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Good Fish Handling Techniques to Maintain the Quality of Catch from Ship to Consumer

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Abstract

Proper handling of fish or fishery products from ships to consumers necessitates collaboration among fishermen, government agencies, and other stakeholders. By adopting a holistic approach encompassing technical, regulatory, and educational aspects, we can ensure the efficient and sustainable operation of fisheries supply chains for all involved parties. This article presented a literature review on good fish handling practices from ship to consumer, focusing on onboard handling, auctions, landing, and transportation. Using the search term 'Good Handling Practices for Fishing Products,' six articles out of 4,470 were identified that met the criteria for further discussion. The literature review findings highlighted optimal strategies for increasing fishing, auction, and transportation processes. These included improving record-keeping and documentation, implementing aerator systems to preserve fish quality, bulk fish cooling using ice cubes without water to mitigate quality deterioration, ensuring sanitation of fish distribution support equipment to prevent bacterial contamination, and utilizing tools such as Trolley Lifters to increase the efficiency of the fish distribution process. Therefore, governmental and non-governmental institutions should provide support and training to fishermen to maximize both the quality and quantity of fish catches.

Keywords: Fish Handling Techniques, Catch Quality, Ships, Consumers

INTRODUCTION

Fishery products are foodstuffs derived from the capture or cultivation of fish and other aquatic organisms. Unpreserved fishery products are generally highly perishable, meaning they spoil very easily. This characteristic stems from the fact that fish or seafood meat has a high water content, around 70-80% of its total weight. This high water content typically affects how the food is cooked and handled, as the water content can impact texture, taste, and the required processing methods. Fish meat has short, easily detached myocommata and very little binding tissue, usually less than 2%. It should be noted that mollusks (such as clams or oysters) may have a higher connective tissue content, reaching up to 7%. This is different from meat from slaughtered animals, which typically have much more connective tissue. Due to these characteristics, handling fish meat must be done carefully and following the four handling principles known as Clean-Carefull-Cool Chain-Quick (3C+Q): the fish handling process must be quick, maintaining the fish meat's temperature cold throughout handling, storage, and transportation, tools used must be clean, and sanitation must be well-maintained to prevent contamination, and fish handling must be done meticulously and carefully, including during cutting and processing. This can help maintain the quality of fish meat and reduce the risk of contamination or spoilage. Due to these characteristics, handling fish meat must be done carefully and follow the four handling principles known as Clean-Carefull-Cool Chain-Quick (3C+Q) This means that government agencies are responsible for regulating the fisheries industry and establishing regulations related to the capture, handling, and trade of fish (Zulaihah et al., 2019).

Cooperation between fishermen and the government is necessary to ensure compliance with these regulations to maintain the sustainability of marine resources. Additionally, government agencies and non-governmental organizations can train fishermen on sustainable fishing practices, good fish handling, and food safety (Mustaruddin et al., 2022). This facilitates increased fishermen's understanding and awareness of the importance of maintaining the quality and freshness of fish. However, many fishermen still lack information on proper fish handling, resulting in fewer fresh catches and many remaining unsold (Siegers et al., 2022).

The development of the fisheries sector drives infrastructure development in coastal areas, including ports, docks, cold storage facilities, processing plants, and other supporting facilities (Wardono et al., 2022). These measures help improve the efficiency of fishery capture, processing, and distribution. Exporting fishery products such as fish, shrimp, lobster, and processed seafood has become a source of foreign exchange revenue for Indonesia. The export of fishery products significantly contributes to the country's foreign exchange earnings.

Fish handling on board the ship must focus on three key aspects: first, understanding good handling techniques and using the 3C+Q system (Clean, Careful, Cool Chain, Quick) (Purnomo et al., 2023). This includes treating the fish gently, preventing injury to the fish, and minimizing stress during the handling process. It also involves ensuring that the ship is equipped with proper fish-handling equipment, such as cutting tools, cleaning tools, and cooling systems. Second, applying cleanliness principles: the ship must always be clean, and sanitation must be well-maintained to prevent contamination and spoilage of the fish (Wiji Nurani et al., 2023). People handling fish must wear gloves, aprons, and maintain personal hygiene. Third, maintaining the proper temperature: the storage area temperature must be kept at an appropriate level to preserve the freshness of the fish (Kurniadi et al., 2024). Furthermore, the processed fish must be properly packaged to maintain its quality during storage and transportation. It is also important to ensure that waste from the fish handling process is well-managed to prevent environmental pollution. By following these practices, it is expected that the ship can maintain the quality of the caught fish and ensure the safety of the products for consumers.

