



The Importance of Maintaining Fishing Boats and Understanding Life Safety at Sea for Fishermen in East Sapa Village

Dedtri Anwar ^{1*}, Sevian G Rakka ², Frisca Mareyta Pongoh ³,

Yustiani Frastika ⁴, Santun Irawan ⁵, Joseph R Rengga ⁶

^{1,2,3,4,5} Politeknik Pelayaran Sulawesi Utara, Indonesia

Korespondensi: dedtrianwar@poltekpelsulut.ac.id

Article History:

Received: 02 Juni 2024

Revised: 14 Juni 2024

Accepted: 28 Juni 2024

Published : 30 Juni 2024

Keywords: *Ship Maintenance; Fisherman; Life Safety; East Sapa Village*

Abstract *The importance of fishing boat maintenance cannot be underestimated. A well-maintained vessel not only increases efficiency in fishing operations, but also minimizes the risk of accidents at sea. Ship maintenance covers various aspects, from regular engine inspections, repairing damaged hulls, to ensuring that all safety equipment is in good condition. The purpose of this study is to increase the awareness and understanding of fishermen in East Sapa Village regarding the importance of ship maintenance and life safety at sea. This research method uses a qualitative method with a short description of the analysis. The results of this study show that although the fishermen of East Sapa Village have a basic awareness of the importance of boat maintenance and safety at sea, they face a variety of significant challenges, including limited resources, limited technical knowledge, and lack of relevant training. Financial and material constraints hinder the implementation of thorough ship maintenance, while a varied understanding of safety indicates the need for more in-depth education. Strong community cooperation and greater government support, including the provision of resources and training programs, are essential to address these issues and improve the well-being and safety of fishermen.*

1. INTRODUCTION

East Sapa Village, located on the coast, has most of the population who depend on the fishing sector for their livelihoods. Fishermen are the backbone of the village's economy, so their sustainability and well-being are very important. However, the job as a fisherman is not easy and full of risks, especially related to safety at sea and the condition of the boat used. In this context, a deep understanding of the importance of caring for fishing boats and saving lives at sea is essential. The importance of fishing boat maintenance cannot be underestimated. A well-maintained vessel not only increases efficiency in fishing operations, but also minimizes the risk of accidents at sea. Ship maintenance covers various aspects, from regular engine inspections, repairing damaged hulls, to ensuring that all safety equipment is in good condition. By carrying out regular maintenance, fishermen can avoid technical problems that can be fatal. One of the key factors in boat maintenance is regular engine inspections. Poorly maintained boat engines can suffer sudden breakdowns, which not only disrupt fishing activities, but can also cause serious accidents. Routine

checks include checking oil, filters, and other components that are crucial for engine performance. Thus, the risk of damage can be minimized and the ship can operate optimally.[M. C. W. Saldanha, R. J. M. de Carvalho, R. Arcuri, A. G. Amorim, M. C. R. Vidal, and P. V. R. de Carvalho,2018]

In addition to the engine, the hull also requires special attention. A damaged or leaking hull can be fatal if not repaired immediately. Even a small crack can develop into a big problem if left unchecked. Therefore, fishermen must regularly check the condition of the hull and make repairs if damage is found. The use of quality materials in repairs is also very important to ensure the durability and reliability of the ship. Not only the main equipment, but safety equipment such as life jackets, life rafts, and communication devices must also always be in ready-to-use condition. These devices can be lifesavers in emergency situations at sea. Therefore, fishermen must ensure that all safety equipment has been tested and is in good working order before heading out to sea. These checks should be carried out periodically and every time before going on a sea trip. Understanding the safety of lives at sea is crucial for fishermen. The sea is a dynamic and sometimes unpredictable environment, so knowledge of safety procedures, the use of personal protective equipment, and emergency measures is essential. Training and education on marine safety must be a priority so that fishermen can deal with emergency situations calmly and effectively.[F. Piniella and M. A. Fernández-Engo,2009]

Marine safety training includes not only theory, but also hands-on practice in the field. Simulation of emergencies such as fires on ships, people falling into the sea, or leaking ships should be done regularly. With this exercise, fishermen will be better prepared to face the real situation and be able to respond quickly and appropriately. This knowledge can save lives and reduce the negative impact of incidents that occur at sea.[J. Kolding, C. Béné, and M. Bavinck,2014]

