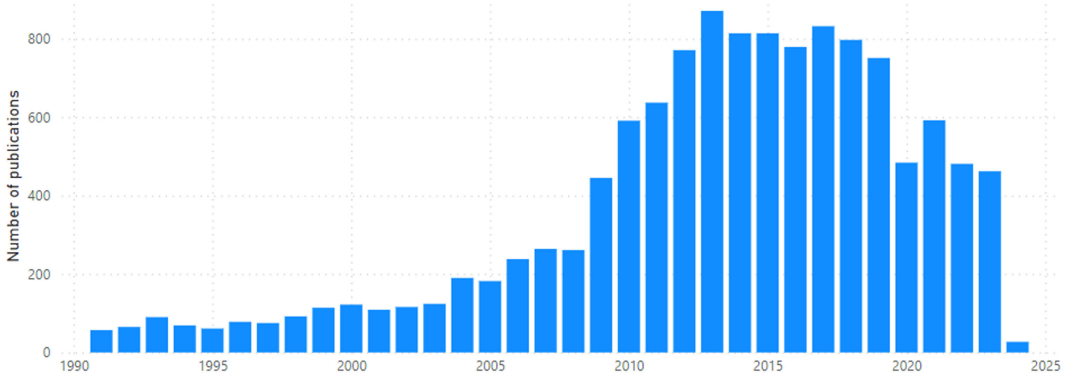


Figure 1. *Number of publications concerning maritime piracy by year based on OpenAlex database.*

Research articles addressing maritime piracy are abundant involving various research fields. The number of publications has notably risen since 2009 and it encountered its maximum in 2013 with more than 800 works (see Figure 1) based on the OpenAlex database. Consequently, this study offers an overview and systematic review of maritime piracy research through bibliographic analysis. The aim is to identify the diverse domains of study interested in this issue, relevant works, notable authors, prevailing research trends and valuable datasets.

While research experts in maritime piracy are aware of most of this work, other field experts that are applying their knowledge to this case study can neglect part of the whole picture. Reciprocally, maritime piracy experts do not know about distant topics, i.e. legal experts can neglect results from technical works. The main objective of this work is to be a starting point for discovering research works studying maritime piracy, giving a general overview of this topic. In the next sections, we develop the following research questions: (RQ1) What are the main research domains working on maritime piracy? (RQ2) What are the most representative works, authors and publications? (RQ3) What are the most-used datasets by researchers? (RQ4) What are the current topics addressed in the last years?

This paper is organised as follows. First, Section 2 provides an overview of related works. Section 3 outlines the used methodology. Section 4 presents the analysis and results of this study, including identified trends. Section 5 presents the most-used datasets. Finally, we discuss the results and present our conclusions in Section 6.

2. Related works

Literature review analyses are useful methodologies to identify research topics and concerns within a particular field. Many types of reviews exist, as described by Booth et al. (2021). A non-exhaustive list of examples includes the following.

- Critical review: analyses research findings and discusses the quality of the works reviewed.
- Meta-analysis: combines results from multiple studies to provide a quantitative synthesis of findings.
- Integrative review: combines experimental and non-experimental research to provide a comprehensive understanding of the topic.

These different review types offer distinct approaches to synthesising and evaluating research literature, each serving specific purposes in advancing knowledge within the field.

Bibliometric analysis is a popular and rigorous method for exploring and analysing large volumes of scientific data. It enables us to unpack the evolutionary nuances of a specific field, while shedding light

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

on the emerging areas in that field (Donthu et al., 2021). These analyses are less quantitative than those used in the scientometrics field that mainly seek to quantify the impact of research. These analyses have been used in many varied research fields such as tourism (Ülker et al., 2023) or maritime cybersecurity (Bolbot et al., 2022).

Various bibliometric software tools are available, offering a range of functionalities for gathering, extracting, analysing, and visualising bibliographic information. Some examples are VoSViwer, Bibliometrix, Bibexcel, Biblioshiny, BiblioMaps, CiteSpace, CitNetExplorer, Pajek, Gephi, SciMat, Sci2Tool and UCINET (Moral-Muñoz et al., 2020).

Guidelines for conducting pertinent bibliometric analysis are available, with one of the most commonly used being QUOROM (QUality Of Reporting Of Meta-analysis), which has evolved into 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA) (Liberati et al., 2009). PRISMA is straightforward to apply and comprises a 27-item checklist and a four-phase flow diagram. These phases include the identification of records, screening non-duplicated records, eligibility assessment of records, and inclusion of records for qualitative and quantitative analysis.

For maritime piracy, several overviews tackle this issue from various perspectives. For instance, Forster (2014) addresses piracy in the riskiest identified regions. The book 'Maritime Piracy' approaches piracy from a legal and political point of view (Haywood and Spivak, 2013). Other authors explore research challenges within specific fields such as criminology (Twyman-Ghoshal, 2014), while some works adopt an economic and political perspective (Samiotis et al., 2013). However, to the best of our knowledge, no works offer a comprehensive general overview of maritime piracy.

Also, security centres publish annual reports presenting annual data, analysing piracy evolution and presenting novelties. An example is the anti-crime arm of the International Chamber of Commerce (ICC) Commercial Crime Services (CCS) in the United Kingdom. It publishes reports and allows reporting attacks.[1] Another example is the French MICA (Maritime Information Cooperation & Awareness) centre.[2] They publish annual statistics, best management practices, regional guides, and guidance for maritime companies, masters and seafarers. Similarly to the MICA centre, UKMTO[3] surveys maritime piracy operating a Voluntary Reporting Scheme (VRS) for the Indian Ocean, specifically Red Sea, Gulf of Aden and Arabian Sea. They also regularly publish warnings, notices and reports for this region.

3. Methodology

A 'Mapping review' and an 'overview' of the existing literature are performed to fulfil the above-mentioned objectives. Booth et al. (2021) define these analyses as follows.

> Mapping review/systematic map: maps out and categorises existing literature from which to commission further reviews and/or primary research by identifying gaps in research literature.
>
> Overview: surveys literature and describes its characteristics.

For this, a methodology inspired by the PRISMA statement has been followed. Because VOSviewer is free, offers a very comprehensive set of analytic capabilities and is fully tailored to our needs, we have used it to undertake our analysis. The stages to implement our bibliometric analysis are shown in Figure 2, which makes reference to the PRISMA phases.

We first extract the bibliographical data. There exist a few significant general scientific databases such as Google Scholar, Scopus, Web of Science (WoS), Crossref and OpenAlex. They include 389, 90,

[1] ICC CCS's website. https://www.icc-ccs.org/. Accessed on 3 Apr 2024.
[2] MICA centre's website. https://www.mica-center.org/en/home/ Accessed on 3 Apr 2024.
[3] UKMTO's website. https://www.ukmto.org/. Accessed on 27 Feb 2025.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

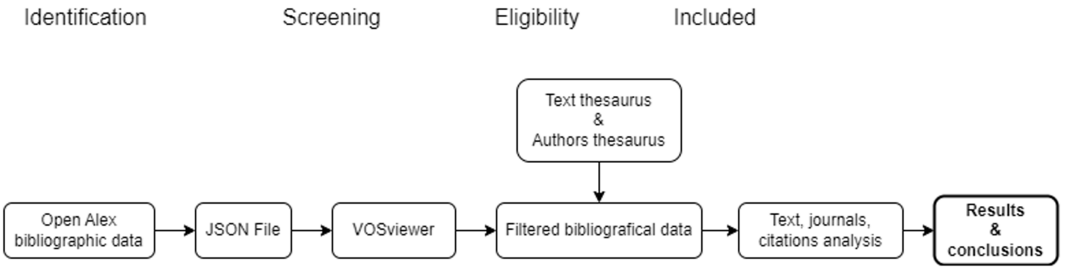


Figure 2. *Steps of used methodology.*

95, 89 and 248 million works, respectively (Gusenbauer, 2019). The majority of them allow recovering data, i.e. titles, abstracts, authors and citations through an API (Application Programming Interface) for further analysis. It is important to remark that bigger databases include articles coming from sources that are not considered by the other databases because they can be perceived as lower quality. After an analysis of pertinence, we use the OpenAlex dataset since it is open, cost-free, easy to use, user-friendly and significantly larger than the other databases with the exception of Google Scholar.[4]

```
'maritime' AND 'piracy' NOT 'cyber' NOT 'cybersecurity'
```

Thanks to the OpenAlex API, we can extract our bibliographical data in a JSON (JavaScript Object Notation) file. This offline file allows for decreasing the network traffic and waiting time. We use the following query to extract bibliographic references related to maritime piracy:

We only consider 'scientific articles' having five or more citations to ignore articles without significant impact in the field. Following some initial research, we have detected several works concerning exclusively cyber-piracy. That is, piracy attacks concerning information systems. To exclude them, we eliminate documents containing the word 'cyber' and 'cybersecurity'. This way, we reduce the number of references from 2940 to 2756. We have verified that non-relevant articles have been removed by this process.

