# Increasing of fish quality using ice-sterofoam container for paseban fisherman at Jember Regency East Java, Indonesia

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**Abstract.** Using of fish storage containers is not always done by fishermen at Paseban Beach, Jember Regency East Java-Indonesia. This study evaluated the quality of fisherman catches fish based on population of microbial. The introduction of storage container was conducted without or using the ice cooler. There were three samples of fish treatment that evaluated i.e without storage container (on the boat floor), sterofoam container and ice-sterofoam container. Recall questionnaires conducted to evaluate the habits of Paseban fishermen in fish storing during fishing. There were 36% of fishermen no use the storage container for their fish during fishing, 14% of fishermen use the sterofoam container without ice cooler, and 50% of fishermen used ice-sterofoam container. The level of microbial contamination on the catch fish required SNI standard that reached $10^4$ cfu/g. The storage of catch fish in the sterofoam container can decrease the level of contamination up to 2 log cycles ($10^2$ cfu/g). The quality of catches fish of Paseban fishermen can be classified as the SNI required (less than 5 x $10^5$ cfu/g).

## 1. Introduction

Paseban Beach is located ± 50 km to the northwest of Jember city precisely in Paseban Village, Kencong Subdistrict, is a beach tourism object that stretches long and clean and can look towards the island of Nusa Barong. The fishermen on Paseban beach still use simple equipment to catch the fish. The fishing community on Paseban beach belongs to artisanal fishermen. Fishing communities are one group of people who are considered to be absolutely poor, even the poorest of the poor. Various studies have also shown that the condition of fishermen, especially fishermen of small-scale fisheries in Indonesia are at a marginal level.

Artisanal fishermen who are included as *small scale fisheries* are boat owners whose majority of their income depends on fishing activities in the sea, operating their own boats with a weight of the boat between 2.75-25 GT (or the size of the boat length of 5 meters to 15 meters, widths between 1.5 meters to 6 meters using simple fishing gear (such as gilnet, clown nets, *minitrawl*, fishing rods, stakes), using revenue sharing systems between owners and crew members, and selling fish catches within the local market limited[1].

There are can affect the quality of the end-product, if the fish raw material is bad. Choosing the appropriate fish containers is considered as one significant factor contributing to the fish freshness and quality.The changes of fish quality more easily be noticed and consist of changes the colour, odour or smell, taste, appearance and texture, that can affect the sensory preference[2].

The problem that arises is that the catching facilities and infrastructure are still simple and limited, so the number and quality of catch fish are also very low. Thus the selling price of Paseban beach fish is relatively very low. This has an impact on the level of welfare of fishermen who are low (poor) with the daily income of fishermen is very low around less than Rp. 20,000.00 per fisherman. Temperature control in containers can improve during fresh fish handling by using simple redesign and experimental testing. The design improvements can more stable temperature through sea freight and transport so get satisfactory improvements with simple and cost effective Procedures[3].

In general, the catch sea water fish is still quite feasible to consume, but to improve the quality of the caught fish, the vessels transformed the vessels that used to use ice coolers to ships using coolers *freezer*. The purpose of this study was to analyze the quality of caught-sea water fish by the various storage containers.

## 2. Materials and Methods

### *2.1 Materials*

The media for determination of microbial contamination were PCA (*Plate Count Agar*), and the chromogenic media i.e HEA (*Hectoin Enteric Agar*) and SCA (*Salmonella Chromogenic Agar*). The tools used are autoclaves, laminar flow, a set of microbiology test kits.

### *2.2 Sampling of Sea Water Fish*

Sampling of sea water fish was done on fresh caught fish with sterofoam storage containers, sterofoam containers with cube ice, and without storage containers. A total of 500g of sea water fish were dissolved in a sterile physiological solution contain 0.85% NaCl. Then the series dilutions up to $10^{-4}$ were $10^{0}$, $10^{-1}$, $10^{-2}$, $10^{-3}$ and $10^{-4}$. The last three series were inoculated on PCA, HEA and SCA media. Inoculation method used the pour plate on the last three series of dilution. The microbial population was calculated based on BAM standards 25 - 250 colonies/dishes. The contamination of *Salmonella* sp showed green colonies on HEA and purple media on SCA media. The contamination of *Eschericia coli* sp showed yellow colonies on HEA media and blue on SCA media[4].

### *2.3 Determination of Contaminant Microbes Population[5]*

Determination of bacterial population was carried out using the BAM (Bacteriological Analytical Manual) namely:

$N = \{\Sigma C / [(1 \times n1) + (0.1 \times n2) \times (d)]\}$

N = number of colonies
ΣC = number of colonies in both dilution series used
n1 = number of plates used in the first dilution series
n2 = number of plates used in the second dilution series
d = series of lowest dilution used.