In addition, fishermen must also be equipped with knowledge about the weather and sea conditions. Knowing how to read the signs of bad weather and high waves is essential to avoid danger. Modern technology such as weather apps and navigation systems can be very helpful for fishermen in planning their trips. However, traditional knowledge that is passed down from generation to generation is no less important and must be maintained. In East Sapa Village, increasing awareness of the importance of boat care and life safety at sea will not only protect the lives of fishermen, but will also increase their productivity and welfare. With a well-maintained boat and a good understanding of safety, fishermen can work more efficiently and reduce time

wasted due to breakdowns or incidents. This will ultimately have a positive impact on fishermen's catches and income.[S. Salas and D. Gaertner,2004]

Governments and related organizations must play an active role in supporting fishermen. This support can be in the form of providing ship maintenance facilities, safety training, and the provision of adequate safety equipment. These programs can be carried out in collaboration with educational institutions, non-governmental organizations, and the private sector. With this support, fishermen in East Sapa Village will be better prepared to face challenges at sea. Not only the government, but local communities must also participate in supporting the safety and maintenance of fishing boats. Communities can form working groups that focus on ship maintenance and safety training. With good cooperation between fishermen, experience and knowledge can be shared with each other, so that all community members can feel the benefits. This solidarity and togetherness will make the fishing community stronger and more resilient in facing various challenges. Thus, boat maintenance and understanding of life safety at sea are two interrelated aspects and are equally important for the sustainability and welfare of fishermen in East Sapa Village. Through coordinated and sustainable efforts from various parties, it is hoped that fishermen can work more safely, efficiently, and prosperously. This will not only improve their quality of life, but also make a positive contribution to the overall village economy.[C. M. Roberts, J. P. Hawkins, and F. R. Gell,2005]

The purpose of this study is to increase the awareness and understanding of fishermen in East Sapa Village regarding the importance of ship maintenance and life safety at sea. By strengthening knowledge and skills in maintaining vessels and adopting proper safety procedures, it is hoped that it can reduce the risk of accidents, improve operational efficiency, and ultimately improve the welfare and quality of life of fishermen. Support from the government, communities, and related organizations is also expected to facilitate the achievement of this goal through the provision of adequate facilities, training, and equipment.[R. J. Stanford, B. Wiryawan, D. G. Bengen, R. Febriamansyah, and J. Haluan,2014]

2. METHOD

This research method uses a qualitative method with a short description of the analysis. The methods used in this study include in-depth interviews and focus group discussions with fishermen in East Sapa Village. In-depth interviews are conducted to gain a deeper understanding

of fishermen's experiences, views, and knowledge related to boat maintenance and safety at sea. Focus group discussions involve small groups of fishermen to discuss important issues in a more interactive and collaborative manner, so as to identify the challenges and solutions they face on a daily basis. The results of this qualitative method will provide in-depth insights that cannot be obtained through quantitative methods, as well as help in formulating recommendations that are more relevant and in accordance with the needs of local fishermen.[Sugiyono,2018]

3. RESULTS AND DISCUSSION

Result

The results of this study show that most fishermen in East Sapa Village have a fairly high awareness of the importance of boat maintenance. However, their knowledge of the technical aspects of maintenance is still limited. Many fishermen only perform basic maintenance such as checking the engine and cleaning the boat, without understanding the importance of further maintenance such as checking the structure of the boat and safety equipment. Fishermen also mentioned that limited resources, both financial and material, are the main obstacle in carrying out thorough boat maintenance. The high cost of repairing and maintaining ships is often unaffordable for them, and the availability of spare parts and access to a competent workshop or technician are also an issue. From the interview, it was revealed that there are local customs and cultures that affect the way fishermen carry out boat maintenance. Some fishermen still rely on traditional knowledge passed down from generation to generation, which is sometimes inadequate in the face of modern technical challenges. However, they are also open to receiving new knowledge if given adequate training. Fishermen's understanding of safety at sea varies. Most are aware of the importance of using life jackets and other safety devices, but there are also those who consider them not very necessary except in emergency situations. Knowledge of evacuation procedures and the use of emergency communication tools is still very minimal.[R. Indrayani, A. I. Syamila, R. I. Hartanti, and A. D. P. Sujoso,2023]

