Investigation of *Escherichia coli* contamination in fresh *momar* (*Decapterus* sp) in Ambon City fish market

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Abstract. The process of handling fresh fish by traders is still inadequate in terms of safety when handling fish after rigor mortis. Preliminary exploration in the market results in the fish that reach consumers being contaminated microbiologically in addition to chemical and physical contamination. Microbiological contamination is of great concern because it can potentially cause disease. This study investigated *Escherichia coli* contamination on *momar* (*Decapterus* sp) sold in three Ambon City fish markets, namely the Arumbae fish market, the Rumah Tiga fish market and the Wayame fish market. This study used descriptive analysis with *E. coli* detection testing. The results of the investigation of the presence of *E. coli* is positive for *momar* in the Arumbae market and it is already exceeding the maximum contaminant of ISO 7388-2009 *E. coli* bacteria in fresh fish. On the other hand, *E. coli* bacteria is not detected for *momar* from the Rumah Tiga market and the Wayame market. The potential for *E. coli* contamination in the Arumbae market may come from the washing water used.

1. Introduction

So far, the process of selling fresh fish, both in fish auctions, traditional fish markets and retailers, has not had serious attention to hygiene and sanitation. The potential for pathogenic bacteria originating from water can be a source of contaminants in fish, therefore fish traders in the market must pay attention to the quality of washing water used [1]. There are evident through several reported research results regarding the quality of fish washing water used by traders in traditional fish markets in several provinces in Indonesia, such as *Salmonella* bacteria in fish washing water at a market in a fish auction in Kupang City [2] and *Escherichia coli* in fish washing water used by fish traders in several fish market centers in Manado City [3, 4]. Preliminary results of laboratory tests by Fish Quarantine and Inspection Agency Ambon also detected *E. coli* in fish at the Arumbae market in Ambon City.

Fish is the most perishable food product where its quality can quickly decline during handling and storage which limits the shelf life of the product [5]. The advantages of fish as food are due to its easy digestibility and high nutritional value [6]. However, fish are susceptible to a wide variety of pathogenic bacteria, most of which are capable causing disease. In addition, the current condition of fish sales in traditional fish markets is still not applying the principles of being careful, fast, careful and clean, so the quality of the fish will decline very quickly. Of a number of species of fish pathogenic bacteria that are transmitted through food, one of them is *E. coli* which is associated with fish infection or contamination of fish products intended for human consumption. *E. coli* generally lives in the intestines of humans, animals
and fish. Most of the \textit{E. coli} which are normal inhabitants of the small intestine and large intestine are non-pathogenic. However, this non-pathogenic \textit{E. coli} can cause disease if it spreads beyond the intestine to other organs. Pathogenic \textit{E. coli} strains can cause diarrhea by producing and releasing toxins (called enterotoxigenic \textit{E. coli} or ETEC) \cite{7} and may be the cause of food spoilage in fish. Therefore, the determination of bacterial in fresh fish destined for human consumption is an indicator of the quality of fresh fish \cite{8}.

Several studies on bacterial contamination of fish and marine products have been carried out and reported the presence of bacteria in fish such as in tuna sold at the Kedonganan Bali fish market \cite{9}, at traditional, modern marketing places as well as fish auction warehouses in Bandar Lampung City \cite{10} and at Peunoyang market and TPI Lampulo Aceh City \cite{11}. Meanwhile, \cite{7} reported isolation and identification of \textit{E. coli} and \textit{Edwardsiella tarda} from fish caught in Zeway Lake, Ethiopia. Furthermore, \cite{1} reported a review of fish handling and microbial contamination in flying fish in the Arumbae market and Batumerah market in Ambon city. \cite{12} reported organoleptic quality of fresh fish (\textit{Decapterus} sp.) during selling at Ambon traditional market.

In Ambon City, the habits of fish sellers in the market have not paid attention to sanitation and hygiene facilities such as the use of air, fish storage and fish handling techniques with poor facilities so that they are undoubtedly a potential source of bacterial contaminants that can be transmitted to food. Therefore, the safety of fish products for human consumption should be a major concern. However, so far there has been no detailed research on the microbiological safety of fish products, especially for the most dominant fish in Ambon, \textit{momar} (\textit{Decapterus} sp). Therefore, this research is conducted to see the presence of pathogenic bacteria \textit{Escherichia coli}, which interfere with the safety of fish products.