Next, we use VOSviewer[5] software tool which is useful for constructing and visualising bibliometric networks and text analysis. We import our dataset in VOSviewer excluding articles that are not written in English. Before analysing the data, we create two thesauri. The first one is employed to prevent duplicate references in the dataset. The second one is helpful for eliminating words that are irrelevant or generic and fuse equivalent terms such as 'ais', 'ais data' and 'automatic identification system'. Some references appear twice but with complementary information. In these situations, we have fused references manually. Additionally, references to datasets are also separated. After applying these filters, we obtain a dataset composed of 2,714 bibliographic references.

VOSviewer proposes multiple analysis tools for investigating relations among text, articles, authors and journals. In the following sections of this work, we demonstrate how these tools can be applied to the identification of research topics and trends, and highlight key articles, authors and journals for the maritime piracy study.

Several datasets are used to study maritime piracy. Even if sometimes they are referenced as bibliographic references, they are not used in the same way as research articles and are not what we would consider to be such. Because of this, they are excluded from the bibliometric analysis and examined independently in Section 5.

[4] Comparison of OpenAlex with other scholarly data sources. OpenAlex website. https://help.openalex.org/coverage Accessed on 29 Feb 2024.

[5] VOSviewer website. https://www.vosviewer.com/ Accessed on 29/02/2024.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

4. Analysis and results

In this section, we present analysis results based on the application of a set of VOSviewer analysis tools. The chosen analysis tools are text analysis, referenced journals, article citations and authors' citations. The last subsection is dedicated to highlighting identified research topics and trends.

4.1. Text analysis

We began our study by looking at the terms used in titles and abstracts to find research domains interested in maritime piracy. We selected the 500 most-relevant terms that appeared at least 10 times in the retained references. Using the text mining tool, we can identify connections between these words, resulting in a total of 52,383 links. This approach enables us to gain insights into the key concepts and themes prevalent in maritime piracy research, facilitating a deeper understanding of the various domains of inquiry within this field.

Using the terms and links, we create an undirected graph for further analysis. Figure 3 shows the constructed graph of terms for maritime piracy. In this part, the terms are not related to particular references. For this reason, the graph is analysed globally without making reference to specific research works.

Multiple parameters allow for detecting clusters in different manners. In this case, the cluster algorithm detects six different clusters that correspond to main research topics and two geographic areas. Table 1 presents the identified clusters and representative terms that have been selected based on the sizes of the nodes and relation to the cluster.

Near clusters means closely studied subjects. The most representative case is the China and Africa clusters because, apart from the names of the regions, the studied problems are fairly similar but with few particularities. We can locate terms like 'regionalism', 'democracy' and 'transition' in between

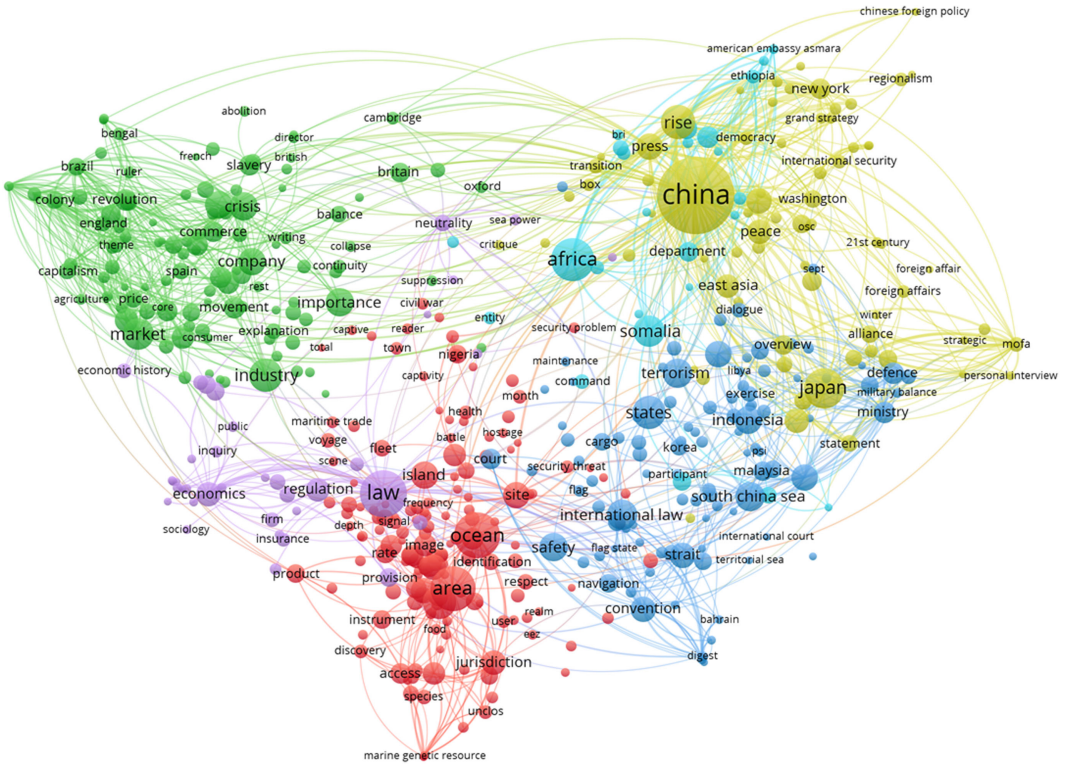


Figure 3. *Most-used words in selected papers categorised in six clusters.*

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

Table 1. *Identified clusters through text analysis*

Colour	Most-representative term	Other representative terms
Green	Economy	Market, company, crisis, commerce
Purple	Economics	Sociology, public
Red	Areas	Ocean, AIS
Blue	International Law	Convention, court, flag state
Yellow	China	East Asia, Japan
Cyan	Africa	Africa, Somalia, Ethiopia

these two clusters. Since governments develop and implement laws, international law is likewise closely related to these clusters and then placed closely in the graph. The term 'states' can be easily identified as a bridge between these clusters. Similarly, we can remark that every cluster uses the word 'law' as a point of reference. For this reason, this node is near the centre of the graph.

Another cluster studies geographical areas and vessel trajectories. In this cluster, we find geographical terms such as area, ocean or island. These terms are linked with 'jurisdiction' and 'UNCLOS' that show the link with international law. As the geographical position and associated data of vessels are key elements when analysing the impact of piracy, multiple terms are related to them. It also contains more technical terms such as 'signal', 'frequency' or 'AIS'. Works employing these words seem to have an engineering approach. This is because researchers look for methods for monitoring maritime traffic and detecting piracy activity. The Automatic Identification System (AIS) allows for following vessels. As pirates deactivate or modify the functioning of this system, other technical methods need to be used.