In the group discussion, several fishermen recounted their experiences facing incidents at sea, such as leaking boats or engine shutdowns. They recognize that in such situations, safety skills and knowledge are essential. Many of them feel unprepared for emergencies due to a lack of adequate training and equipment. The group discussion also revealed the importance of cooperation and solidarity between fishermen. More experienced fishermen often assist younger

or less experienced fishermen in maintaining boats and handling emergency situations. This shows the potential to improve skills and knowledge through mentoring programs and community cooperation. Fishermen expressed the need for more intensive training and education on ship maintenance and safety at sea. They feel that the current training programs are insufficient and not always relevant to their condition. They propose that training be conducted regularly and involve practitioners or experts who understand the local context. One of the main topics in the discussion is the role of the government and related institutions in supporting fishermen. Fishermen hope for greater support in the form of subsidies for boat maintenance, the provision of safety equipment, and access to quality training. They also want a policy that is more in favor of small fishermen to improve their welfare.[A. C. Chávez-mejía, R. Magaña-lópez, J. C. Durán-álvarez, and B. E. Jiménez-cisneros,2019]

Another survey shows that only about 40% of fishermen carry out regular boat maintenance every month. The rest perform maintenance only when damage or problems occur. This shows that there are still many fishermen who have not considered boat maintenance as a top priority. Survey data shows that the level of fishermen's knowledge about safety at sea is at a moderate level. About 60% of fishermen know the basics of using safety equipment, but only 25% know evacuation procedures and emergency management well. This signifies the need for increased safety education. The survey results show that about 70% of fishermen have life jackets, but only 30% have emergency communication devices such as radios or flares. The ownership of the liferaft is also low, only about 20%. This data shows that despite awareness, the availability and ownership of safety equipment is still inadequate. The survey revealed that around 35% of fishermen have experienced accidents at sea in the last five years. The most common incidents are leaking ships, engine shutdowns, and bad weather. Most of these incidents occur due to a lack of maintenance of the ship and unpreparedness in dealing with emergency conditions.

Only about 20% of fishermen are satisfied with the support provided by the government and related institutions. Most fishermen feel that the existing support is inadequate, especially in terms of access to relevant safety equipment and training. One of the main findings is the need to increase education and training for fishermen. Comprehensive education on boat maintenance and safety at sea will help fishermen reduce the risk of accidents and improve operational efficiency. Training must be carried out regularly and adjusted to the specific needs of local fishermen. Financial support from the government and related institutions is urgently needed. Subsidies for

boat maintenance and the provision of safety equipment will ease the financial burden of fishermen and allow them to carry out better maintenance and have adequate safety equipment. Infrastructure upgrades such as the provision of affordable ship workshops and access to competent technicians are urgently needed. This will make it easier for fishermen to carry out routine boat maintenance and handle damage quickly and efficiently.

Fishing communities have great potential to support each other and share knowledge. Mentoring programs and community cooperation can be an effective solution to improve fishermen's skills and knowledge. Solidity between fishermen can also be strengthened through joint activities facilitated by the government or related organizations. There is a need for policies that are more in favor of smallholder fishers in the form of regulations that support access to resources, training, and social protection. Proactive and inclusive policies will help fishers overcome the challenges they face and improve their overall well-being. The introduction and use of modern technology such as weather apps, navigation systems, and emergency communication tools should be improved. This technology can help fishermen in planning trips better, avoiding hazards, and responding to emergencies more effectively. The programs that are carried out must be accompanied by continuous monitoring and evaluation to ensure their effectiveness and relevance. Feedback from fishermen must be taken into account to continue to improve existing programs and policies, as well as ensure that they are truly beneficial to the fishing community of East Sapa Village. The following author provides a brief overview of the main findings of the qualitative research conducted, helping in formulating more targeted strategies and recommendations to improve the welfare and safety of fishermen in East Sapa Village.

