Studi Epidemiologi Penyakit Viral Pada Ikan Kerapu (*Epinephelus* sp.) Sebagai Pola Dasar Peta Sebar Penyakit Ikan Di Sumatera Utara

Bambang Hendra Siswoyo, S.Pi, M.Si

Abstract

The long term aim of this study is to make the prediction of the appearance of viral disease of sea fish/epinephelus sp. as an early warning system. Meanwhile, for the short term aim, it is to analyze the spread of virus infection in sea fish which is based on the influence of qualitative water quality parameter caused by changeable weather as a study material for epidemiology of fish disease. The special target in this study is to have an arranged map of the spreading fish disease of virus group which attack sea fish in North Sumatera. This study was carried out in Laboratory of Fish Quarantine Hall Class I Polonia – Medan in North Sumatera as a test laboratory of Biology molecular (PCR conventional) and the quality of test water. The field study was carried out in the cultivation centers of sea fish in east coastal area in North Sumatera and in the center of sea fish natural haul in the surrounding area. This study is a survey study and the method used is Descriptive method and Sentinel Surveillance Method. The basic data of virus prevalence is analyzed by finding out the association between virus infestations with the data obtained from water quality.
*Keywords: Epidemiology, Viral, sea fish/epinephelus.sp*

Preface

The activity of fish cultivation causes the manipulation efforts and modification not only for circumstance, bio-reproduction, density, woof management, but also many more. This condition causes stress towards the cultivated commodity which is susceptible to either infection or non infection disease. The appearance of that disease is a biological risk that should be anticipated. The fish disease is a serious problem which should be faced in developing fish cultivation. The lost of fish caused by fish disease can make the death of fish and also decrease the quality of the fish itself. The death caused by the fish disease depends on kinds of fish disease attack, fish condition and circumstance condition. If the circumstance condition decreases so the death fish caused by epidemic disease is very high, but on the other hand, if the circumstance condition is good the death fish caused by epidemic disease is lower. The lower and higher of the death fish caused by an infection disease depends on the fish immunization condition. If the epidemic disease happens in healthy fish it will not cause high death fish and on the contrary, it will make fish death high if the condition of the fish is unhealthy (Spriyadi, 2007).

The biggest spreading of sea fish (epinephelus fuscoguttatus) is now in Malaysia with its seeds taken from Indonesia. The supply from North Sumatera area can reach more than 20 million fish seeds per year (Sisterkarolin, 2010). Epinephelus fuscoguttatus is one of the promised first rate fishes in Indonesia and now it has been a potential and a big promised change market. The potency needs more quality cares from the seed resulted by hatchery because the activity of seedbed is the starting of a set of fish activities. The high qualified seed is one of the keys of the successful activity cultivation.

The handling of larger activity management and the handling of disease are very important by implementing principle management of friendly circumstance in order to increase productivity area, to reduce pollution, and to make sustainable cultivation area.

Epidemiology

Epidemiology is the study about patterns (dynamic and distribution) and caused factors (determinant) of disease of a population (Malole and Zenal, 2006). Determinant consists of three factors usually called Ecology Venn Diagram as can be seen in the following picture 1
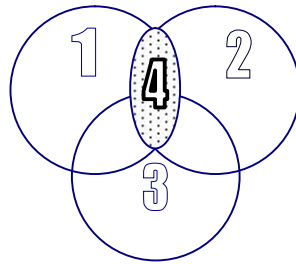
Picture I. Ecology Venn diagram
Note: (1.Agent; 2. mother**;** 3. Circumstance; 4.disease)

The dynamic of the existence disease depends on the level of incidence, intensity, the total number of fish death, and the level of death, while distribution is connected to seasons and ecosystem. In a certain disease, distribution is determined by *natural barriers* and commodity traffics. The combination among determinant, dynamic and distribution cause one area becomes endemic, where the incident value and its intensity are lower because the mother develops the immunity towards the agents. It the circumstance takes a role as an influence, the agent has changing attitude (mutation) which causes virulence and leads to epidemic with high scale number of death and level of death. Epidemics study can be carried out by several ways, they are: by collecting field data (primer and secondary and laboratory inspection by using several inspection methods (Malole, 2006).

Based on the three illustrations of circles above, as a general mechanism concept it causes disease naturally. Philosophical strategy of basic management of the healthy fish should be focused on the efforts on the repairing the three integrated components (Taukhid, 2006), namely: First, providing a good circumstance and management. Second, choosing a healthy mother which is free from diseases; having enough food; and having scale monitoring. Third, implementing the bio-security concept towards the pathogen.

