The prevalence of fungi on groupers (Epinephelus sp.) in cage mariculture systems of the northern coast of Surabaya, East Java

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Abstract. Groupers are marine fish that live on coral reefs. These fish have a high economic value and the potential to be developed in Indonesia. To support the production of groupers in Indonesia, seeding is very important. However, many obstacles must be faced in the maintenance of grouper fingerlings. One disease that is a problem in fish farming is mycosis diseases caused by fungi. Fungi are quickly transmitted to other fish in the same pond. They spread quickly and can potentially cause substantial losses for farmers and fishermen alike. The purpose of this study was to determine the type of fungi that can be isolated and identified from the groupers and whether there are fungi that have the potential to cause disease in the groupers. The results of this research indicate that out of all of the isolated fungi, it was found that Aspergillus flavus, Aspergillus niger and Penicillium glabrum have a prevalence of 20%, 10% and 10%. The conclusion of the research is that fungi can be found in groupers (Epinephelus sp.) at the Mariculture Cages System in Surabaya, East Java, and that the types found were Aspergillus flavus, Aspergillus niger and Penicillium glabrum specifically. The fungi that have the potential to cause disease in groupers (Epinephelus sp.) are Aspergillus flavus and Aspergillus niger.

1. Introduction

Mariculture development is conducted to increase the fish production to balance out overfishing activities, impacting on the decline and population extinct threat, as well as habitat degradation. Mariculture development can be an alternative occupation for fishermen and it can also be used to increase the food production (marine fish protein) for society. One of the marine fish species which has a high important economic value is grouper fish (Epinephelus sp.). Grouper fish lives in the coral reefs and have a potential to be developed in Indonesia.

Based on the data reported, grouper fish production in Indonesia from 2010 until 2014 was good enough, although there was a declined level of production in 2008. However, the production increased until 2010, which was significantly increased overall. The average increase in the grouper fish over the last four years was by 18.72 percent, with the highest increase observed in 2010 by 18.28 percent. The
increased production happened in 2009, going from 8,791 tons to 10,398 tons in 2010. Grouper production in Indonesia comes from two sources; marine fishing and mariculture.

One of the instigators of disease that can attack the fish is fungi [1]. Fungi disease cases in fish in Indonesia has not generally been of concern, as the occurrence of fungi is due to the poor environmental condition, nutrient deficiencies or primary infectious agents, such as parasites, bacteria and viruses. Diseases caused by fungi are called secondary infections due to generally attacking fish that have been hurt or that are weak already. Fungi are also able to attack other fish in the same pond quickly, which can cause great economic losses. This research was conducted to discover if fungi existed on the grouper fish as well as to identify the fungi that are able to cause disease (mycosis) in the cage mariculture system off the northern coast of Surabaya. This location was near to industrial companies, which influenced the water quality around the cage culture location.

2. Materials and method
The equipment used in this research included a light microscope, Bunsen burner, plastic tape, pinset, scissors, scalpel, petri dish, beaker glass, object glass, autoclave, thermometer, pH meter, DO meter, ammonia test kit, Erlenmeyer tube, and Laminar air flow.

2.1 Materials
The materials used as a part of the fungi identification included 10 grouper fish sized 25-30 cm from 1,000 populations that were taken deliberately from the cage culture of Surabaya, East Java Province. The chosen fish samples were the ones suffering from clinical fungal symptoms. The media used for the fungal isolation was Sabouraud Dextrose Agar (SDA). The fungi morphological observation was done using the Lactophenol blue coloration method.

2.2 Method
2.2.1 Fungi isolation
The fungi that attacked the grouper fish was identified macroscopically by observing the cotton-like particles that had occurred on the fins and skin of the fish [2]. The sample was isolated using the scraping method and inoculated onto a dish of SDA media. The sample was incubated at 25ºC for 3-4 days.

2.2.2 Fungi identification
The purified fungi were ready for further identification after incubation. The fungal isolate observation was done using the plastic tape technique. This technique began with the object glass preparation and one drop of Lactophenol blue. The fungi sample was taken from the cultured media using plastic tape and was put on the object glass containing the Lactophenol blue coloration substance. The object was closed using the cover glass and observed under the light microscope at 100x and 400x magnification. The fungi was identified based on its morphology as seen under the microscope [3].

The fungi identification was done by observing the macroscopic and microscopic morphology. The macroscopic identification was done by observing the colony characteristics and color, while the microscopic morphological characteristics were comprised of the hyphae characteristic, as well as spore form and location based on the standard identification procedure. The isolation and identification data was analyzed using the descriptive method.

3. Results and discussions
The isolation and identification results of the fungal diseases infecting the grouper fish (Epinephelus sp.) in the cage culture showed the discovery of Aspergillus flavus in two fish samples, which had a yellowish green colony color with a long conidiophore, rounded vesicle and spore-covered vesicle surface.
Aspergillus flavus had a yellowish green colony color and long conidiophore reaching 400-800 µm with a rounded vesicle and conidia with a 25-45 µm diameter [1].

![Image](image1.png)

**Figure 1.** Culture on the sda medium and the morphology of the fungi on the groupers

Another fish sample was identified to be suffering from a fungal disease caused by *Aspergillus niger* with a black colony color that was white at the corner, with a transparent conidiophore, soft fur-like flour and black rounded spores. *Penicillium glabrum* was identified on another sample by the dark green, small and rounded colony shape with septae-possessed conidiophore. *Aspergillus niger* is dangerous because it causes aspergillosis [4].
Table 1. The morphology of the fungi on the groupers [5]

| Number of Groupers | Location | Characteristic traits of research results | Characteristic by (Summerbell and Kane, 1988) | Kind of Fungi |
|--------------------|----------|------------------------------------------|---------------------------------------------|--------------|
| 2, 4               | A        | Macroscopic characteristics: Yellowish brown color with a short, conical shape. Microscopic characteristics: It has a thick, white mycelium. | Yellow colony color brown, yellowish green colorless conidia phoresa rough, joint texture like cotton (Summerbell and Kane, 1988) | Aspergillus flavus |
| 5                  | B        | Macroscopic characteristics: Black colony color, yellowish white, fluffy texture like flour, red and brown conidia phoresa. (Summerbell and Kane, 1988) | (Summerbell and Kane, 1988) | Aspergillus niger |
| 9                  | C        | Macroscopic characteristics: Colony color dark green, small round. Microscopic characteristics: Having conidia phoresa papillate, exudes chains, separate hyphae. | Colony color green, blue-green, greenish, rapid growth, a soft texture like flour, conidia phoresa straight and erect, separate hyphae (Summerbell and Kane, 1988) | Penicillium glabrum |

The results of the measurement of the water quality at the sampling location shows that the waters are still of a normal condition concerning the temperature, DO, pH and ammonia. The water quality measurement data shows the range of the water quality values, focusing on temperature. The water quality measurement data showed the range of the water quality, such as 30-31°C in temperature, 4 ppm in DO, 6-7 in pH level and 1 ppm in ammonia content.

4. Conclusion

Based on the research results, it was concluded that the fungi discovered on the grouper fish (Epinephelus sp.) in the cage culture system off the northern coast of Surabaya were Aspergillus flavus, Aspergillus niger, and Penicillium glabrum. The fungi that have the potential to cause fungal disease are Aspergillus flavus and Aspergillus niger. Further research dealing with the pathogenicity level of the fungi observed is necessary to conduct in order to retrieve promising data on the cultured fish.

5. References

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