Table. 1 Main Findings from Qualitative Research on Ship Maintenance and Fishermen's Life Safety in East Sapa Village

| Aspects | Key findings |
|----------------------------------|--|
| Awareness and Knowledge | Most fishermen are aware of the importance of boat maintenance but technical knowledge is still limited. Many only do basic maintenance. |
| Resource Limitations | Financial and material constraints are the main obstacles to complete ship maintenance. Repair costs are high and access to parts and technicians is limited. |
| Local Customs and Culture | Local customs are still dominant in ship maintenance methods. Traditional knowledge is used, but fishermen are open to new knowledge if given adequate training. |

| Aspects | Key findings |
|-----------------------------------|--|
| Understanding Safety | Understanding varies; Many know the importance of life jackets, but knowledge of evacuation procedures and the use of emergency communication devices is still minimal. |
| Incident Experience at Sea | The experience of common incidents such as leaking ships and dead engines underscores the importance of safety skills. Lack of preparedness in an emergency due to lack of training. |
| Cooperation and Solidarity | Cooperation between fishermen is strong; Experienced fishermen often help the less experienced. The potential for skill improvement through mentoring and community cooperation is huge. |
| Training and Education | Fishermen feel the need for intensive training and education on ship maintenance and marine safety. The existing training program is considered less relevant and inadequate. |
| Government Support | Expectations for greater support from the government in the form of subsidies, safety equipment, and quality training. A policy that favors small fishermen is highly expected. |

Source:

After examining the results of the table above which contains the main findings of qualitative research on boat maintenance and the safety of fishermen in East Sapa Village, several important points can be identified. First, although many fishermen are aware of the importance of boat maintenance, their technical knowledge is still limited, often covering only basic maintenance such as checking the engine and cleaning the boat. This shows the urgent need for more comprehensive education on ship maintenance, including inspections of ship structures and safety equipment. Limited resources are a significant obstacle in ship maintenance. High repair costs and limited access to parts and competent technicians often prevent fishermen from performing adequate maintenance. This highlights the need for financial support and the provision of better resources to support effective ship maintenance. Local customs and culture also influence the method of boat maintenance. Many fishermen still rely on traditional knowledge, which is sometimes inadequate to meet modern technical challenges. However, they show openness to new knowledge if given relevant and contextual training. Therefore, training that combines traditional and modern knowledge will be very beneficial. When it comes to safety at sea, there are significant differences in understanding. Many fishermen are aware of the importance of using life jackets, but knowledge of evacuation procedures and the use of emergency communication devices is still very minimal. This shows the need for increased safety education that covers all aspects of safety at sea, not just the use of safety tools.

Discussion

The Importance of Technical Knowledge in Ship Maintenance

Technical knowledge regarding boat maintenance is a critical aspect that is still not paid attention to by many fishermen in East Sapa Village. While many of them are aware of the importance of maintenance, in-depth technical knowledge of how to maintain various boat components such as propulsion systems, hull structures, and navigation equipment is often limited. This has an impact on the efficiency and safety of the ship, and has the potential to increase the risk of damage that can affect daily operations. More in-depth and structured technical training is urgently needed to address these shortcomings and ensure that ship maintenance is carried out thoroughly. [R. E. Johannes, M. M. R. Freeman, and R. J. Hamilton, 2000]

Resource Limitations and Their Impact

Financial and material limitations faced by fishermen are one of the main obstacles in comprehensive boat maintenance. The high cost of boat repairs and maintenance often leaves fishermen only performing basic maintenance that does not include thorough inspections or preventive repairs. These limitations also worsen the condition of the ship which can lead to more serious and costly damage in the future. To address this problem, support is needed in the form of ship maintenance subsidies, easier access to parts, and more affordable repair facilities. [S. Jennings, 2016]

Local Customs and Culture in Ship Maintenance

Local customs and cultures influence the way fishermen perform boat maintenance, with many still using traditional methods that may not always be effective in the modern context. For example, knowledge passed down from generation to generation often does not include the latest technology or better safety standards. Combining traditional knowledge with modern techniques can be an effective approach, given the importance of preserving tradition while improving the necessary technical skills and knowledge. [Sabihaini, A. H. Pratomo, H. C. Rustamaji, and Sudaryatie, 2018]

Awareness of Safety at Sea

Awareness of safety at sea among fishermen shows significant differences. Many fishermen already understand the importance of safety equipment such as life jackets, but knowledge about evacuation procedures and the use of emergency communication equipment is still lacking. This can jeopardize their safety, especially in emergency situations. Thorough safety education and frequent training are required to ensure that all fishermen understand and are

prepared for emergencies in the right way.[S. Tuler, J. Agyeman, P. P. Da Silva, K. R. LoRusso, and R. Kay,2008]

Incident Experience and Lack of Preparedness

The experience of fishermen facing incidents such as leaking boats or dead engines highlights the importance of preparedness in dealing with emergency situations. Many of these incidents occur due to a lack of adequate training and equipment. In situations like these, practical knowledge and skills in dealing with damage and emergency situations are essential. Training programs that include emergency simulations and vessel damage handling can help fishermen become more prepared and responsive in unexpected situations.

