Study on Halfbeak Fish *Hemirhamphus* sp. Smoking Through Sanitation And Hygiene Approach in Sambiki Baru Village, East Morotai District, North Maluccas Province

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Abstract. Fish Smoking is a way of processing to keep the fish durability when it comes to the consumers. The utilization of sea food is still done through traditional process. Modern processing needs some requirements that are difficult to meet by small and medium scaled fishery businessmen. The problem of traditional processing is sanitation and hygienic. Based on this reason, a study on was done on smoking process of halfbeak fish *Hemirhamphus* sp. in Sambiki Baru village, east Morotai district by using sanitation and hygienic approaches. Results showed that the acceptance of raw materials was not landed in the appropriate place of fish rather than on the coast near the smoking house. Halfbeak fish *Hemirhamphus* sp. as raw material were not put in the cool box with ice to maintain the fish quality. The process of carrying raw materials was still opened to air so that it was potential to contamination. The landed catch is first washed in sea water. The process of clipping and binding of the raw materials up to the curing process was done in open space at the sandy and dusty floor and many insects, such as flies, that inhibits the sanitation and the hygiene of the raw materials. Results exhibited that the workers did not use footwear, gloves and head cover. There were also workers who work while smoking. This study concluded that halfbeak fish smoking in Sambiki Baru village did not meet the standard of sanitation and hygiene.

Keyword: Halfbeak fish, smoking, sanitation, hygiene, Morotai.

1. Introduction

Morotai Island Regency consists of 5 districts and 88 villages. One of the villages in Eastern Morotai has fishing fisheries and fisheries products potentials, Sambiki Baru. This village is a coastal area with long coastline and possesses relatively abundant fish resources potency. One of the pelagic fish resources in Sambiki Baru village is halfbeak fish (*Hemirhamphus* sp.) locally called Ngawaro fish.

This fish group is one of marine commodities needed to be developed. The potential of *Hemirhamphus* sp. is high enough and distributed in Morotai waters. In optimizing the utilization of this fish potential, the development of *Hemirhamphus* sp. processing industry. Since the demand for *Hemirhamphus* sp. tends to continuously rise, the fish population has sufficiently promising market for people’s economy in Sambiki Baru.

Halfbeak fish *Hemirhamphus* sp. is one of the fishes containing high water content so that they will easily be decomposed after fishing. Thus, *Hemirhamphus* sp. needs to be well handled that it can be safely consumed by human. One of the preserving technique is smoking. Fish smoking can make the fish be durable and allow for distribute from production center to the consumer. However, fish
smoking practiced in Sambiki still belongs to traditional technique. This traditional fish is supported by the availability of fish resources in the production center, the high demand in the consumer level, simple technology, as well as the high number of traditional household processing industries.

Nevertheless, sanitary and hygienic aspects in traditional fish processing still require attention and improvement in order to meet the quality standard and food safety for the consumers, so that the processing improvement can consider the use of correct processing technique, the principle of good sanitation and hygiene, and standardization from raw materials, additives, processing, to the end product that the product can meet the standard quality and is safe to be consumed.

Sanitation and hygiene in halfbeak fish *Hemirhampus* sp. smoking in Sambiki Baru are major aspects, covering environment and working facilities in order to yield good quality, attractive, healthy products for consumers. It means that the hygiene of human body is very important and needs to be considered, so that the processing of halfbeak *Hemirhampus* sp. is not contaminated with bacteria. Therefore, processing place and workers are necessary to be considered.

Halfbeak fish *Hemirhampus* sp. are usually caught to make smoked fish product due to high enough selling price and to make this processed product be of interest. Halfbeak fish group is potential to be continuously developed based upon consumer’s interest for the product. This study aims to know the smoking process of *Hemirhampus* sp. based on sanitary and hygienic aspects in Sambiki Baru village, Eastern Morotai district. This study is expected to be able to provide solution for smoking product development, particularly *Hemirhampus* sp. due to its economic value, business executors, government institutions or private sectors that are active in small or large-scaled smoking businesses and become basic knowledge of educational world concerning *Hemirhampus* sp. smoking through sanitary and hygienic approach.