Fish Auction Places (Indonesian: *Tempat Pelelangan Ikan*) are a process in the fish supply chain that ensures fish caught by fishermen can be distributed and sold efficiently (Sihotang et al., 2024). Below is the sequence of fish handling at the fish auction place, starting with fishermen bringing their catches to the port or fish landing facility. The captured fish are inspected and documented. Once documented, the fish are typically placed in containers or baskets for transportation to the market or auction place. Packaging must be done carefully to ensure the safety and quality of the fish are preserved. If not immediately taken to the auction place, the fish are usually stored under appropriate conditions, such as refrigeration or the use of ice, to maintain their freshness and quality. The prepared fish are then transported to the auction place. Transportation must be done quickly and efficiently to prevent damage to the fish. Upon arrival at the auction place, the fish are usually inspected again to ensure their quality. This may involve checking for freshness, size, and the physical condition of the fish. The fish are then auctioned to interested buyers. The auction process is typically conducted swiftly and efficiently, with prices determined based on market demand and the quality of the fish. Fish auctioning plays a crucial role in the distribution of fish from fishermen to end consumers. It's important to maintain the quality of the fish throughout this entire process to ensure customer safety and satisfaction (Nur Alam & Tang, 2023).

Proper fish transportation is key to maintaining the freshness and quality of fish during the journey from the catch location to the market or end consumers. Here's the correct and proper way of fish

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transportation, starting right after the catch: the fish must be promptly chilled to prevent damage and spoilage. The use of ice or efficient cooling systems is crucial to keeping the fish temperature low (Loppies & Lilipaly, 2021). Then, use transport vehicles equipped with good cooling facilities, such as refrigerated trucks or ice containers, to maintain the fish temperature stable during the journey. Subsequently, the fish are separated based on type, size, and condition by carefully arranging them in suitable containers or boxes for transportation (Iskandar et al., 2022). It is necessary to discard fish that are already damaged or unfit for consumption to prevent bacterial contamination that leads to decay. The final step is to ensure that the fish are packed tightly and securely with plastic bags or ice bags to avoid leakage or damage during transportation.

Fishery handling involves a series of steps undertaken to maintain the quality and safety of fishery products from the moment they are caught until they reach the hands of consumers. This process involves various actions to prevent damage, contamination, or deterioration in the quality of fishery products. Here are some common steps in fishery handling. Good handling and adherence to food safety standards are important factors in maintaining the quality and safety of fishery products. Handling begins as soon as the seafood is first taken from the water. Careful harvesting and the use of appropriate fishing methods and equipment, as well as clean decks and holds, will help maintain the quality of the catch. After being thoroughly washed, the fishery products are sorted to separate the target fish from the non-target fish. Injured or damaged fish can affect the overall quality of the catch. Fish sorting activities can be carried out based on the type of fish, size, and level of freshness. Subsequently, the cooling or freezing stage, where the process is done as soon as possible after the fishery products are caught. This process helps maintain the quality and freshness of fishery products by inhibiting the growth of microorganisms and enzymatic deterioration. After being frozen, fishery products must still be handled with care to prevent physical damage. The use of appropriate containers or packaging and storage at the correct temperature will help maintain product quality. Furthermore, transporting fishery products using proper methods and equipment ensures that temperature conditions are maintained, and handling is gentle. The use of vehicles equipped with cooling or freezing facilities can help maintain the quality of fishery products during transportation.

However, there is still untapped potential in Indonesia's fishing activities, namely the ineffective management of fisheries resources or the inadequate implementation of regulations, which can lead to overfishing (Siregar et al., 2020). In some areas, especially in inland or remote regions, there are several obstacles such as limited access to technology and modern infrastructure needed to increase fishing efficiency. Furthermore, many fishermen, especially those operating on a small scale, have limitations in both technical knowledge and access to capital and training. Additionally, some fishermen may face economic challenges, such as accessing capital to improve fishing capacity, high fuel costs, and a lack of access to profitable markets (Azuwandri, 2021). The last issue is climate change, habitat degradation, pollution, and other environmental factors that can affect the success of fishing and lead to a decline in catch. Therefore, this study addresses the title " Good Fish Handling Techniques to Maintain the Quality of Catch from Ship to Consumer" using a literature review method to determine good fish handling practices from capture, auctioning, to transportation.

METHODOLOGY

This article is a literature study that uses secondary data from journal publications spanning from 2015 to 2024, relevant to the topic of discussion. The article is sourced from the specified database, Google Scholar. The research employs the search term "Best Practices for Handling Fish Catch." In conducting article selection, inclusion criteria are established

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to filter the retrieved articles. The inclusion criteria for the literature study are studies utilizing both quantitative and qualitative methods within the last 10 years (2015-2024). The types of articles used are from national and international journals, both in Indonesian and English languages, and are available for downloading in full paper. The next step is to assess the quality of the articles using the Critical Appraisal instrument from the Joanna Briggs Institute for Studies with the Checklist for Qualitative Research. An article will be considered not feasible for synthesis if the appraisal score is ≤20, while an article will be considered feasible for synthesis if the appraisal score is >20. The search strategy for the literature results is presented in the following flowchart. Out of 4,470 articles matching the keywords, a number are considered feasible for further discussion.