The Role of Cooperation and Solidarity Between Fishermen

Cooperation and solidarity among fishermen is an important force that can be harnessed to improve their skills and knowledge. More experienced fishermen often share knowledge and skills with less experienced ones, creating a supportive learning environment. Community-based mentoring and training programs that harness the power of solidarity can accelerate the improvement of skills and knowledge among fishermen.

The Need for Relevant Training Programs

The need for more relevant and intensive training programs is the main finding in this study. The current training program does not always meet the specific needs of fishermen in East Sapa Village. Training should be tailored to local conditions, include vessel maintenance techniques that are appropriate to the type of vessel they use, as well as provide an in-depth understanding of safety at sea. More specific and focused training can help fishers face the challenges they face more effectively.

Expectations for Government Support

The support of the government and related institutions is a key factor in improving the welfare of fishermen. Many fishermen expect subsidies for boat maintenance, the provision of safety equipment, and access to quality training. This kind of support will help reduce the financial burden and allow fishermen to prioritize boat maintenance and safety. Governments need to consider policies that are more in favor of smallholder fishers and provide the necessary resources to support the sustainability and safety of the fishing industry. This is the Importance of

Infrastructure Development Improvements such as the provision of affordable ship workshops and access to competent technicians are urgently needed. Currently, the limitation of ship repair facilities and spare parts is a big problem for fishermen. The construction and development of adequate infrastructure will make it easier for fishermen to carry out routine boat maintenance, handle damage quickly, and maintain the operational quality of their boats.

The Potential of Modern Technology in Supporting Safety

The introduction and use of modern technology such as weather apps, navigation systems, and emergency communication tools can help fishermen in better planning trips, avoiding hazards, and responding to emergencies more effectively. This technology can improve operational safety and efficiency, as well as help fishermen make more informed and data-driven decisions. The implementation of technology that suits local needs can be an important step in improving safety at sea.

Program Monitoring and Evaluation

Programs implemented to improve boat care and fishermen's life safety must be accompanied by continuous monitoring and evaluation. Regular evaluations can help assess the effectiveness of programs and ensure that they are truly meeting the needs of fishermen. Feedback from fishers must also be taken into account to continue to improve existing programs and policies, as well as ensure that the interventions carried out provide real benefits.

The Importance of Community Involvement in Safety Education

The involvement of fishing communities in safety education can strengthen efforts to increase awareness and knowledge. Communities can play an important role in disseminating safety information and practices through joint activities and group discussions. Educational programs that engage local communities can increase participation and adherence to good safety practices.

Development of Inclusive Training Modules

The development of inclusive training modules, which take into account different levels of fishermen's knowledge and experience, is essential. These modules should be designed to meet the needs of fishermen with different backgrounds and experience levels, as well as provide training materials that are easy to understand and apply in daily practice. This inclusion will ensure that all fishermen benefit from the training provided.

The Role of the Private Sector in Supporting Fishermen

The private sector, including fishing companies and boat equipment providers, also has an important role to play in supporting fishermen. Cooperation between the private sector and the government can facilitate the provision of better equipment, as well as provide training and technical support. This collaboration can create a more supportive ecosystem for fishermen and improve their safety and operational efficiency.

Risk Management Strategies for Fishermen

Effective risk management strategies must be implemented to help fishermen face the various challenges associated with vessel maintenance and safety at sea. This approach should include identifying potential risks, evaluating their impacts, and developing appropriate mitigation plans. With a good strategy, fishermen can be better prepared to face risks and reduce the possibility of incidents that endanger their safety.

The Role of Formal Education in Improving Skills

A formal education in marine engineering and marine safety can provide a solid foundation for fishermen to improve their skills. Formal education programs that are affordable and relevant to the needs of fishermen can improve technical knowledge and safety, as well as open up opportunities for them to have a better career in the fishing industry.

