Analysis of intensity and prevalence of Anisakis sp. in frozen fishery products mackerel

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Abstract
Scomber japonicus mackerel is an imported commodity that has a high nutritional content as a raw material for traditional fish processing industries in the form of steaming in Indonesia, however imported fish can be infected by diseases due to infection from endoparasites caused by worms. This research aims to analyze the nutritional content which includes moisture, ash, protein, and fat content of mackerel that are not infected and infected with the parasite Anisakis sp. This research uses an observational method by taking 15 samples of mackerel randomly. Then the organoleptic condition was examined referring to (2014) SNI 4110: 2014 concerning frozen fish to determine the difference between infected and uninfected mackerel Anisakis sp. Furthermore, it is examined to determine the number of parasites that infect and the number of samples infected with the parasite Anisakis sp. Next the samples were tested proximate according to (AOAC) 2005 to compare the nutritional content of the mackerel fish that are not infected and infected with the parasite Anisakis sp. The results of the research were analyzed descriptively and comparatively. It showed that there was no difference between uninfected and infected mackerel with Anisakis sp. when viewed from an organoleptic point of view. The results of identification of parasites from 15 samples of mackerel, 10 positive fish were infected with the highest infection intensity in the intestine. The results of the proximate content analysis showed that the mackerel samples were not infected with the parasite Anisakis sp. has water content of 62.00%, ash content of 12.96%, protein content of 23.52%, and fat content of 12.28%. While the SM09 sample infected with the parasite Anisakis sp. has a water content of 62.81%, an ash content of 10.23%, a protein content of 21.32%, and a fat content of 10.73%.

Keywords: Mackerel (Scomber japonicus), organoleptic, fish parasites, Anisakis sp., proximate analysis

1. Introduction
Fish like other living things cannot be separated from various diseases. One of the diseases in fish can be caused by parasites. Various types of fish can be attacked by parasites, both freshwater and marine fish. In general, parasite attacks do not kill fish as a host sporadically, but can interfere with the fish's physiological processes, because parasite attacks can damage body tissues, suck blood and fish nutrition as a source of nutrition for these parasites to grow and reproduce. In addition, parasitic attacks on fish can cause secondary infections, either by bacteria, viruses or fungi, which can lead to death in farmed fish, so that it will have an economic impact due to a decrease in fish production [14]. According to Rosidah (2016) in terms of where it lives on the host’s body, parasites are divided into two, namely ectoparasites and endoparasites.

There are several types of parasites that are zoonotic, which is a type of parasite that can infect fish and humans. One of the parasites zoonotic is Anisakis sp. which live as endoparasites in the intestines of fish. According to Hafid (2016) the risk of transmitting these worms to humans is relative small because the fish consumed after going through the perfect heating process first causes the worms to die. However, fish infected with Anisakis sp. The nutritional content of the fish (meat) will decrease, as Muhdi argued in Hidayati (2016), the nature of parasites is to suck nutrients from their host.

Mackerel fish species Scomber japonicus including sea water fish species which is an imported fish as raw material for traditional fish processing industry in the form of pemindangan in Indonesia and sold in auction place fish in a frozen state. According to data from the Directorate General of Fisheries in 2013, mackerel imports in 2011 reached 93,781 tons and an increase in 2012 reached 120,436 tons, this shows that this fish is a leading
 commodity in Indonesia. Based on data from the Directorate General of Processing and Marketing of Fisheries Products (2012), mackerel is an alternative source of animal protein for Indonesians.

Apart from having a high nutritional content, this mackerel is easily available in the market and the price is relatively cheap, which is IDR 23,500 / kg. November 2012-2017 increased by 10.58% per year. Based on the description above, it is necessary to conduct research on the intensity and prevalence of Anisakis sp. in frozen fishery products mackerel as a standard of feasibility for consumption.

2. Materials and methods

The research method used was observation, by taking samples of frozen mackerel randomly as many as 15 samples. The sampling method used was purposive sampling method. The sample was examined for its organoleptic condition and then given a sample code to determine the difference between infected and uninfected mackerel Anisakis sp. after surgery on the fish. Then, the fish samples were dissected to determine the presence and number of infecting parasites and the number of samples infected with Anisakis sp.

The procedure carried out in this research consisted of three stages, namely organoleptic testing of 15 samples of frozen fishery products mackerel as a document (SNI 4110: 2014 concerning frozen fish). The aspects assessed in the frozen fish assessment sheet are divided into two parts, namely when it is frozen and after melting, as presented in Table 1.

| Specifications | Value | Sampel Code |
|---------------|-------|-------------|
| **A. Frozen State** |       |             |
| 1. Appearance (especially for frozen blocks) | Flat, clear, thick enough on the entire surface covered with ice. | 5 | ✓ | ✓ |
| 2. Drying (dehydration) | No drying on the product surface | 5 | ✓ | ✓ |
| 3. Color change (discoloration) | Has not experienced a color change on the product surface. | 5 | ✓ | ✓ |
| **B. After melting (thawing)** |       |             |
| 1. Appearance | Brilliant type specific. | 5 | ✓ | ✓ |
| 2. Smell | Fresh type specific. | 5 | ✓ | ✓ |
| 3. Meat | The meat incision is less than brilliant. | 4 | ✓ |
| | The cutlet is getting dull. | 3 | ✓ |
| 4. Texture | A little less compact, a little less elastic. | 2 | ✓ | ✓ |

Information: SM01 (sample of mackerel infected with Anisakis sp.), SM09 (sample of mackerel infected with Anisakis sp.)