Last clusters include terms about economy and economics showing a gap between them that proves the difference between these two domains. In other words, economics focuses on population implications, whereas economy clusters concentrate on issues related to the macroeconomy or markets from a state perspective. The 'Economics' term is, as a consequence, connected with terms related to people like 'sociology' and 'public'. In an 'economy' cluster, we find 'commerce', 'crisis', 'company', 'capitalism' and different names of countries. 'Industry' and 'market' appear as a bridge between these two clusters.

Numerous names of countries appear everywhere in the graph. Obviously, they are all connected with the cluster related to geographic data, but each country has different concerns and, as a consequence, different research interests. For this, each node of the graph representing countries appears in the cluster that represents their most important concerns. For example, some countries are related to the economy, while others study terrorist activities.

In addition, some themes can be discovered through these terms, although they are not identified as a cluster. Geopolitics is an example with terms such as 'alliance', 'foreign affairs', 'dialogue' and the names of countries.

4.2. Journals

A second analysis identifies where selected articles have been published and the references among them. The resulting graph, which displays the most significant journals in this field, is shown in Figure 4.

In this figure, we can perceive nearly identical clusters as we did in the text analysis. That occurs because journals are very specialised. For this, every author associated with a research field prefers publishing in journals that are most suited to their work.

The most pre-eminent journal is 'Marine Policy' published by Elsevier. It can be found in the centre of the image and is connected to nearly every other journal. It also appears with a bigger size than other graph nodes because it contains more publications related to maritime piracy. The reason is that this publication covers general maritime topics that are likely to be of interest to other fields.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

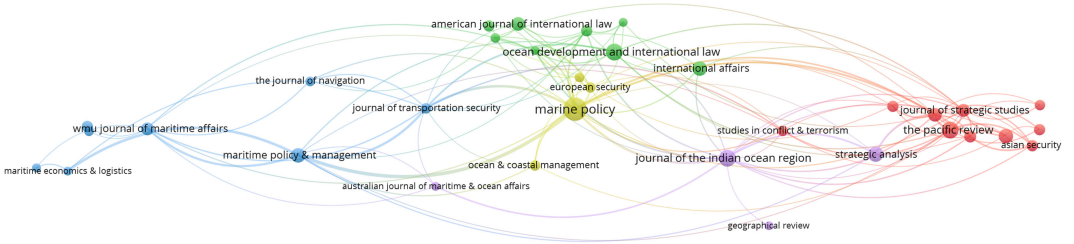


Figure 4. *Most-cited journals and co-citations.*

The journals on the right address regional issues. For instance, we can find 'Asian security', 'The Pacific review' and 'Indian Ocean region'. Also, we find more general journals covering a wider range of topics in geopolitics and strategic subjects.

At the top of the image, law journals are concentrated. As perceived with the 'law' term in the text analysis, law journals present links within almost every journal. Two examples are 'American Journal of International Law' and 'Ocean Development and International Law'. Oxford University Press's journal 'International Affairs' is located at the boundary between this and the previous cluster. This is because it addresses a variety of other multidisciplinary subjects such as international governance, ethics, regional issues, politics, economy and economics.

Going to the left, we can find journals such as 'Journal of Transportation Security' and Cambridge University Press's journal 'The Journal of Navigation' that study maritime topics in a more practical and technical manner. Lastly, the journals 'Maritime Policy and Management' and the 'WMU Journal of Maritime Affairs' establish a connection with the economics journals such as 'Maritime Economics & Logistics'.

4.3. Articles

With the aim to identify the most known and representative articles, we perform a citation analysis. This analysis also allows us to see connections and identify important articles for particular domains or for the general topic of maritime piracy.

For citation analysis, a criterion of at least 20 citations has been adopted to ensure that articles with notable impact are considered, while still capturing fewer quoted articles for trend discovery. Following citation calculations, a selection of the 200 most pertinent references has been made to construct the graph. Among these, 164 interconnected references have been plotted in Figure 5, highlighting the network of the most influential works within the domain.

First, we can easily identify two references' groups at the top and on the right that are rather far apart from the other graph nodes. The cluster on the top is composed of works addressing alternative routes such as the Cape route (Notteboom, 2012) or Arctic navigation (Theocharis et al., 2018). Arctic navigation has economic ramifications since it avoids treacherous piracy routes (Zhu et al., 2018). As an illustration, insurance companies may agree with a piracy premium of 40$/TEU (Theocharis et al., 2019). These works can be tailored to specific types of vessels, such as containers (Notteboom, 2012) or dry bulk carriers (Shibasaki et al., 2017).

Works on the right focus on the history of maritime navigation where piracy plays a significant role. There exist works concentrating on various regions and periods such as Chinese waters in the 17th century (Andrade, 2004), the Western Indian Ocean and Persian Gulf Regions in the 18th century (Risso, 2001), or the western Indian Ocean from the 12th to 16th centuries (Prange, 2011).

Technical works are shown in blue in the lower left. The most cited article looks for anomalies in AIS data (Pallotta et al., 2013). AIS data analysis is commonly employed to study ship trajectories and knowledge extraction. In addition, maritime satellite surveillance allows worldwide vessel tracking (Fournier et al., 2018). Approaching the graph's core, we discover technical papers whose authors model the maritime piracy situation with Bayesian networks (Dabrowski and De Villiers, 2015). These

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

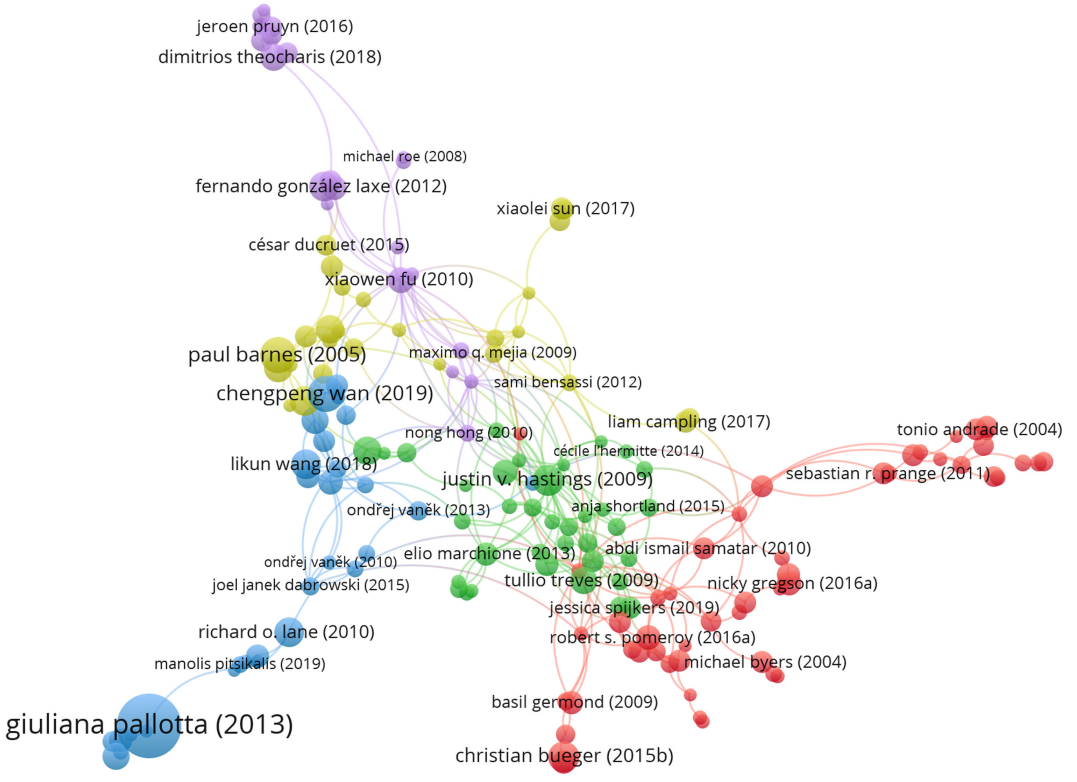


Figure 5. *Citation analysis for research articles.*

papers had a variety of goals such as estimating the likelihood of a ship being hijacked (Pristrom et al., 2016). Some of them propose agent-based systems with different purposes such as enhancing transport security (Jakob et al., 2011) or search operations (Onggo and Karatas, 2016).