2. Materials and Method

This research was conducted in July 2020. Fish samples were taken from the Ambon City fish market. The \textit{E. coli} analysis was carried out at the Fishery Product Technology Laboratory, Faculty of Fisheries and Marine Sciences, Pattimura University Ambon. The data collection method is carried out by survey methods in the field to observe directly the fish handling techniques by traders in the market, namely the water source used, ice, fish storage during sales and exploratory methods to determine \textit{Escherichia coli} contamination in fish grown on agar media.

Sampling of fish from traders in Arumbae Market, Rumah Tiga and Wayame markets is carried out in the morning (07.00-10.00 am). Sampling was repeated three times in which in the first collection, fish was collected inside the market, while in the second and the third fish were collected outside the market. Fish collected were stored in a cool box then taken to the Fishery Product Technology Laboratory, Faculty of Fisheries and Marine Sciences, Pattimura University Ambon, for further observation \textit{E. coli} contamination using the MPN method.

3. Results And Discussion

3.1. Detection \textit{E. coli} in \textit{momar} at Arumbae Market

The results showed that fish of first sampling contain \textit{E. coli} bacteria in \textit{momar} at the Arumbae market, with a total of 240 APM/g. This figure indicates that the fish has exceeded the maximum limit of microbial contamination of ISO 7388-2009 for \textit{E. coli} bacteria in fresh fish i.e. <3 / g. On the other hand, no \textit{E. coli} bacteria were found in \textit{momar} of the second and third collection. So it can be said that not all fish in the Arumbae market contain \textit{E. coli}. It is suspected that on the first sampling, the fish was contaminated with \textit{E. coli} bacteria because the handling carried out by the traders was less hygienic. Figure 1 and Figure 2 show that the place and equipment used when selling fish is very dirty and the water used for watering the fish is taken directly from sea water at the market location which is also looks dirty.
This sea water might be contaminated by the *E. coli* bacteria. Bacterial contamination in food or processing equipment is an indication that sanitation practices are poor in handling [13].

![Figure 1](image1.png) **Figure 1.** The pit for taking sea water for washing fish

![Figure 2](image2.png) **Figure 2.** Fish storage box

No *E. coli* bacteria found in the second and third collection might be due to the conditions of the selling place which is more hygienic and the fish storage in boxes filled with ice was still intact and clean. Whereas in the first collection, it was suspected that the cause of the *E. coli* bacteria was due to the unhygienic use of sea water for washing and watering fish during sales.

### 3.2. Detection of *E. coli* in momar at Wayame and Rumah Tiga Markets

Analysis on momar that were sold at Wayame and Rumah Tiga markets showed that the fish samples had negative *E. coli* results. This result shows that fish handling practices in these two markets are good that can be shown through the use of clean sea water in fish washing as well as other handling support equipment.

The first step taken by the fish sellers at Wayame Market and Rumah Tiga is washing fish after the fish are removed or unloaded from the car with sea water which is collected in pans and buckets. The washing process carried out by the sellers is by putting the fish into a bucket filled with seawater then rinsing the fish repeatedly until it is clean. According to fish traders at Rumah Tiga and Wayame markets, based on their experience using fresh water to clean fish will cause the fish spoil quickly. This is supported by [14] who stated that fish washed with seawater do not rot quickly when compared to fish washed with fresh water. However, the sea water used must be clean and before used it should be collected first to remove the particles in the sea water.

The difference in the presence of *E. coli* contamination in the momar described above is possible because of the influence of the environmental conditions of the water source. Therefore, the quality of water used in the handling and assessment of fish in the market must be considered because it is a determining factor for the quantity of microbial contamination in fresh fishery products.

[15] argue that in order to maintain the quality of fresh fish consumed, they must be handled properly because fish must be considered like any other food product. Cleanliness must always be maintained throughout the distribution chain, given that fish are a food item that rots faster than others. Apart from the fish itself, the tools used in handling must be considered for cleanliness and the use of ice to keep its freshness.
4. Conclusion
The presence of *Escherichia coli* in momar at the inside of Arumbae market is already exceeding the maximum contaminant of ISO 7388-2009 *Escherichia coli* bacteria in fresh fish i.e. <3 / g. The potential for *E. coli* contamination probably comes from the washing water used, while the momar from the Rumah Tiga market and the Wayame market *E. coli* bacteria were not detected.

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