2. Method and Research Procedure
This study was conducted for one month, July to August 2017 in the smoking place of halfbeak fish *Hemirhamphus* sp. in Sambiki Baru village, East Morotai district, Morotai Island regency, North Maluccas Province.

![Figure 1. Map of study site](image-url)
Table 1. Equipment and materials

| No | Equipment and materials   | Benefit          |
|----|---------------------------|------------------|
| 1  | Questioner               | Interviews       |
| 2  | Writing equipment        | Data recording   |
| 3  | Digital camera           | Photography      |
| 4  | Smoking furnace          | Smoking place    |
| 5  | Coconut wood             | Firewood         |
| 6  | Scoop net                | Fish bag         |
| 7  | Bamboo                   | Clipping material|
| 8  | Hemirhampus sp.          | Raw material     |

This study employed a survey method covering direct observation, involvement in Hemirhampus sp. smoking activities in Sambiki Baru village, interviews concerning smoking process, and documentation to obtain accurate and reliable data. The data were qualitative descriptive. The observational objects were acceptance of raw materials, clipping and fastening, air-drying, smoking, packing, sanitation, and hygiene.

3. Results and Discussion

3.1. Preparation phase of smoking components

Bamboo-fish clipping was prepared a day before smoking. Bamboo was made with required size, then webbed in such a way to lay the fish at the place. Firewood used was coconut wood. The use of coconut wood because it is believed to be able to produce good heat for long time in smoking process. The fish smoking place had been cleaned before the fish were placed at the smoking shelf. Hafkbeak fish Hemirhamphus sp. were caught around the waters of Sambiki Baru village and directly landed for smoking process. The catches were not put in the cool media.

3.2. Halfbeak fish Hemirhamphus sp. smoking process in Sambiki Baru

Smoking process of Hemirhamphus sp. in Sambiki Baru is presented in Table 2. Smoked Hemirhamphus sp. production starts from the collection of Hemirhamphus sp. as raw material landed on the shore of the village near the smoking house and put in the scoop net locally called salapa.

Table 2. Hemirhamphus sp. smoking process.

| No | Smoking phase                      | Procedure                                      |
|----|------------------------------------|-----------------------------------------------|
| 1  | Fish collection on the beach       | Landed fish were put in the scoop net          |
| 2  | Fish washing                       | The fish were washed in seawater              |
| 3  | Transportation                     | The fish were brought by workers              |
| 4  | Sorting and clipping               | The fish were separated with size and clipped in the bamboo web. |
| 5  | Air-drying                         |                                              |
| 6  | Hot smoking and cool smoking       | The fish were air-dried and placed on the smoking shelf. |
| 7  | Packing                            | Smoking were done in hot smoking, then cool smoking. The fish were left on the second shelf while waiting the buyers. Packing was done by piling them and put in the bag. |

The fish were caught in the surrounding waters of Sambiki Baru village. Since the distance was near from the smoking place, the fishermen did not place the fish in the cool-box during fishing operation. The fish were firstly washed in seawater and brought to the smoking place. The fish were taken from the boat using hand and put in the bag. During fish transport from the shore to the smoking house did not also use ice at all because it was only about 20 M to the smoking house.
To maintain the freshness of the fish, the fish handling skill is needed. Bad fish handling could make the fish rot fast. Similarly, fish handling without cooling media, such as using ice cube, makes the fish get contact with sunlight and can accelerate decomposition. Factors considered in fish handling on board are temperature, time, and hygiene in working environment. On shore handling, such as temperature change during fish unloading, auction, packing during transportation to distribution centers or processing unit highly affects the fish freshness.

Figure 2. Fish transportation and supplying phase

Figure 2 indicates that low attention on sanitation and hygiene, and raw material handling, such as no cooling media, direct contact with surrounding environment or processing labors (sanitation and hygiene), is potential to cross contamination. The fish brought to the smoking house were placed on the tarp. The labors then separated the fish with size. They did not wear gloves, sandals, or head cover at the fish sorting and did wash their hands before sorting. Mean fish size obtained ranged from 20-30 cm length. One scoop net of halfbeak fish will obtain 10 packs of fish, 100 clips of fish ready to be smoked, and a clip of fish holds 23 individuals of fish.