RESULTS

The research results indicate that the best way to improve the fishing, auctioning, and transportation processes is by enhancing the capability of recording and documenting fish catches, implementing aerator systems to maintain fish quality, bulk cooling of fish using ice blocks without water to address and prevent fish quality deterioration, sanitation of fish distribution equipment to prevent bacterial contamination. Additionally, to enhance the effectiveness and efficiency of fisheries distribution, auxiliary tools such as trolley lifters are required (Table 1).

Tabel 1. Results

No	Title and Year	Publication and Sinta	Authors	Research
1.	Implementasi Praktik Baik Perikaan Tangkap Berkelanjutan di Kecamatan Ayah Kabupaten Kebumen (Implementation of Good Practices for Sustainable Fishing in Ayah District, Kebumen Regency) (Wiji Nurani et al., 2023)	Agrokreatif: Jurnal Ilmiah Pengabdian kepada MasyarakatSinta 3	Tri Wiji Nurani, Prihatin Ika Wahyuningrum, Rianti Dyah Hapsari, Nurani Khoerunnisa, Elvanri Anggi Widianti, Eko Sri Wiyono, Iin Solihin, Muhammad Dahri Iskandar, Sugeng Hari Wisudo	Fishing practices in the Kebumen area still need improvement, especially in terms of proper handling of fish for export, catching lobsters of appropriate sizes, processing and adding value to abundant fish during the fishing season, improving the ability to record fishing activities, the ability to use technology to identify fishing areas, aerator systems to maintain fish quality, increasing willingness and ability to use larger fishing ships, and improving knowledge of other fishing techniques.
2.	Praktik Perikanan Destruktif (Studi Kasus pada Taman Nasional Taka Bonerate) (Destructive Fishing Practices (A Case Study in Taka Bonerate National Park)) (Asri et al., 2019)	Jurnal Sosiologi Pedesaan Sinta 2	Muh. Asri, Ekawati Sri Wahyuni, Arif Satria	Appropriate fishing practices to maintain quality require monitoring and eradication of perpetrators of destructive fishing practices in the area. Additionally, inter-agency efforts are needed to monitor and eradicate perpetrators of destructive fishing practices, including networks involved in the trade of fish bombing materials and tranquilizers, as well as fish obtained from destructive fishing practices. Moreover, support programs for fishermen are also necessary to revitalize local institutions aimed at environmentally friendly

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No	Title and Year	Publication and Sinta	Authors	Research
				management of capture fisheries resources.
3.	Analisis Sosio Ekonomi Terhadap Praktek Penanganan Mutu Ikan Pelagis Kecil di Tempat Pelelangan Ikan Blanakan dan Pekalongan (Socio-Economic Analysis of Quality Handling Practices for Small Pelagic Fish at Blanakan and Pekalongan Fish Auctions) (Purnomo et al., 2023)	Jurnal Penelitian Perikanan Indonesia Sinta 2	A.H. Purnomol, Subaryono, Suryanti, and E.S. Heruwati	Quality handling practices at fish auctions can be improved by increasing performance through the use of appropriate technology that processors can utilize to improve product quality. Additionally, considering alternative processing methods that can enhance short-term profits without sacrificing the future of business and resource sustainability is crucial. It is also important to establish green areas through the formation of marine conservation areas or fishing prohibition zones to ensure the recovery of threatened fish stocks, maintain marine biodiversity, and preserve a healthy marine ecosystem
4.	Pelatihan Penanganan Ikan Tuna Sirip Kuning (*Thunnus Albacares*) Secara Bulking Dengan Es Batu di PPI Hamadi Kota Jayapura (Training on Handling Yellowfin Tuna (*Thunnus Albacares*) in Bulking with Ice Blocks at Hamadi Fisheries Port, Jayapura City) (Siegers et al., 2022)	DINAMISIA: Jurnal Pengabdian Kepada MasyarakatSinta 3	Willem Hendry Siegers, Ade Kurniawa, Dahlan, Yudi Prayitno, Sitti Khairul Bariyyah, Ralph.A.N. Tuhumury, Imran Syafei M. Nur	To prevent quality deterioration during sales and storage processes, bulk cooling of fish using ice blocks without water helps address and prevent quality degradation of the fish. Therefore, training is required to construct boxes with drainage holes at the bottom to ensure proper circulation of melted ice and blood. This is done to prevent significant deterioration in organoleptic quality, which can result in fish loss and decreased consumer acceptance
5.	Desain Alat Bantu Trolley Ergonomis di Depo Pasar Ikan Kota Tasikmalaya (Design of an Ergonomic Trolley Tool at the Fish Market Depot in Tasikmalaya City) (Eldrin & Sarvia, 2021)	Jurnal Teknik Industri : Jurnal Hasil Penelitian dan Karya Ilmiah dalam Bidang Teknik Industri Sinta 4	Gheva Julian Eldri and Elty Sarvia	Equipment in the form of a trolley lifter is needed to make loading and unloading easier and faster. This lifting trolley is designed according to transportation needs and based on anthropometric data analysis to reduce repetitive transportation processes, lessen the burden of carrying fish for sellers, and make the usage process easier and more comfortable.
6.	Segi Sanitasi Pada Pendaratan Ikan Tuna di Pelabuhan Perikanan	Jurnal Ilmu Pertanian Indonesia Sinta 2	Mustaruddi, Eno Selomita, Thomas Nugroho, Sri	The sanitation of fish during landing has a direct and significant impact on the quality of captured tuna. The quality of tuna, whether maintained or not, is