At the bottom, in red, maritime piracy is examined as a geopolitical issue (Germond, 2015). Several research articles make links between Illegal, Unreported and Unregulated (IUU) fishing activities and piracy (Okafor-Yarwood, 2019) or other related conflicts (Pomeroy et al., 2016). An important part of these works focuses on national and transnational measures to address maritime security (Chapsos and Malcolm, 2017). For instance, some European vessels carry weapons aboard to repel pirate attacks, so they can no longer legally dock in ports where weapons are prohibited (Le Manach et al., 2013).

Law and policy articles mixed with works analysing geopolitics, which are at the heart of the graph, serve as a bridge between various academic domains. This mix is due to the proximity of these topics because policy concerns the rules or plans while politics is the process to reach them. These articles typically use state examples, most notably Somalia (Treves, 2009). As indicated before, some works make reference to geopolitical concerns. For example, the sophistication of piracy attacks may be related to weak or failed states (Hastings, 2009).

This graph allows confirmation that even if most of the clusters are connected, there exist big gaps between some domains. For instance, as stated before, teams working on geopolitics are quite connected with works concerning law, while they are less connected with technical works.

4.4. Authors

To produce a clearer visualisation, we have decided to reduce the number of retained authors. For this purpose, we selected the most cited ones having at least five works in the domain. After, we keep authors who are linked to other retained authors. This allows preserving authors that belong to the

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

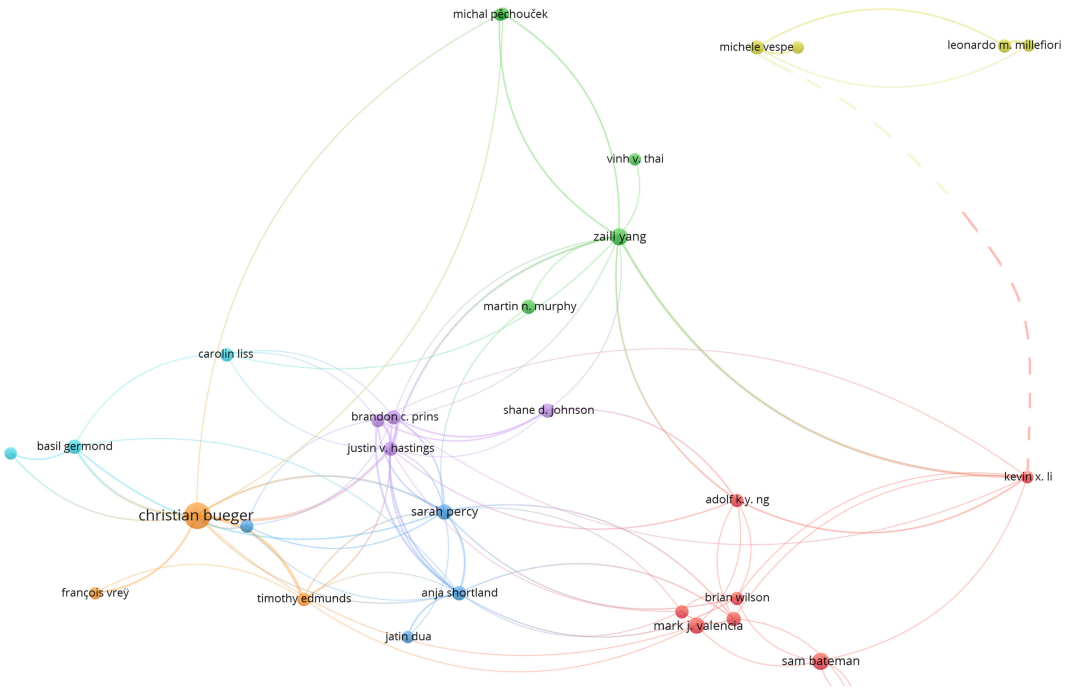


Figure 6. *Most-cited authors related by citations.*

'maritime piracy research community'. For this analysis, we have tested with different filter parameters, obtaining similar results. In this manner, a shortlist of 33 authors is produced. The resulting graph is presented in Figure 6. In the figure, the yellow cluster (top right) has been shifted to reduce the image size since it was located far to the right.

We can easily perceive that authors are connected by groups creating clusters. These relations are obviously related to the research articles' citations. As a result, clusters are nearly the same as in previous subsections, but now, we can identify significant authors. In the next paragraphs, we present the most-cited authors who are represented in the figure by being more interconnected and having bigger nodes.

Bueger (2015) (bottom left in orange) is a researcher in international political relations and is one of the more cited authors in this field. His works deal with maritime security and more precisely with piracy (Bueger, 2015). Because of his broad perspective, he has become a frequently cited source.

Edmunds, a co-author of Bueger et al. (2020), believes that piracy is a challenge to include in the maritime agenda. On the left, in blue, Germond (2015) illustrates the geopolitical aspect of maritime piracy.

In the middle of the graph, Daxecker and Prins (2013) worked together on the resolution of piracy as they argue that piracy is a result of permissive institutional environments and the lack of legal forms of employment in fishing sectors. Percy and Shortland (2013) have studied a similar topic, concentrating on pirates from Somalia. As mentioned in earlier sections, J.V. Hastings is renowned in geopolitics for his work establishing relations between state issues and piracy (Hastings, 2009).

At the bottom of the graph, in red, Brewster (2017) is an expert in the Indian Ocean navigation with a geopolitical and strategic point of view; similarly to Bateman (2010). Some writers in this cluster, like C. Liss, focus more on piracy issues as a transnational issue (Liss and Sharman, 2015). Adolf K.Y. Ng. links this cluster with other research topics studying the impacts of piracy on economics (Fu et al., 2010).

In the top green cluster, Yang appears to be a key node working on models to protect merchant vessels (Pristrom et al., 2016) and spatio-temporal patterns (Li and Yang, 2023). Thanks to their contributions to agent-based modelling, Vaněk et al. (2013) appear at the top of this cluster.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

Table 2. *Main identified research topics*

Research topic	Definition
Economy	Works focusing on financial issues through a macro-economic view (i.e. markets, companies, crisis and commerce)
Economics	Works focusing on financial issues through a sociological and population view.
Areas	Works focusing on the ocean as a surface area. This works address routes analysis and jurisdictions.
Law	Works focusing on regulations and laws.
Geopolitics	Works focusing on political issues such as power, territory and international relations.
China	Works focusing on the specific area of East Asia and Japan.
Africa	Works focusing on the specific area of Africa, especially Somalia and Ethiopia.
History	Works focusing on the different subjects with an historical view.

On the upright, in yellow, an Italian team of researchers using tracking techniques for vessel surveillance and searching for counter-piracy goals is depicted. Vespe et al. (2015) makes the link with the main graph with works using AIS and LRIT (Long Range Identification and Tracking) data. This cluster demonstrates that there exist research groups that are linked by proximity in terms of laboratory location and topics. By adjusting the analytic parameters, we could find Pallotta et al. (2013) within this cluster. She shares works with the other authors and had yet to be identified in previous analysis. Since this author is a valuable resource for AIS data analysis and anomaly detection, but not for the field of maritime piracy, her graph node disappears with more restrictive filters.

4.5. Identified research topics

Thanks to the presented analysis, we have identified seven main types of topics. They have been initially identified thanks to text analysis, and reinforced by journal and citation analysis. History has been identified afterwards because it focuses on the same topics but with a historic vision. Table 2 lists them with an associated definition.

Table 2 shows the diversity of research topics pertaining to maritime piracy. This demonstrates how challenging it is to approach this issue from a single perspective. With this vision, we can affirm that maritime piracy is a historical problem that is concentrated in specific areas. It has multiple origins, usually linked to economy and economic issues. The solutions are numerous, heterogeneous and proposed from different research domains such as law, economy and technology.