In fish clipping phase, the bamboo clips were prepared a day before smoking process. The bamboo clip locally called “galafea” was left in the smoking place and it was usually not washed before use. Bamboo was cut in 57 cm leng andthe clip width was 20 cm long. The use of bamboo-materialized clip aims to do the smoking process easily and safely. In this process, the fish should be quickly clipped to reduce decomposition rate from room temperature, physical damage from transportation and microorganisms. The fish clipping process is shown in Figure 3.

Figure 3. Fish clipping and fastening process
The fish were placed in the same size after sorting. They were tidily set following the length of bamboo, and clipped that they are not removed from the bamboo. In fish clipping phase, sanitation and hygiene were not considered, as shown in Figure 3, in which fish clipping was done on the ground, and the workers did not wear glove and sandal. Thus, the clipping phase has not met the standard sanitation and hygiene.

Field observation indicated that the smoking equipment and the smoking place for *Hemirhamphus* sp. processing in Sambiki Baru was categorized as close smoking facility with wooden frame, in which the first shelf was made of wood and the second shelf was made of bamboo. This smoking facility did not have special wall, such as concrete wall, but it was only protected in the wooden house to protect it from weather disturbance, such as rain.

Halfbeak fish *Hemirhamphus* sp. smoking in Sambiki Baru employed hot smoking and cool smoking methods. The distance of firewood to raw materials (fish) was 1 M for the first (lower) shelf and 1.70 M for the second (upper shelf). The former was used for cooking process, while the latter was used for drying process. According to Murniati and Sunarman (2000), the use of low temperature can maintain the product freshness during the process and prevent decomposition as well.

Based on the organoleptic aspects, smoked *Hemirhamphus* sp product had the following characteristics: dry, crispy texture, golden-colored appearance, typical smoke aroma, and typical taste. Moreover, product packing was carried out not in the box but using plastic line as bamboo frame fastener. Number of *Hemirhamphus* sp. packs were prepared following the numbers ordered by consumers in the form of bond. A bond of smoked *Hemirhamphus* sp. holds 10 clips each of which contains 23 individuals or 230 individuals per bond.

![Figure 4. Smoking of *Hemirhamphus* sp.](image)
3.3. Sanitation and hygiene implementation in Hemirhamphus sp. smoking place

Fish smoking processing in Sambiki Baru village, based on field observation, has not met standard sanitation and hygiene required yet, from raw material acceptance, no ice cube usage as preservatives to maintain the fish quality, uncovered fish transport potential to contamination, fish clipping process up to smoking phase, were still conducted in an open room with sandy and dusty floor, and presence of many flies could also disturb sanitation and hygiene of the raw materials.

Table 3 demonstrates that the security of water and ice cube directly contacted with raw materials of fish has not been well managed. The fish catches were washed in seawater around the coast to ensure that the raw materials were clean during the smoking process. The water used to clean the workers and the equipment was taken from water well near the smoking place. The fish were not also placed in the ice-containing box during on-board, fish landing up to fish fastening process.

According to Jaena (2009), the smoked Hemirhamphus sp. product treated with seawater wash has higher total plate count (TPC) than that washed in freshwater. It could result from that seawater used for fish cleaning may be contaminated and the fish handling from fishing to smoking is not hygienic. Besides, there is no water content difference between the smoked Hemirhamphus sp. washed with seawater and that washed with freshwater. According to Moeljanto (1992), unhygienic handling, processing, and storing techniques of raw materials or processed products could contaminate the raw materials or the processed products with microbes from surrounding environment.

The location used for the fish smoking process from landing phase was still not hygienic. The scoop net was also washed in seawater, and the fish received were only laid on the tarp, in which the tarp part directly contacted with fish was not clean and sanitized. The bamboo web used as fish clippers at placement phase was only cleaned with cloth and brush to remove sand or soil from the bamboo. The workers did not wear head cover and glove and were not in clean condition. Water used for hand wash was taken from the water well, and the toilet was near the smoking house. The smoking place did not also have specific media for hand wash and relied merely upon the well water. Other supporting cleaning aids, such as towel and soap, were not available as well.