## 3. Results And Discussion

### *3.1 Fish Quality of Paseban Fishermen*

Investigation of catches fish was carried out on the Paseban fisherman and local fish market (Tempat Pelelangan Ikan/TPI). The catch fish was shown in Figure 1.


**Figure 1**. Investigation of the catching fish quality of Paseban fisherman

Quality of fish without storage container was not neat and the chances of contamination was very high, both from the condition of the boat's facilities and the cross contamination by fishermen personnel. Contamination by fishermen can be caused by poor sanitation of personnel. The results of the questionnaire showed that more than 50% of fishermen respondents do not have a habit of washing hands, only 9% always do handwashing, and 36% seldom do handwashing (Figure 2).

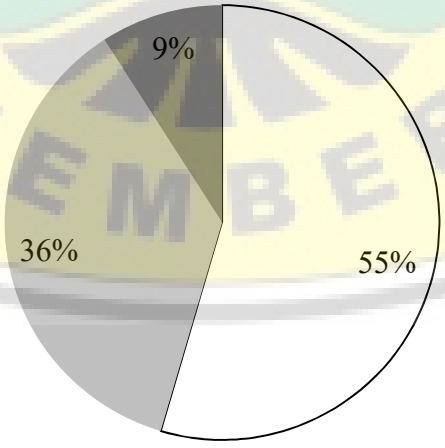


**Figure 2**. The handwashing habits of Paseban fishermen's: never (□), always (▒), seldom (■)

The fish is often handled in unhygienic conditions can causing spoilage by pathogenic bacteria contamination, and a loss of income as fish are sold for a low price. Fishermen may also lack knowledge, skills and the ability to invest in new equipment during fish storage[6].

*3.2 Using of Fish Storage Container*

Results of the investigation showed that there were differences in the effect of using containers with and without cube ice on the microbial population of contaminants. Sterofoam storage containers produce fewer microbial populations than without using containers. The catch storage in sterofoam containers equipped with ice cubes produces the least contaminated microbial population. There were still 36% of Paseban fishermen no used container to storage the cathes fish, 14 % are used sterofoam container, and 50% are used sterofoam container with cube ice (Figure 3).

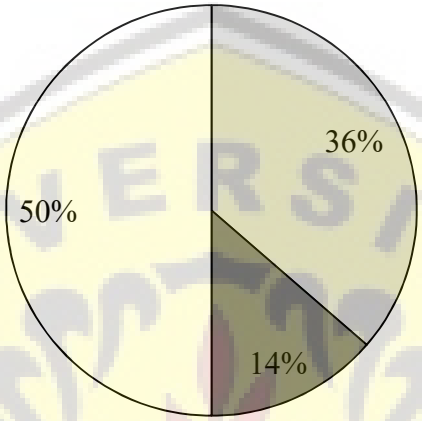


**Figure 3**. Using of fish storage containers by Paseban fishermen's: without container (□), sterofoam container (■),sterofoam container with cube ice (□)

With the limitations of fishing facilities, the Paseban fishermen have high hopes for the facilities, especially fish nets, and storage container. Figure 4 is the result of the fishermen's hope questionnaire. As many as 82% expect to get the aid of fishing gear in the form of nets, storage container and 18% expect the construction of a wave-reducing arm, considering the waves are big on Paseban Beach.

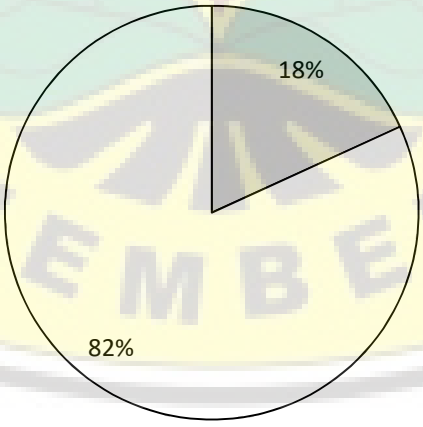


**Figure 4**. The hope of Paseban fishermen's to Government: a wave-reducing arm (■), fishing gear facilities (□)

*3.3 Population of Microbial Contamination on Catches Fish of Paseban Fishermen Using Different Type of Container*

The population of total microbial contamination on catches fish of Paseban fishermen up to $10^4$ cfu/g, while the bacteria contamination in the range of 10 - 100 cfu/g or 1 - 2 log cfu/g cycles. The population of microbial contamination is presented in Table 1 and figure 5.