The Need for Competency-Based Curriculum Development

A competency-based training curriculum, which focuses on the practical skills and knowledge required for ship maintenance and safety, should be developed. This curriculum should be developed by involving experts and practitioners who understand the specific needs of fishermen. The development of relevant curriculum will ensure that the training provided is truly effective and beneficial to fishermen.

Implementation of Incentive Programs for Ship Maintenance

Incentive programs for boat maintenance can be an additional motivation for fishermen to perform better maintenance. These incentives can be in the form of subsidies, maintenance vouchers, or awards for fishermen who demonstrate effort and compliance in boat maintenance. Incentive programs can increase fishers' participation and commitment in keeping their boats in good condition, including non-governmental organizations (NGOs) can play an important role in supporting boat maintenance and fishermen's safety initiatives. NGOs often have the experience and resources that can be used to implement training, counseling, and equipment provision

programs. NGO involvement can expand the reach of support and provide innovative solutions to the challenges facing fishermen.

Development of Public-Private Cooperation Model

The public-private partnership model can be an effective solution to increase support for fishermen. Through this collaboration, governments, the private sector, and fishing communities can jointly design and implement programs that support vessel maintenance and safety. This model can facilitate the sharing of responsibilities, resources, and knowledge between various parties. There is the implementation of policies that support boat maintenance and fishermen's safety facing various challenges, such as bureaucracy, lack of coordination between agencies, and budget constraints. Addressing these challenges requires a coordinated and collaborative approach, as well as a commitment from all parties to ensure that the policies implemented are effective and can be implemented well.

Program and Policy Impact Evaluation

Evaluating the impact of the programs and policies implemented is essential to assess their success and make improvements if needed. This evaluation should include measuring results, collecting feedback from fishermen, and analyzing data to determine whether the program is achieving the expected goals. The results of the evaluation can be used to improve the program in the future and ensure that the support provided is truly beneficial. Long-Term Strategy for Shipbuilding Sustainable shipbuilding requires a long-term strategy that includes proper planning and investment. This strategy should consider the need for innovation in ship design, fuel efficiency, and the latest safety technologies. With careful planning and adequate investment, fishermen can have safer and more efficient boats in the long run. Continued Innovation in Ship Maintenance Techniques. Innovations in ship maintenance techniques can help improve the effectiveness and efficiency of maintenance. New technologies, such as sensors and monitoring systems, can provide real-time data on the condition of the vessel and aid in the early detection of problems. The implementation of this innovation can help fishermen carry out more proactive maintenance and reduce the risk of damage.[K. Malakar, T. Mishra, and A. Patwardhan, 2014]

The Importance of Continuous Safety Education

Safety education must be an ongoing process, not only done once but as part of a routine and periodic activity. Awareness of safety at sea must continue to be increased through regular training, simulations, and information campaigns. Continuing education will ensure that fishermen are always prepared and aware of the latest safety procedures. Then Collaboration Between Fishermen and Research Institutes Collaboration between fishermen and research institutions can produce better solutions to the problems of boat maintenance and safety. Research conducted by involving fishers can provide deeper insights into the challenges faced and effective solutions. This collaboration can accelerate the development of technologies and best practices in the fishing industry. With this in-depth discussion, it is hoped that more effective and relevant solutions will be realized to improve boat maintenance and the safety of fishermen's lives in East Sapa Village. Integrated and sustainable efforts are essential to achieve significant improvements and ensure the welfare and safety of fishermen.[K. V. Størkersen and T. Thorvaldsen,2020]

4. CONCLUSION

This research shows that although the fishermen of East Sapa Village have a basic awareness of the importance of boat maintenance and safety at sea, they face a variety of significant challenges, including limited resources, limited technical knowledge, and lack of relevant training. Financial and material constraints hinder the implementation of thorough ship maintenance, while a varied understanding of safety indicates the need for more in-depth education. Strong community cooperation and greater government support, including the provision of resources and training programs, are essential to address these issues and improve the well-being and safety of fishermen. The implementation of integrated strategies and ongoing support will help fishers face these challenges more effectively.