Table 3. Sanitization and hygiene implementation in fish smoking place.

| No | Parameter                                               | Implementation Level                                                                                                                                 |
|----|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Security of water and ice cube used in smoking process (direct contat with fish) | Water for fish washing uses seawater and well water used for the workers is not well managed. Fish are not placed in the cooled box on the fishing boat up to landed. The fish smoking place starts from fish landing in unclean condition, since the surface directly contacted with fish is not clean and sanitized. The floor directly contacted with fish is also not clean due to using only the tent tarp. The workers do not wear head cover, gloves, and are not allowed to wear any ornament. The water used for hand washing is well water. Toilet is too close to the smoking place in the house. No washing tank, no towel, and no soap for hand washing. No specific standard storage place. The fish are left in the smoking place before selling. |
Heruwati (2002) stated that traditional fish processing is usually categorized as poor technique. Traditional smoking process is obtained hereditarily from the family members or local community’s habit in fish smoking process so that its management is not well considered. Beside poor sanitation and hygiene in the smoking place, the fish-raw materials had very low quality and its food safety was poor. The preservation principle in smoking process relied upon salting and drying. Both processes help reduce the water content to kill bacteria and other microorganisms and also help increase the amount of smoked particles adhered on the fish body.

Poor hygiene practice, such as the use of unclean equipment, unwashed hand, dirty nail, long uncares raw materials, could highly expose the raw materials to pathogen contamination. Dirty environmental conditions could also cause pathogenic microbial contamination brought by dirty air particles. Other important factor affecting bacterial contamination into the smoked fish is hygienic practice of the producer(Satiyaningsih, 2001). Environmental condition, such as waste disposal around the smoking place could contribute to microbial contamination, because waste is very good medium for the development of flies, insects, rats, and could yield unpleasant smell and disturb esthetics. Contamination occurs from strong interaction between producers and fish-raw materials, so that individual hygiene of the workers, particularly hands, should be paid attention (Satiyaningsih, 2001). However, traditional fish processing still has promising prospects because people still rely on fisheries product to meet their nutrient requirements. Traditional processing development also needs skill construction through research, dissemination, and facility and infrastructural improvements. Sanitation and hygiene requirements of fisheries products are established through the Decree of Marine Affair and Fisheries Minister Numbered 52A/KEPMEN-KP/2013 concerning Quality Standard and Safety requirements of fisheries products in production, processing, and distribution. This requirement should be followed by all fisheries business executors, individual or company, in their business activities.

Fresh fish required for the raw materials of fish processing must meet the National Standard of Indonesia (SNI 2725.3:2009: handling and processing), in which the fresh fish must weeded, removed the gill and intestinue, fished from uncontaminated waters, and organoleptically tested. Water used should followed SNI 2721.2:2009 fulfilling drinking water quality, such as clear, unsmelled, untasted, free of pathogenic bacteria, pH 1-14, and free of chemicals.Ice cube used follows SNI 01-4872.1-2006, in which the raw material should come from drinking water standard, well handled, and kept in clean place.Equipment follow SNI 2725.3:2009 concerning smoked fish handling and processing, in which all equipment used should have fine and flat surface, not peeled, not rusty, not source of microorganism contamination, not broken, and easily cleansed. All equipment must be in clean condition before, during, and after used.Wood utilization should meet the requirements of SNI 2725.3:2009,not hazardous or potential as carcinogenic in fish.

4. Conclusion
Halfbeak fish *Hemirhamphus* sp. included raw material acceptance, clipping, fastening, air-drying, smoking, and packing. The smoking method applied hot smoking with the distance of firewood to the raw materials of 1 M for 5 hours smoking and and cool smoking with the distance of firewood to the raw materials of 1.70 M. The smoking process used closed smoking equipment made of wood.However, the fish smoking processing in Sambiki Baru has not followed the standard of sanitation and hygiene. Therefore, *Hemirhamphus* sp. processing in this village should consider the sanitary and hygienic aspects. Government’s attention in relation with training on sanitation and hygiene for this fish processing activities is also needed. In addition, research on organoleptic and proximate testings for halfbeak *Hemirhamphus* sp.
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