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No	Title and Year	Publication and Sinta	Authors	Research
	Samudera Bungus, Sumatra Barat (Sanitation Aspects in Tuna Fish Landing at Bungus Ocean Fisheries Port, West Sumatra) (Mustaruddin et al., 2022)		Susanti Kartini	determined by the cleanliness quality at 84.4%. Potential losses due to lack of sanitation measures during landing include a decrease in tuna quality and loss of the highest selling price, costs for nutritional counseling and disease management, as tuna consumption reduces nutritional content and increases vulnerability to diseases.

DISCUSSION

Huwaida et al., (2023) stated that the process of proper fish handling involves ensuring that all crew members on the ship have a good understanding of good handling practices and the importance of food safety. The research by Ilham et al., (2023) stated that good fish handling involves a series of steps and practices to ensure the freshness, quality, and safety of fish from the moment it is caught until it reaches the hands of consumers. Furthermore, the study by Sartika Amiria & Rozi (2022) indicates the importance of complying with all regulations and legal requirements related to fishing, handling, and trading of fish, including rules regarding minimum fish size, catch limits, and waste handling procedures. Through the implementation of these practices, fish handling can be conducted effectively, maintaining the quality and freshness of fish, and ensuring safe and high-quality fish products for consumers.

Nurrachman et al., (2023) explain that good handling after catching fish involves promptly dealing with the fish to prevent a decline in quality and freshness. Swift handling helps reduce the risk of decomposition. Sifatullah et al., (2023) state that cooling the fish using ice or ship cooling systems helps maintain low temperatures and prevents the growth of harmful bacteria.

Bulk cooling of fish using ice blocks without water is a commonly used method in the fishing industry to maintain the quality and freshness of fish during transportation or storage processes. Zulaihah et al., (2019), in their research, explain the benefits of this cooling method, stating that ice blocks without water allow fish to be cooled without the risk of contamination by water or excessive humidity. This helps maintain the quality of fish and prevents spoilage during transportation or storage processes. Supported by the research by Wahyudi (2022), which indicates that the use of ice blocks without water can also reduce the risk of leakage or spills that often occur in cooling methods using liquid ice.

Sanitation on fish distribution equipment to prevent bacterial growth. In line with the research by Nuryanti et al., (2017) states that sanitation on fishing equipment is crucial to prevent contamination and bacterial growth that can cause damage to fish and even pose health risks to consumers. The study by Sartika Amiria & Rozi (2022) states that implementing good sanitation measures can ensure that fish distribution equipment remains clean and safe to use, thereby helping to maintain the freshness and safety of fish distributed to consumers.

Auxiliary tools such as trolley lifters are also necessary to enhance the efficiency and effectiveness of fisheries distribution processes. This statement is supported by the research of Nyoman Subawa et al., (2015). These trolleys have ergonomic designs that consider human body posture and minimize pressure on the body when used. For example, ergonomic and elevated handles allow users to push the trolley comfortably without bending too low. Purwanto & Pakaya (2021) also

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support previous research, stating that the use of specially designed ergonomic trolleys can improve efficiency, comfort, and safety in the transportation and distribution processes of fish, thus helping to ensure the freshness and quality of the fish produced.

CONCLUSION

The results of the literature review indicate that the fisheries distribution process must be carefully considered to maintain the quality of fish; thus, when they reach consumers, they can provide maximum benefits. Some aspects to consider in handling fish on board, at auction sites, and during transportation include improving the capability of recording and documenting fish catches, implementing aerator systems to maintain fish quality, bulk cooling of fish using ice blocks without water to address and prevent the deterioration of fish quality, sanitation on fish distribution equipment to prevent bacterial growth. Additionally, to increase the effectiveness and efficiency of fisheries distribution, auxiliary tools such as trolley lifters are required. Therefore, government and non-governmental organizations need to provide training to fishermen to ensure that the quality and quantity of fish catches are maximized.

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