5. REFERENCES

- Chávez-Mejía, A. C., Magaña-López, R., Durán-Álvarez, J. C., & Jiménez-Cisneros, B. E. (2019). Fisherman competency study on fishing business units on pole and line based on SKKNI and STCWF-1995 in Sikka Maumere Regency, East Nusa Tenggara. *International Journal of Environment, Agriculture and Biotechnology*, November, 44–57. <https://doi.org/10.22161/ijeab>
- Indrayani, R., Syamila, A. I., Hartanti, R. I., & Sujoso, A. D. P. (2023). Work safety aspects on the sea on small-scale fishermen in Jember Regency, Indonesia. *Indonesian Journal of Occupational Safety and Health*, 12(3), 337–348. <https://doi.org/10.20473/ijosh.v12i3.2023.337-348>

- Jennings, S., et al. (2016). Aquatic food security: Insights into challenges and solutions from an analysis of interactions between fisheries, aquaculture, food safety, human health, fish and human welfare, economy and environment. *Fish and Fisheries*, 17(4), 893–938. <https://doi.org/10.1111/faf.12152>
- Johannes, R. E., Freeman, M. M. R., & Hamilton, R. J. (2000). Ignore fishers' knowledge and miss the boat. *Fish and Fisheries*, 1(3), 257–271. <https://doi.org/10.1111/j.1467-2979.2000.00019.x>
- Kolding, J., Béné, C., & Bavinck, M. (2014). Small-scale fisheries: Importance, vulnerability and deficient knowledge. In *Governing Marine Fisheries and Biodiversity Conservation: Interactions and Co-evolution* (pp. 317–331). <https://doi.org/10.1002/9781118392607.ch22>
- Malakar, K., Mishra, T., & Patwardhan, A. (2018). A framework to investigate drivers of adaptation decisions in marine fishing: Evidence from urban, semi-urban and rural communities. *Science of the Total Environment*, 637–638, 758–770. <https://doi.org/10.1016/j.scitotenv.2018.04.429>
- Piniella, F., & Fernández-Engo, M. A. (2009). Towards a system for the management of safety on board artisanal fishing vessels: Proposal for check-lists and their application. *Safety Science*, 47(2), 265–276. <https://doi.org/10.1016/j.ssci.2008.04.005>
- Roberts, C. M., Hawkins, J. P., & Gell, F. R. (2005). The role of marine reserves in achieving sustainable fisheries. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 360(1453), 123–132. <https://doi.org/10.1098/rstb.2004.1578>
- Sabihaini, A. H., Pratomo, H. C., Rustamaji, H., & Sudaryatie. (2018). Environmental factors affecting traditional fishermen in maintaining the resilience of marine areas in the context of Indonesian state defense. *Humanities and Social Sciences Reviews*, 6(3), 46–54. <https://doi.org/10.18510/hssr.2018.637>
- Salas, S., & Gaertner, D. (2004). The behavioural dynamics of fishers: Management implications. *Fish and Fisheries*, 5(2), 153–167. <https://doi.org/10.1111/j.1467-2979.2004.00146.x>
- Saldanha, M. C. W., de Carvalho, R. J. M., Arcuri, R., Amorim, A. G., Vidal, M. C. R., & de Carvalho, P. V. R. (2020). Understanding and improving safety in artisanal fishing: A Safety-II approach in raft fishing. *Safety Science*, 122, 104522. <https://doi.org/10.1016/j.ssci.2019.104522>
- Stanford, R. J., Wiryawan, B., Bengen, D. G., Febriamansyah, R., & Haluan, J. (2014). Improving livelihoods in fishing communities of West Sumatra: More than just boats and machines. *Marine Policy*, 45, 16–25. <https://doi.org/10.1016/j.marpol.2013.11.013>
- Størkersen, K. V., & Thorvaldsen, T. (2021). Traps and tricks of safety management at sea. *Safety Science*, 134(February 2020), 1–20. <https://doi.org/10.1016/j.ssci.2020.105081>
- Sugiyono. (2018). *Metode penelitian kualitatif*. Alfabeta.

Tuler, S., Agyeman, J., Da Silva, P. P., LoRusso, K. R., & Kay, R. (2008). Assessing vulnerabilities: Integrating information about driving forces that affect risks and resilience in fishing communities. *Human Ecology Review*, 15(2), 171–184.