4.6. Current trends

To detect last years' trends, we carry out a text mining analysis for publications written between 2019 and 2024. This time, no citation limit is imposed. Some of these works did not have enough time to be cited because they are recent and did not appear in previous analyses. The same filtering thesaurus is applied as introduced in Section 3. To simplify the results, we chose to retain terms cited at least 40 times. The result is depicted in Figure 7.

Some statements can be easily perceived. The Africa and China regions are still of important interest. These works follow the piracy evolution through time. Economy and economic issues related to maritime piracy are now blurred and more difficult to identify. International law is always crucial when addressing piracy, and it can be easily identified at the bottom of the graph. That is because States should always converge diverse points of view into a shared position based on the context evolution. Seafarers are constantly looking for new, better, more efficient and safer routes; this is referred to as 'performance', which is primarily associated with 'risk' and 'time'.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

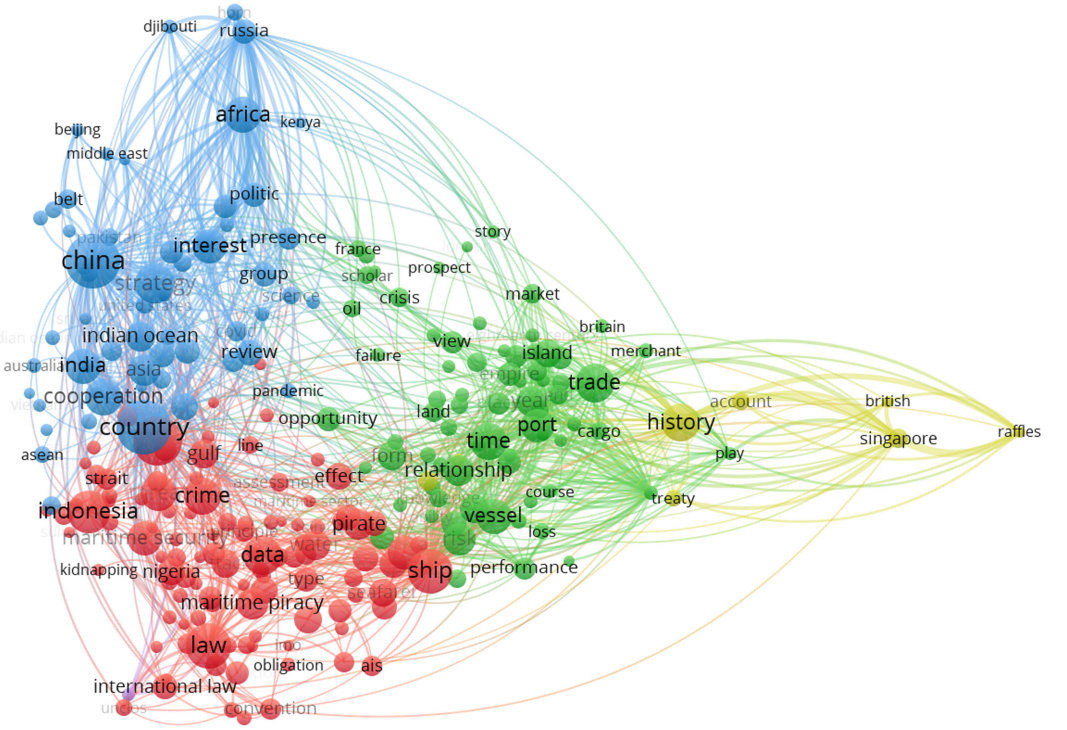


Figure 7. *Most-used words in research publications between 2019 and March 2024.*

Concerning ‘China’, we can appreciate that now it is more connected to other important nodes such as ‘India’ and ‘Asia’. It proves the importance of the SEA (South-East Asia) region in contemporary maritime piracy hotspots. ‘Cooperation’ and ‘strategy’ are near terms that show the collaboration between the countries located near this zone.

New terms, such as ‘pandemic’ and ‘covid’, indicate new trends based on current events. A significant transformation is expressed by the term ‘data’. It appears in the middle of the red cluster and it is related to numerous fields. We have also perceived that this node also grows over time. New information technologies offer new possibilities for pirates and to develop new protection systems. This is the main reason of Section 5 describing the mainly used datasets. Additionally, the word ‘History’ is now clearly visible on the right and it is mainly connected with ‘Singapore’ due to the significance of the Malacca Strait in global maritime trade.

Although it has not been identified as a cluster, a group of nodes that is easily identifiable, between the red and green clusters, is composed of terms like ‘port’, ‘time’, ‘vessel’, ‘performance’, ‘course’ and ‘ship’. They show the increasing number of works analysing the movements of vessels. This is mainly due to new technologies such as global AIS or satellite images.

As suggested in the introduction, cybersecurity can be considered a new era of piracy in the maritime domain. Recent cyberattacks impacted important actors such as Maersk in 2017, CMA-CGM in 2020 or the Barcelona port in 2018. These events show the present and actual risk, creating important operational and economic consequences. Cyber risks have been recently identified by the IMO with Resolution MSC.428(98) as an important risk to consider when applying ISM and ISPS Codes. Because of this, cybersecurity researchers look to apply their knowledge to the maritime sector.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press



Figure 8. *IMB database schema for piracy acts (Benden et al., 2021).*

5. Datasets

In previous sections, datasets were deliberately omitted from the references for several reasons. At times, datasets are not adequately referenced; they may be cited in footnotes, provided on websites, documented in technical reports or described in research articles detailing the data. Additionally, including datasets can introduce bibliometric biases, especially when official datasets are repeatedly used across various research works. In this section, we provide a description of the most frequently used datasets in the analysed research works.

5.1. Datasets concerning maritime piracy acts

Historical works, evolution of attacks, or time or geographical analysis are based on historical datasets. When analysing presented works using data, we can identify three datasets that are usually used.

The first corresponds to data collected from the International Maritime Bureau (IMB), cleaned and enriched with geospatial data. This dataset contains information on maritime pirate attacks between January 1993 and December 2020, as well as country indicator data for the same period (Benden et al., 2021). It has been used by several works with different objectives, such as validating hypotheses about maritime piracy (Daxecker and Prins, 2013) or detecting patterns improving these data (Coggins, 2012). Figure 8 illustrates the various pieces of information provided by the dataset.

Second, Piracy and Armed Robbery (PAR) dataset that is associated with the Global Integrated Shipping Information System (GISIS) has been collected by the International Maritime Organization

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

Table 3. *Description of PAR dataset extracted from GISIS*

Column Name	Description
Ship name	Name of the ship
Imo number	IMO number of the ship
Flag	Flag of the ship
Gross tonnage	Gross tonnage of the ship
Ship type	Type of ship
Date	Date of the incident
Ship released on	Date when the ship was released
Time	Time of the incident
Time zone	Time zone of the incident
Position of incident	Geographic position of the incident
Coastal state	Coastal state involved in the incident
Area	Area where the incident occurred
Latitude	Latitude of the incident
Longitude	Longitude of the incident
Details	Details of the incident
Consequences	Consequences for crew, ship and cargo
Location	Specific location of the incident
Ship status	Status of the ship when attacked
Number	Number of persons involved in the attack
Consequences	Consequences to the crew
Weapons	Weapons used by the attackers
Ship parts	Parts of the ship raided
Lives lost	Lives lost
Wounded crew	Crew wounded
Missing crew	Crew missing
Crew hostage-kidnapped	Crew members taken hostage/kidnapped
Assaulted	Assaulted
Ransom	Ransom amount demanded
Action taken	Actions taken by the master and the crew
Reported	Incident reported to coastal authority
State	State reporting the incident
Organisation	Reporting international organisation
Action	Actions taken by the coastal state

(IMO) and is freely available on their website.[6] The PAR dataset covers worldwide pirate attacks from January 2006 to the present day. Piracy incidents are listed with numerous characteristics, including location, date, incident details and incident consequences. For illustration, this database has been used to estimate the likelihood of a ship being hijacked in specific areas (Pristrom et al., 2016). Table 3 shows the different information provided by the dataset.