The Quality of Water for Fish Cultivation

Generally, fish cultivation in Indonesia used floating net cages in the sea; however, traditional cultivation is still being used in earthen dam. Generally in Vietnam, Singapore, Thailand and Malaysia use cultivation system floating net cages. According to Chua and Teng (1978) the quality of waters optimally for the growth of sea fish such as the temperature is between 24-31 C, salinity is between 30-33ppt, soluble oxygen is $>$3,5 ppm and pH is 7,8-8,0

At the same time, Suprakto and Fahlivi (2007) report that he quality of waters at cultivation area with its current speed is 15-30cm/second, temperature is 27-29°C, salinity is 30-33 ppt, pH 80-8,2 oxygen $>$5 ppm and the depth is $>$5m. The quality of waters in the haul location is in North Tanimbar, with its temperature is 27, 00-29, 62 °C, salinity is 34,259- 34,51ppt, soluble oxygen is 3,95 – 4,28 ml/nitrate is 1,00-6,00 µg. at/l and phosphate around 0,80 -1,40 mg a/l (Laksono and Wenno, 2003). Suitable ecology parameter for the growth of sea fish the temperature is about 24 -31°C, salinity is 30 -33 ppt, soluble oxygen is $>$ 4,9 ppm, pH is between 7,8-8,0 (Yoshimitsu *et al.*,1986).

Arthur (1966) states that the problem of sea fish cultivation disease in East Asia and South East Asia have been identified by some cultivation factors, namely by: developing the circumstance (pollution and poison caused by abundant platoon) and improving management (acclimatization, handling the mortality and mortality transportation in juvenile. The program of health management should fulfill several requirements and should cover all cultivation activities. At the level of production, the requirements should be fulfilled such as the choices of seed, nutrition, handle the waste, optimize the quality of water, and monitor occasionally (Reantoso *et al*, 2006).

From many problems, the main cause of health problem is circumstance. For this case, we should consider the level of preventing, monitoring and, overcoming. The successful method which is usually used to decrease the health problem is by improving the quality of cultivation circumstance. The following are the indicators which cause the bad circumstance of   cultivation ponds:

- The high fluctuation of pH is (≯ 0 5),
- The transparency and the unneeded ponds' water
- The appearance of foams and the bubbles or algae which are floating on water surface
- Waste distribution is on the bottom of the ponds
- There are blooming platoons
- There are leftovers foods or the leftover foods are consumed very fast.

High ammoniac concentration in the water makes the fish reserves osmosis by decreasing ion internal concentration ammoniac as well as increases oxygen consumption by nets, destroys fish gills and decreases the ability of blood for transformation. All this happens because there is ammoniac sublette concentration that can increase the fish sensitivity of disease.

Ammoniac is produced by decreasing the protein to get energy and discharge through fish gills as the exchangeable sodium as part of ion regulation system. The power of ammonia poison decreases along the increasing of water salinity. The content of ammonia is 30 (thirty) % on sea water with empoison if it is compared to fresh water with pH (Andrew *et. al*, 2003). Boyd (1982) also states that water, nitrogen, ammonia (NH3) cause toxicity on fish and ionization ammonia (NH4) do not cause toxin for fish, except if it is in high concentration that is above 0,3 ppm which can damage fish gills and as a result it make difficulty for respiration.

Epinephelus Fuscoguttanus

Nowadays, the spreading of Epinephelus Fuscoguttanus is Malaysia with its seeds taken from Indonesia. The supplying is taken from North Sumatera which can reach about 15 (fifteen) millions fish seeds per year (Sisterkarolin, 2008). Epinephelus Fuscoguttanus belongs to Perciformes ordo, Serranidae family, Epinephelus genus and Epinephelus Fuscoguttanus species. This fish belongs to active fish eaten and it is sensible to the change of fluctuate water quality ,needs indirectly shine light, live in coral reef, swim on the bottom of water with its optimal temperature20 ˚C, and its average length maximum 90 cm.