**Table 1**. Population of total microbe, *Salmonella* sp, *Eschericia coli*

| Type of container | Population (cfu/ g) | | |
|---|---|---|---|
| | Total microbe | *Salmonella* sp | *Eschericia coli* |
| Without container | $1.14 \times 10^4$ | 0 | $1.6 \times 10^1$ |
| Sterofoam container | $3.73 \times 10^2$ | 0 | $1.4 \times 10^1$ |
| Sterofoam container with block ice | $1.45 \times 10^1$ | 0 | $2.0 \times 10^0$ |
| Standard SNI (total plate count/ TPC) | $<10^5$ | 0 | <3 |

Table 1 showed that the microbial population of contaminants is around $10^4$ cfu/g. The treatment of storage containers showed significant results that storage using stereofoam could reduce the microbial population of contamination compared with no storage containers. Storage using container contain cube ice is the best method for improving the quality of catch fish. Storage methods with ice can reduce microbial and bacterial contamination populations up to 2 log cycles (Figure 5). Ice limits the growth of mesophilic bacteria. Bacteria are the fastest microbes in multiplying compared to other microbes (yeast and yeast and mold). Bacterial growth generally occurs at room temperature and most bacterial contamination populations are mesophilic bacteria[7]. The total difference in microbial population indicates the difference in the processing error [8]. This is suitable to be caused by a dirty, unhygienic and sterile environment that can trigger rapid microbial growth [9].

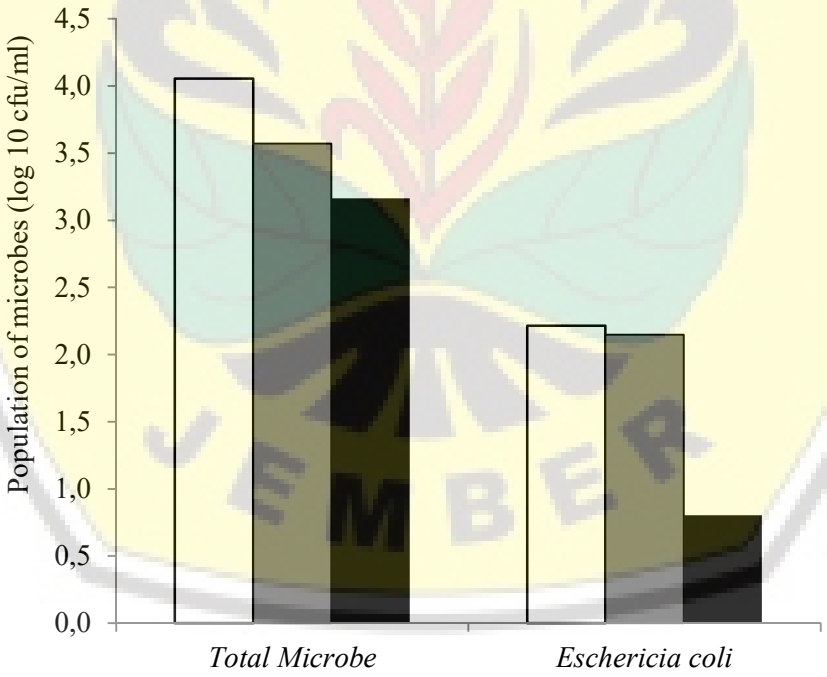


**Figure 5**. Population of Microbial Contamination on Paseban fishermen's: without container (□), sterofoam container (▒), sterofoam container with cube ice (■)

Indonesian National Standard (SNI) No 2729: 2013 concerning microbiological requirements of fresh fish quality including total plate numbers, number of coliform bacteria, and identification of pathogenic bacteria. There were the maximum limit for total microbial contamination is less than $10^5$ cfu/g, the contamination of *E. coli* bacteria is less than 3 and there should be no pathogenic microbes

such as *Salmonella*, *Vibrio cholera* and *Vibrio parahaemolyticus*[10]. The caught sea water fish of Paseban fishermen contain $10^4$ cfu/g of microbial total, 2 cfu/g of *E. coli* and no contain of *Salmobella* sp, if the fish storage in the container with cube ice. Thus the quality of catched fish from Paseban fishermen tested is in compliance with SNI standards of fresh fish that are permitted.

## 4. Conclusion

The habit of Paseban fishermen in storing catches is 36% of fishermen storage the sea water fish without using the storage containers. The level of microbial contamination in the catched fish still meets the required SNI standards which is less than $10^4$ cfu/g. Storage of catched fish in a sterofom container was able to reduce the level of contamination by about 2 log cycles ($10^2$ cfu/g). The catching fish quality of Paseban fishermen was classified as meeting the required SNI standards (maximum 5 x $10^5$ cfu/g).

## 5. Acknowledgments

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