Finally, the third dataset corresponds to the ASAM (Anti-Shipping Activity Messages) piracy dataset. It is available on its website,[7] and provides information on the type of vessel targeted, date, position, as well as a description of the attack. This dataset has been used, for example, to analyse the dialectics of piracy in Somalia (Samatar et al., 2010). Table 4 shows the different provided information.

[6] IMO's GISIS website. Available at https://gisis.imo.org/Public/PAR/Default.aspx. Accessed on 07/03/2024

[7] ASAM's website. https://msi.nga.mil/Piracy. Accessed on 07/03/2024.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

Table 4. *Description of the ASAM dataset*

Attribute	Description
Reference Number	Attack identifier
Geographical Subregion	Number of geographical region
Date of Occurrence	Date of the piracy attack
Aggressor	Type of attack
Geographical Location	Location of the attack
Victim	Ship type and ship name
Description	Description of the attack

These three databases are different and do not contain the same information. As a result, some authors have chosen to use the most relevant one for their analysis or to merge them in different manners. For instance, the second and third datasets have been merged to find relations between fishing issues and maritime piracy (Desai and Shambaugh, 2021). Additionally, these three datasets can be cross-referenced and joined to create a new, more comprehensive and complete dataset (Li and Yang, 2023).

5.2. Datasets concerning AIS data

Nowadays, ships are predominantly observable in real-time using various position sensors, aiming to identify and locate these vessels and to detect anomalies at sea. The surveillance of maritime areas, especially coastal regions, for safety and security reasons, traffic management or protection of biodiversity zones, relies heavily on identifying typical ship positions and behaviours that enable the detection of anomalies or abnormal trajectories. This is done to detect illegal or criminal activities, associated risks (such as piracy, illicit trafficking, clandestine immigration, over-exploitation of fishery resources, pollution from hazardous materials, accidents, etc.) and violations of regulations. The multitude of ship positioning reporting systems implemented generates constantly increasing volumes of data to analyse. For this, numerous research works addressing maritime piracy are interested in these data (Pallotta et al., 2013; Vespe et al., 2015).

The AIS is a system that has been on board ships for almost two decades. Originally designed as an anti-collision system for ships, it is mandatory for all ships subject to the SOLAS convention; ships over 300 gross tonnage, fishing vessels over 15 meters and ships carrying passengers. The system essentially consists of a GNSS (Global Navigation Satellite System) as GPS (Global Positioning System), a transponder and a VHF (Very High Frequency) antenna for communication. The data exchanged by a ship equipped with the AIS includes static information (ship name, international identifier, size, age, cargo, etc.) and dynamic information (heading, speed, GNSS position, etc.). The system also transmits additional meta-information related to the trip (destination, expected arrival date and time) as well as control messages. Recently, AIS data have gained much popularity in maritime research (Yang et al., 2019). In our bibliometric dataset, 205 research articles use this data directly. 447 articles appear when no citation restriction is applied. Some research works look for enhancing SAR systems (Zhao et al., 2014), detecting anomalies (Kontopoulos et al., 2020; Pallotta et al., 2013) or improving awareness in specific zones (Posada et al., 2011).

A non-exhaustive list of sources concerning AIS data is as follows.

- MarineTraffic https://www.marinetraffic.com/ is a leading maritime analytics provider, offering real-time insights into ship movements, harbour activities and port locations. Through its platform, users gain access to a comprehensive database containing vital vessel information such as construction origin, dimensions, gross tonnage and International Maritime Organization (IMO) numbers. While accessing vessel positions is freely available through the MarineTraffic website, the comprehensive data needed for in-depth analysis is not provided for free. Accessing and storing

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

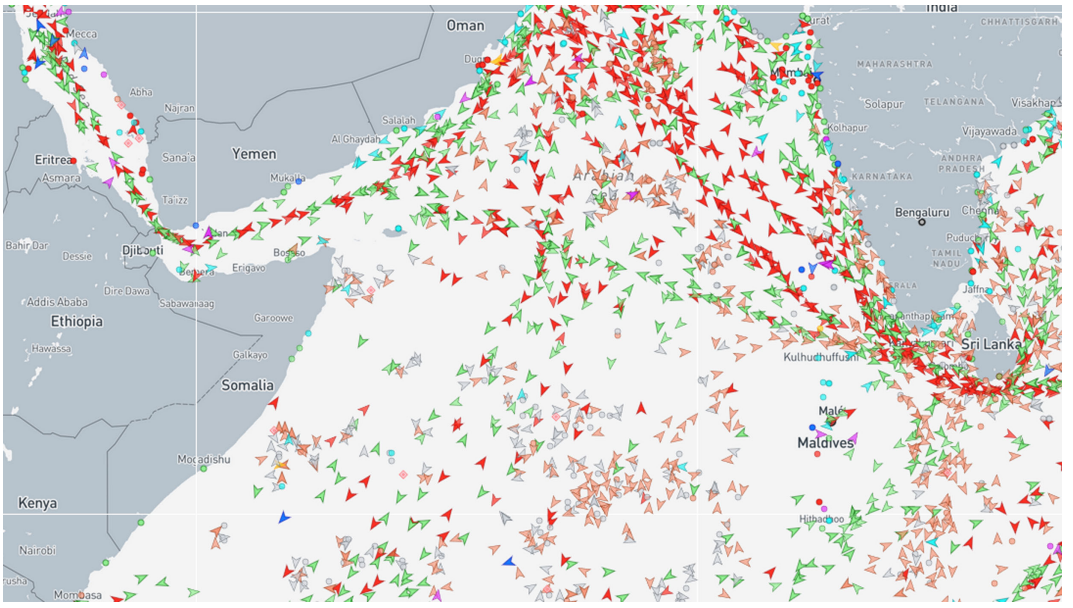


Figure 9. *Example of MarineTraffic data in the Arabian Sea.*

data for analytical purposes typically involves subscription or payment for premium services. Figure 9 shows an example of these data.

- Marine cadastre https://marinecadastre.gov/ offers free access to AIS data, which provides real-time and historical information on vessel movements in U.S. waters. MarineCadastre.gov also facilitates access to a variety of spatial data sets and tools pertaining to the marine environment along the American coasts. These data can include information on marine boundaries, marine protected areas, marine habitats and marine energy resources.
- Other academic datasets provide some methods to analyse or store data (SQL scripts) as well as supplementary data (fishing areas, marine protected areas, ports), such as Ray et al. (2019), where data involved concern Brittany coasts. Another dataset concerns Greece coasts with supplementary weather data and extraction of critical points for synthesised trajectories (Tritsarolis et al., 2022).

The last two AIS datasets are less used than the first one. This is because the first covers the entire world, whereas the others concentrate on particular areas. However, they offer insightful viewpoints for this field and are frequently employed to test novel anomaly detection techniques.

AIS data present some limitations. As this system has only been an OMI requirement since 2000, it is difficult to realise pertinent analyses before this year. Also, transponders can be easily switched off or modified, and they are subject to GNSS issues (Banaei Kashani, Zhang, Hendawi,). As a consequence, analyses based on these data need to take into account these limitations. It should be noted that researchers are looking for more secured systems (Goudossis and Katsikas, 2019).

6. Discussion and perspectives

Maritime piracy is a very complex problem that is studied from numerous research fields. When researchers of one specific research field start to apply their knowledge to piracy, they need to be aware of the whole picture of this issue. One example is that specialists in Artificial Intelligence (AI) analysing AIS data need to be aware of cyber vulnerabilities of this system, that biodiversity can impact the fishing economy and then piracy activity, regional regulations or, even more important, how different flag states address this security issue.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

This work allows identifying gaps thanks to multiple visualisations. Some research domains appear to be quite disconnected. This creates new opportunities in terms of collaborations. One example is that the apparition of new technologies such as AI can be useful in numerous domains for analysing huge amounts of data or creating automated alerts and responses.