The body of Epinephelus Fuscoguttanus is full with small scales of fish in the cycloid shape. The name of Epinephelus Fuscoguttanus is usually given for Serranidea genus, namely: Epinephelus, Variola, Plectropamus and Cromileptes. In Indonesia Epinephelus has 38 (thirty eight) species. Most of them are Serranidea families which live in shallow waters with its sandy bottom provided with coral reef although some kinds of the species can be found in deepen waters. Epinephelus Fuscoguttanus has dorsal fish fins (back), anal fish fins (stomach), pectoral fish fins (chest), lateral line fish fins (scratch side) and caudal fish fins (tail). Dorsal fish fins are long and almost cover all of its back where its hard fingers have the same numbers with its soft fingers. The total number of its fingers is 13-15. Anal fish fins consist of 3 fingers. The total number of its fish fins is 15-17 and its braches is 13-15. The fish fins cover of all its small body, shiny with sicloid form. The basic color of Epinephelus Fuscoguttanus is brown with its stomach is white and black and white spots along its unstructured body.

The body shape of Epinephelus Fuscoguttanus is long and tends to be compressed or rather round. The thickness of its body is 2,6 – 2,9 from the standard of length, with its lateral line scale is 53-58. The total length of the Epinephelus Fuscoguttanus' body can reach 80 cm. The wide mouth with slanting position and lower lip appears to the front. The upper and lower jaws completed with two rows, sharp and pointed, and strong. The biggest teeth are located in front. The fish fins of its tail are rounded. A big nostril is located above the mouth like a crescent moon (Abduh *dkk*, 2007).

The spreading of Epinephelus Fuscoguttanus in Indonesia is very exotic. The biggest seedbeds are in Bali and Lampung. Areas such as Aceh, Batam, and South Sulawesi are bunch area.   North Sumatera has become a successful area for enlarging measurement until 6-8 inches (Diskanla Sumut, 2008).

Kinds of Epinephelus Fuscoguttanus can be seen the Picture below :

Picture 2 Epinephelus Fuscoguttanus

The Study Method
The Study Program was carried out by 3 (three) steps for 3 (three) years, each step has a different study method, namely:
1. The first step (1st year) is to make an inventory of the study of virus attack status towards Epinephelus Fuscoguttanus, either the cultivation or natural catch where it usually decreases immunity in parameter condition of fluctuate quality caused by bad weather. At this step, the diagnosis is carried towards sample fish by using conventional molecule biology test (PCR). The given analysis result has become the basic data to determine the prevalence scores. This study method is carried out descriptively in which the first step shows the factual description about the facts and behavior of fish population. Furthermore, in this case, there will a comparison and an evaluation be carried out.
2.   The second step (2nd year) is to look for the possible association between virus infestation in the Epinephelus Fuscoguttanus by using water parameter for each study location. At this level, the data attached by virus are found in the previous step will be collected and analyzed for the cause and effect and with its correlation.
3. The third step (3rd year) is to find out the correlation between the first and the second step by using Sentinel Surveillance System, namely: the combination between the passive and active surveillances in order to get general surveillance data in order to get the completed and detailed data about diseases and production. This activity is obtained through the cooperation between the employees and the researchers. This system is useful for monitoring, early detection of an outbreak of disease and extension.

Taking the Sampling
In this study, the samples of Epinephelus Fuscoguttanus are random sampling which are based on the observation of fish clinical symptom, anamneses, first data of water quality parameter, prevalence parameter which are based on norms of taking the samples which referred to Amos (1985) in Lightner (1996)

The Procedure of the Study
The Measurement of Water Quality Parameter
The parameter measuring of water quality is directly carried out in each location with its certain station center which is suitable for the needs with the assumption that the data accurately gained. The parameter measured covers:

Parameter of Physics	:	air and water temperature
Parameter of Chemistry	:	soluble oxygen (DO), salinity; pH; ammonia and nitrite.
Rainfall	:	the previous year and it happened when the research was carried out.

The water and air temperature are measured by using thermometer. Salinity is measured by using *hand refractometer* and soluble oxygen, pH, ammonia, nitrite which are measured by using *multi parameter ion specific* (HANNA instruments-Italy). The rainfall data is obtained from Bureau of Meteorology Climatology and Geophysics (BMKG) of the local place.

The Handling of Sampling

After the sample of fish are collected, then, they are packed by using plastic which is filled with oxygen so that it can be lasted for about 8 (eight) hours. Then, it is kept in a different aquarium with each sampling station with a given code (the aquarium measurement is 60 x 40 x 40 cm3 filled with water for 10 liters).Before the aquarium is used it should be disinfected.