Based on Table 1, observed from the appearance of the fish in a frozen state, the two samples both have a value of 5, which means that they are coated with ice evenly, clear, thick enough on the entire surface. Then, from the drying indicator, the two samples also got a value of 5 which means that there is no drying on the surface of the product. Both samples also received a value of 5 from the color change indicator, which means that there has not been a change in color on the surface of the product. The next fish assessment is an assessment after the fish has gone through the process of thawing. The appearance of the two samples got a value of 5, which means that they looked bright and were specific to the type of fish. The aroma of the two samples also scored 5, which means that it is fresh with specific types. However, if seen from the indicator of the meat, the samples were not infected with Anisakis sp. The average score was 4, which means that the incisions were less brilliant, while the samples infected with Anisakis sp. On average, it got a lower score of 3, which means that the cutlet is getting dull. The texture of the two samples also got the same value, namely 2, which means that it is a little less compact, a little less elastic. The decline in the quality of fish meat can be caused by the freezing and thawing processes, as argued by Hong (2013) and Hasan (2016) stated that freezing and melting greatly affect the characteristics of fish meat, this occurs due to the oxidation process of fat, protein damage, and changes in the structure of fish meat.

Organoleptic observation of fishery products is very important to do as the main tool for measuring the acceptance of the product. Organoleptics, namely assessing and observing the texture, color, shape, aroma, taste of a food, drink or medicine [8].

3.2 Observation Results of Parasites Anisakis sp.

3.2.1 Identification Result of Anisakis sp.

Parasite Anisakis sp. which is often found in fish is the third stage Anisakis, morphology Anisakis sp. The third stage is a
hard cuticle, has teeth in the ventral part of the mouth that protrudes to make a hole, the secretion holes between the dorsal lips, the simple digestive system (esophagus, ventriculus, intestine) (Figures 1 and 2).

**Fig 1:** The head of Anisakis sp.

**Fig 2:** The tail of Anisakis sp. Morphology of Anisakis sp. (1) The head with a booring tooth, (2) Part Esophagus, (3) The tail, (4) The tail of the anal (sewer)

### 3.2.2 The results of the calculation of the intensity and prevalence of Anisakis sp.

Intensity is the average number of parasites per fish observed, in this case the parasites observed were Anisakis sp. while the infected fish object was mackerel with a size of ≥ 20 cm. The spread of Anisakis sp. in some organs, namely to complete its life cycle. The high intensity in the intestine indicates that the intestine is a very favorable place for Anisakis sp. The small intestine provides a source of nutrition for nematodes, including blood, tissue cells, body fluids, and food juices contained in the lumen of the small intestine. Based on Table 2, it can be revealed that there is a significant difference in the number of individuals between the number of Anisakis sp. in the intestines and the meat. The results of the observation of the spread of Anisakis sp. In 15 samples of frozen mackerel, the average intensity data of Anisakis sp. in the intestine as many as 6 individuals per 1 fish, while the average number of Anisakis sp. on the muscle as much as 2 individuals per 1 fish. The prevalence of the 15 mackerel fish samples was observed, the results were that 10 fish were infected with the parasite Anisakis sp., while the other 5 samples were declared uninfected (clean), so it can be concluded that as many as 67% of the mackerel fish samples in the SKIPM Cirebon laboratory were positively infected by the parasite Anisakis sp. The large number of fish infected with parasites can be caused by several factors, one of which is extreme temperature changes in the environment. An increase in temperature (environmental change) that cannot be tolerated by the host will spur the development of pathogenic agents, disease will arise because on the one hand it will cause stress to the fish (host) while on the other hand it will cause pathogenic malignancies to attack the host.

**Table 2:** The results of the distribution data of Anisakis sp. in mackerel

| No. | Sampel Code | Length (cm) | Weight (g) | Where the Larvae were Found Anisakis sp. |
|-----|-------------|-------------|------------|----------------------------------------|
|     |             |             |            | Meat (ind) | Intestines (ind) |
| 1.  | SM01        | 20.5        | 75         | -          | -                  |
| 2.  | SM02        | 21.5        | 78         | -          | -                  |
| 3.  | SM03        | 21.3        | 80         | -          | -                  |
| 4.  | SM04        | 22.7        | 104        | -          | -                  |
| 5.  | SM05        | 20.7        | 77         | -          | -                  |
| 6.  | SM06        | 21.5        | 75         | -          | -                  |
| 7.  | SM07        | 20.5        | 77         | -          | -                  |
| 8.  | SM08        | 22.7        | 103        | -          | -                  |
| 9.  | SM09        | 23.5        | 95         | -          | 17                 |
| 10. | SM10        | 23.4        | 81         | -          | -                  |
| 11. | SM11        | 21          | 86         | -          | -                  |
| 12. | SM12        | 20.5        | 77         | -          | 5                  |
| 13. | SM13        | 20.5        | 65         | 2          | 3                  |
| 14. | SM14        | 22.3        | 83         | -          | 1                  |
| 15. | SM15        | 20.5        | 67         | 1          | 4                  |
| Total |            |             |            | 3          | 45                 |

Information: SM01 (sample of mackerel infected with Anisakis sp.), SM09 (sample of mackerel infected with Anisakis sp.)

### 4. Conclusions

Based on the research results, it can be concluded that:

a. The organoleptic test results showed that the organoleptic conditions of infected and uninfected mackerel did not show a significant difference in terms of appearance, smell and texture of meat.

b. The parasite intensity of Anisakis sp. in the intestinal organs of mackerel as many as 6 fish / fish and in the muscle organs as many as 2 fish / fish, while the prevalence value of Anisakis sp. in mackerel by 67%.

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