A limitation of this work is that only research articles written in English have been considered. Nevertheless, there exist many works written in French addressing African piracy attacks and Chinese works assessing this problem in Asian seas. Another limitation is that we cannot access multiple articles due to paywalls. Nevertheless, we were able to conduct a wide and detailed study thanks to open or partial access. Eventually, we have perceived that articles that are freely available on the internet are more cited and, as a consequence, more present in this article.

For further and more detailed works, as integrative reviews, needing access to complete texts, it will be necessary to anticipate access to pertinent works. Due to the quantity of identified works, this task promises to be very complicated because of the variety of works. Moreover, if we focus on one domain, the global vision of the subject will be lost.

Section 5 introduces more used datasets. Numerous sources of data do not appear in this section, but they can be very valuable. Further work is needed to list, evaluate and compare them. Also, some of them are complementary, so they can be merged or completed, creating new datasets.

7. Conclusion

Maritime piracy is a complex problem that is addressed in different manners by multiple research domains. In this paper, a literature overview and map review have been realised based on bibliometric analysis with the objective of identifying the diverse domains of study interested in this issue, relevant works, notable authors and prevailing research trends. For this, we have performed a set of bibliometric analyses with VOSviewer software.

Thanks to these analyses, we have identified eight main research communities focusing on maritime piracy. The most important works and authors have been plotted and presented. An additional text analysis has been realised with current works to identify present trends. Also, important and valuable datasets have been recognised and described because of the rising importance of data in analysis works.

The diversity of research topics pertaining to maritime piracy demonstrates how challenging it is to approach this issue from a single point of view. Based on our results, we can affirm that maritime piracy is a historical problem that is concentrated in specific areas. It has multiple origins, usually linked to economy and economic issues. The solutions are numerous, heterogeneous, and proposed from different research domains such as law, economy and technology.

The performed methodology has been described in detail for reproducibility. In this way, further analyses can be realised from different points of view and applications.

This article creates a base for discovering a multidimensional and complex problem through a bibliometric review. The identification of important keywords, works, authors, journals and trends gives a global view of the state of the art. We have also presented the most-used datasets with valuable information for the maritime piracy study.

References

Andrade, T. (2004). The Company's Chinese Pirates: How the Dutch East India Company Tried to Lead a Coalition of Pirates to War against China, 1621–1662. *Journal of World History*, **15**(4), 415–444.

Bateman, S. (2010). Maritime Piracy in the Indo-Pacific Region–Ship Vulnerability Issues. *Maritime Policy & Management*, **37**(7), 737–751.

Benden, P., Feng, A., Howell, C. and Dalla Riva, G. V. (2021). Crime at Sea: A Global Database of Maritime Pirate Attacks (1993–2020). *Journal of Open Humanities Data*, **7**, 19.

Bolbot, V., Kulkarni, K., Brunou, P., Banda, O. V. and Musharraf, M. (2022). Developments and Research Directions in Maritime Cybersecurity: A Systematic Literature Review and Bibliometric Analysis. *International Journal of Critical Infrastructure Protection*, **39**, 100571.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

Booth, A., Sutton, A., Clowes, M. and Martyn-St James, M. (2021). *Systematic Approaches to a Successful Literature Review*. Sage.

Brewster, D. (2017). Silk Roads and Strings of Pearls: The Strategic Geography of China's New Pathways in the Indian Ocean. *Geopolitics*, **22**(2), 269–291.

Bueger, C. (2015). Learning from Piracy: Future Challenges of Maritime Security Governance. *Global Affairs* **1**(1), 33–42.

Bueger, C. (2015). What is Maritime Security? *Marine Policy* **53**, 159–164.

Bueger, C., Edmunds, T. and McCabe, R. (2020). Into the Sea: Capacity-Building Innovations and the Maritime Security Challenge. *Third World Quarterly*, **41**(2), 228–246.

Chapsos, I. and Malcolm, J. A. (2017). Maritime Security in Indonesia: Towards a Comprehensive Agenda? *Marine Policy*, **76**, 178–184.

Coggins, B. L. (2012). Global Patterns of Maritime Piracy, 2000–09: Introducing a New Dataset. *Journal of Peace Research*, **49**(4), 605–617.

Dabrowski, J. J. and De Villiers, J. P. (2015). Maritime Piracy Situation Modelling with Dynamic Bayesian Networks. *Information Fusion*, **23**, 116–130.

Daxecker, U. and Prins, B. (2013). Insurgents of the Sea: Institutional and Economic Opportunities for Maritime Piracy. *Journal of Conflict Resolution*, **57**(6), 940–965.

Desai, R. M. and Shambaugh, G. E. (2021). Measuring the Global Impact of Destructive and Illegal Fishing on Maritime Piracy: A Spatial Analysis. *Plos One*, **16**(2), e0246835.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N. and Lim, W. M. (2021). How to Conduct a Bibliometric Analysis: An Overview and Guidelines. *Journal of Business Research*, **133**, 285–296.

Forster, B. A. (2014). Modern Maritime Piracy: An Overview of Somali Piracy, Gulf of Guinea Piracy and South East Asian Piracy. *British Journal of Economics, Management & Trade*, **4**(8), 1251–1272.

Fournier, M., Hilliard, R. C., Rezaee, S. and Pelot, R. (2018). Past, Present, and Future of the Satellite-Based Automatic Identification System: Areas of Applications (2004–2016). *WMU Journal of Maritime Affairs*, **17**, 311–345.

Fu, X., Ng, A. K. Y. and Lau, Y.-Y. (2010). The Impacts of Maritime Piracy on Global Economic Development: The Case of Somalia. *Maritime Policy & Management*, **37**(7), 677–697.

Germond, B. (2015). The Geopolitical Dimension of Maritime Security. *Marine Policy*, **54**, 137–142.

Goudossis, A. and Katsikas, S. K. (2019). Towards a Secure Automatic Identification System (AIS). *Journal of Marine Science and Technology* **24**, 410–423.

Gusenbauer, M. (2019). Google Scholar to Overshadow Them All? Comparing the Sizes of 12 Academic Search Engines and Bibliographic Databases. *Scientometrics*, **118**(1), 177–214.

Hastings, J. V. (2009). Geographies of State Failure and Sophistication in Maritime Piracy Hijackings. *Political Geography*, **28**(4), 213–223.

Haywood, R. and Spivak, R. (2013). Maritime Piracy. Routledge.

Jakob, M., Vaněk, O. and Pěchouček, M. (2011). Using Agents to Improve International Maritime Transport Security. *IEEE Intelligent Systems*, **26**(1), 90–96.

Kontopoulos, I., Chatzikokolakis, K., Zissis, D., Tserpes, K. and Spiliopoulos, G. (2020). Real-Time Maritime Anomaly Detection: Detecting Intentional AIS Switch-Off. *International Journal of Big Data Intelligence*, **7**, 85–96.

Merino Laso, P., Salmon, L., Bozhilova, M., Ivanov, I., Stoianov, N. T., Velev, G., Claramunt, C. and Yanakiev, Y. (2021). ISOLA: An Innovative Approach to Cyber Threat Detection in Cruise Shipping. Smart Innovation, Systems and Technologies. *Developments and Advances in Defense and Security: Proceedings of MICRADS 2021*, Springer Singapore, 71–81.

Le Manach, F., Andriamahefazafy, M., Harper, S., Harris, A., Hosch, G., Lange, G.-M., Zeller, D., and Sumaila, U. R. (2013). Who Gets What? Developing a More Equitable Framework for EU Fishing Agreements. *Marine Policy* **38**, 257–266.