Laboratory Examination

The fish samples which are obtained for each location is carried out PCR test which is determined the status of virus attack so it can get its prevalence scores. PCR test is carried out by using PCR qualitative production method Iq 2000. The organ target which is taken is eyes and brain for RNA virus and fish gills for DNA virus. The examination procedures can be obtained by manual kit which is going to be bought. The virus infestation in fish is determined by prevalence scores, that is, the percentage of the total number of infected fish divided into the total number of examined fish. The formula used is according to Kabata (1985) is as follows:

$$Pr\,evalence = \frac{the\ total\ inf\,ected\ fish\ by\ virus}{the\ total\ number\ of\ exa\min ed\ fish}\ x\ 100\%$$

Furthermore, to know the association between water quality parameter (DO, temperature, salinity, pH, ammonia, and nitrite) ,the virus prevalence score is used regression and correlation analysis as well as to find determination coefficient in order to know the percentage of the existing extoparasite which is described by water quality parameter factor through linear correlation. Statics data analysis uses *Tool Data Analysis Microsoft Excel*.

Supporting Data

The supporting data is actually the components of *Sentinel Reporting System*, they are:
1.   The report from the farmers/producers
2.   The employees in Fishery Department
3.   The report form of disease
4.   The laboratory Diagnostic
5.   The Management and data analysis
6.   The Report and feedback

Then, the above data are analyzed descriptive comparative by using the obtained main data in order to get a conclusion.

**The Obtained Result**
The result of Field Data

Table 1
The Average Data of Rainfall and Temperature in July 2013 in the Center of Taking the Sampling

Area	The Average of Rainfall (mm)	The Average of Water Temperature
Langkat	305	24,2
Medan	312	24,1
Deli Serdang	157	25,1
Serdang Bedagai	25	27,2

Table 2
The Average Data of Rainfall and Temperature in August 2013 in the Center of Taking the Sampling

Area	The Average of Rainfall (mm)	The Average of Water Temperature
Langkat	137	25,1
Medan	257	24,2
Deli Serdang	187	25,7
Serdang Bedagai	146	27,1

HASIL UJI LAB :

1. **July 2013**
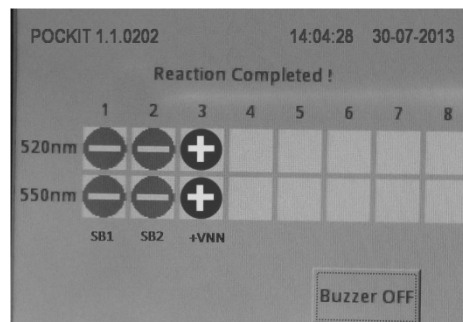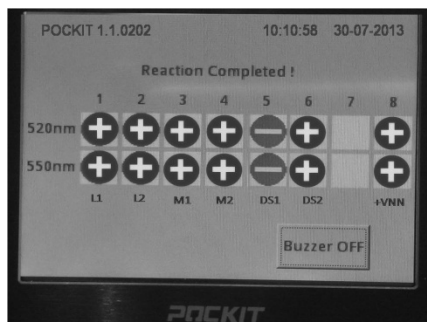
2. **August 2013**
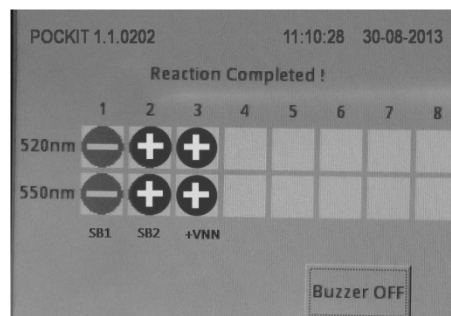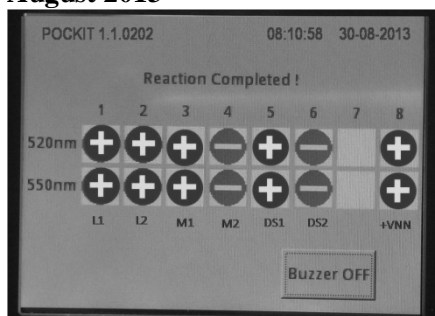
Table 3 Prevalence

Year 2013	The number of examined fish	The number of infected virus	Prevalence
July	8	5	62.5
August	8	5	62.5

The Conclusion
1. From the basic data obtained from the field research and laboratory test, it is found that prevalence between July and August is the same, that is 2,5% in July.
2. The prevalence of bigger score than 50% shows that there is the influence of virus attack towards the heavy fish. This is caused by the high rainfall which causes low temperature. Virus can make incubation in a certain temperature > 250 C.
3. To make sure that there is a correlation between virus attack and water parameter and
1. the analysis of the causes will carried out for the next study

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