Li, H. and Yang, Z. (2023). Towards Safe Navigation Environment: The Imminent Role of Spatio-Temporal Pattern Mining in Maritime Piracy Incidents Analysis. *Reliability Engineering & System Safety*, **238**, 109422.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J. and Moher, D. (2009). The Prisma Statement for Reporting Systematic Reviews and Meta-Analyses of Studies that Evaluate Health Care Interventions: Explanation and Elaboration. *Annals of Internal Medicine*, **151**(4), W–65.

Liss, C. and Sharman, J. C. (2015). Global Corporate Crime-Fighters: Private Transnational Responses to Piracy and Money Laundering. *Review of International Political Economy*, **22**(4), 693–718.

Marchione, E. and Johnson, S. D. (2013). Spatial, Temporal and Spatio-Temporal Patterns of Maritime Piracy. *Journal of Research in Crime and Delinquency*, **50**(4), 504–524.

Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A. and Cobo, M. J. (2020). Software Tools for Conducting Bibliometric Analysis in Science: An Up-to-Date Review. *Profesional de la información/Information Professional*, **29**(1), 81–100.

Notteboom, T. E. (2012). Towards a New Intermediate Hub Region in Container Shipping? Relay and Interlining via the Cape Route vs. the Suez Route. *Journal of Transport Geography* **22**, 164–178.

Okafor-Yarwood, I. (2019). Illegal, Unreported and Unregulated Fishing, and the Complexities of the Sustainable Development Goals (SDGs) for Countries in the Gulf of Guinea. *Marine Policy*, **99**, 414–422.

Onggo, B. S. and Karatas, M. (2016). Test-Driven Simulation Modelling: A Case Study using Agent-Based Maritime Search-Operation Simulation. *European Journal of Operational Research*, **254**(2), 517–531.

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press

Pallotta, G., Vespe, M. and Bryan, K. (2013). Vessel Pattern Knowledge Discovery from AIS Data: A Framework for Anomaly Detection and Route Prediction. *Entropy*, **15**(6), 2218–2245.

Percy, S. and Shortland, A. (2013). Contemporary Maritime Piracy: Five Obstacles to Ending Somali Piracy. *Global Policy*, **4**(1), 65–72.

Pomeroy, R., Parks, J., Mrakovcich, K. L. and LaMonica, C. (2016). Drivers and Impacts of Fisheries Scarcity, Competition, and Conflict on Maritime Security. *Marine Policy*, **67**, 94–104.

Posada, M., Greidanus, H., Alvarez, M., Vespe, M., Cokacar, T., and Falchetti, S. (2011). Maritime Awareness for Counter-Piracy in the Gulf of Aden. In: *2011 IEEE International Geoscience and Remote Sensing Symposium*. IEEE, 249–252.

Prange, S. R. (2011). A Trade of No Dishonor: Piracy, Commerce, and Community in the Western Indian Ocean, Twelfth to Sixteenth Century. *The American Historical Review*, **116**(5), 1269–1293.

Pristrom, S., Yang, Z., Wang, J. and Yan, X. (2016). A Novel Flexible Model for Piracy and Robbery Assessment of Merchant Ship Operations. *Reliability Engineering & System Safety*, **155**, 196–211.

Ray, C., Dréo, R., Camossi, E., Jousselme, A.-L. and Iphar, C. (2019). Heterogeneous Integrated Dataset for Maritime Intelligence, Surveillance, and Reconnaissance. *Data in Brief*, **25**, 104141.

Risso, P. (2001). Cross-Cultural Perceptions of Piracy: Maritime Violence in the Western Indian Ocean and Persian Gulf Region during a Long Eighteenth Century. *Journal of World History*, **12**(2), 293–319.

Salmon, L., Merino Laso, P., Claramunt, C., Follut, D. and Pelissero, N. (2021). Data Fusion Challenges for AIS Anti-Piracy Measures. In *OCEANS 2021: San Diego–Porto*. IEEE, 1–4.

Salmon, L., Ray, C. and Claramunt, C. (2016). Continuous Detection of Black Holes for Moving Objects at Sea. In Kashani, F. B., Zhang, C. and Hendawi, A.M. (eds.), *Proceedings of the 7th ACM SIGSPATIAL International Workshop on GeoStreaming, IWGS@SIGSPATIAL 2016, Burlingame, California, USA, October 31 – November 3, 2016*. ACM, 2:1–2:10.

Samatar, A. I., Lindberg, M. and Mahayni, B. (2010). The Dialectics of Piracy in Somalia: The Rich versus the Poor. *Third World Quarterly*, **31**(8), 1377–1394.

Samiotis, G., Psarrou, V., Pazarzis, M., Tselentis, V. and Dafnos, G. (2013). Maritime Piracy: Trends and Future Developments a Review. *International Journal of Maritime, Trade & Economic Issues (IJMTEI)*, **1**(1), 93–108.

Shibasaki, R., Azuma, T., Yoshida, T., Teranishi, H. and Abe, M. (2017). Global Route Choice and Its Modelling of Dry Bulk Carriers Based on Vessel Movement Database: Focusing on the Suez Canal. *Research in Transportation Business & Management*, **25**, 51–65.

Theocharis, D., Pettit, S., Rodrigues, V. S. and Haider, J. (2018). Arctic Shipping: A Systematic Literature Review of Comparative Studies. *Journal of Transport Geography*, **69**, 112–128.

Theocharis, D., Rodrigues, V. S., Pettit, S. and Haider, J. (2019). Feasibility of the Northern Sea Route: The Role of Distance, Fuel Prices, Ice Breaking Fees and Ship Size for the Product Tanker Market. *Transportation Research Part E: Logistics and Transportation Review*, **129**, 111–135.

Treves, T. (2009). Piracy, Law of the Sea, and Use of Force: Developments Off the Coast of Somalia. *European Journal of International Law*, **20**(2), 399–414.

Tritsarolis, A., Kontoulis, Y. and Theodoridis, Y. (2022). The Piraeus AIS Dataset for Large-Scale Maritime Data Analytics. *Data in Brief*, **40**, 107782.

Twyman-Ghoshal, A. A. (2014). Contemporary Piracy Research in Criminology: A Review Essay with Directions for Future Research. *International Journal of Comparative and Applied Criminal Justice*, **38**(3), 281–303.

Ülker, P., Ülker, M., and Karamustafa, K. (2023). Bibliometric Analysis of Bibliometric Studies in the Field of Tourism and Hospitality. *Journal of Hospitality and Tourism Insights*, **6**(2), 797–818.

Vaněk, O., Jakob, M., Hrstka, O. and Pěchouček, M. (2013). Agent-Based Model of Maritime Traffic in Piracy-Affected Waters. *Transportation Research Part C: Emerging Technologies*, **36**, 157–176.

Vespe, M., Greidanus, H. and Alvarez, M. A. (2015). The Declining Impact of Piracy on Maritime Transport in the Indian Ocean: Statistical Analysis of 5-Year Vessel Tracking Data. *Marine Policy*, **59**, 9–15.

Yang, D., Wu, L., Wang, S., Jia, H. and Li, K. X. (2019). How Big Data Enriches Maritime Research–A Critical Review of Automatic Identification System (AIS) Data Applications. *Transport Reviews*, **39**(6):755–773.

Zhao, Z., Ji, K., Xing, X., Zou, H. and Zhou, S. (2014). Ship Surveillance by Integration of Space-Borne SAR and AIS–Review of Current Research. *The Journal of Navigation*, **67**(1), 177–189.

Zhu, S., Fu, X., Ng, A. K. Y., Luo, M. and Ge, Y.-E. (2018). The Environmental Costs and Economic Implications of Container Shipping on the Northern Sea Route. *Maritime Policy & Management*, **45**(4), 456–477.

Cite this article: Merino Laso, P. and Salmon, L. (2025). Maritime piracy bibliometric analysis: A literature overview and map review. *The Journal of Navigation* **78**: 2-3, 262–279. https://doi.org/10.1017/S0373463325101094

https://doi.org/10.1017/S0373463325101094 Published online by Cambridge University Press