Growth pattern and maturity level of Chevron Snakehead’s gonad (*Channa Striata*)

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Abstract. Chevron Snakehead (*Channa striata*) is one kind of freshwater fish that has high nutrient content, particularly albumin. Chevron Snakehead is mostly found in public waters and has not cultivated extensively. This research was aimed to investigate the behaviour, the biological features, the maturity level of gonad, and the growth pattern of Chevron Snakehead. This research was conducted in Tukad Yeh Sungi and irrigation canal of Subak Baru in Baturiti Sub-district, Tabanan Regency in 30 September until 27 October 2017 by using observation, descriptive, and analitical methods. Chevron Snakehead which was found in this research was *Channa striata* that mostly found in deeper waters with rocky or sandy substrates. This fish is included into nocturnal and carnivora. b. based on the maturity of the gonads of male Chevron Snakehead the testicular weight was 0.1-0.85 gr. Whereas for females it has a gonadal weight of 0.5-1.86 gr. Chevron Snakehead found in rivers have allometric growth patterns, with b values obtained <3 which are b values of females = 2.8696 and b values of males = 2.3335, therefore the growth pattern of Chevron Snakehead was allometric negative. Negative allometric is the dominant increase in on weight gain.

1. Introduction
The world of fisheries today is developing very rapidly as people become more aware of the importance of consuming fish which results in sharply rising consumption of fish, besides that certain fish contain certain ingredients that are beneficial for treatment, food supplements, one of which is albumin. From the results of several studies it was found that Chevron Snakehead (*Channa striata*) contains albumin which is quite high. Therefore, Chevron Snakehead eventually become an alternative source of albumin. Chevron Snakehead that used to have no economic value, resulting in exploitation / capture that is quite high in nature. According to Santoso, Chevron Snakehead (*Channa striata*) is a fish that is commonly found in public waters and has not been widely cultivated so it only relies on catches in natural or public waters, over time cendrung Chevron Snakehead will experience a decline in population [1,2].

Besides Albumin (6.2224%), Chevron Snakehead is known for containing high protein which is 25.5% (the protein content of Chevron Snakehead is higher than the protein content of Milkfish which is 20.0%, Carp fish 16.0%, Snapper 20.0%, and Sardines 21.1%).

Recent cork aquaculture has indeed begun, but its development is not as accurate as the development of other fish cultivation. In order to cultivate a type of fish from wild fish, the behavior (fish behaviour) must be well known so that domestication (taming), marriage (spawning) can be done, seed maintenance, up to its magnification.

In the effort to develop Chevron Snakehead farming, so far the most constrained constraints are the
incomprehensible and correct cultivation methods, so that Chevron Snakehead production from the cultivation process cannot be relied upon to meet market needs. The problems are as follows What is the behavior (bihaviour) of Chevron Snakehead (Channa striata) in their habitat, What is the level of gonad maturity seen from biological characteristics and How is the growth pattern of Chevron Snakehead (Channa striata) seen from a long, heavy relationship.

The Research purposes are to find out the behavior (bihaviour) of Chevron Snakehead in their habitat, to find out the biological characteristics and the maturity level of the gonads of Chevron Snakehead that live in nature and to determine the growth pattern of Chevron Snakehead (Channa striata) seen from a long, heavy relationship.

2. Methods
This research was conducted in the Tukad Yeh Sungi area and the Subak Baru irrigation channel located in Baturiti District, Tabanan Regency, from September 30 to October 27, 2017. At that time it was the peak of the rainy season where river water was experiencing abundant nutrient enrichment from the mainland which is the optimal time for aquatic organisms to carry out their activities, for example feeding, mating and growth activities.

The method used in this study is the method of observation, descriptive and analytical methods. Observation method is an observation activity at the research location to observe the behavior of Gabus Fish [3]. Descriptive method aims to describe data systematically, accurately and factually about the facts and the nature of the population in a particular area [4]. The analytical method is analyzing the relationship between the length of the sample fish weight, observing the behavior of the sample fish, and observing the condition of the gonads, and analyzing the quality of the river water.

3. Results and discussion

3.1. General description of the study area
Tukad Yeh Sungi is a cross-district river with a flow area located to the east of Tabanan Regency which is directly adjacent to the administrative area of Badung Regency. The rivers that pass in Tabanan Regency in the East are rivers that flow throughout the year because almost all of the upper reaches are located in Penebel District and Baturiti District which is a water catchment area and is a river with a large number of springs. The discharge of water from springs in the two sub-districts has the highest total water discharge compared to the water discharge from springs in other sub-districts because this sub-district is located on a plateau with annual plantations and adjacent to the back of a wavy area that juts into the coast that has experiencing erosion for hundreds of years.

The length of the Tukad Yeh Sungi stream is 40.5 km and the area of the river drainage area is 39.2 km². The upstream area is located in Baturiti District, Tabanan Regency and empties into the Banjar Nyanyi area, Beraban Village, Kediri, Tabanan [5]. Pollution in river areas and irrigation canals is still relatively small, and pollution sources still do not yet exist. So that with these conditions, the Tukad Yeh Sungi in the river and irrigation canals is still a good habitat and is favored by Chevron Snakehead from the Canna striata class, where this class likes places that are still clean and free of waste pollution, especially inorganic waste including plastic waste. The condition of river and irrigation canal in which Chevron Snakehead is found contain various substrates. Pictures of the substrates could be seen on Figure 1.
The rocky and muddy riverbed substrate is a habitat that is very favoured by Chevron Snakehead from Canna striata species, with sufficient oxygen levels and temperatures that are not too hot, there are many preferred plant litter for hiding places [6].

3.2. Time and place for catching Chevron Snakehead

At the time of the study where sampling was carried out during the day and night, it was found that Chevron Snakehead caught during the day were mostly caught in river areas that had slow and deep (tibu) water flow and the rest were caught in irrigation canals, with bottom waters sandy, muddy or a mixture of sand and mud. This occurs as a result of the nature of Chevron Snakehead that tends to come out at night or is nocturnal, to carry out various activities, such as foraging for food, or looking for spouses to spawn, as stated by Anonymous that Chevron Snakehead are nocturnal fish, one of the native Indonesian fish species whose natural habitat is in swamps, reservoirs and rivers [7]. Life in shallow water to waters with a depth of 1-2 m, with sandy or silty muddy bottom and in waters which have many aquatic plants or plant litter, because it is nocturnal then Chevron Snakehead will inhabit places that are rather deep and dark, under rocks, and organic waste or under water plants, this causes Chevron Snakehead to be caught only in deep waters during the day or sampling.

In sampling at night, Chevron Snakehead are found in shallow waters in the river, especially in waters with muddy and sandy bottom, found also in channels that have many aquatic plants, where these Chevron Snakehead hide between aquatic plants or under leaves - leaves from aquatic plants. These fish are also caught and many are found under plant litter such as piles of leaves and branches.

Chevron Snakehead found at night are caught using spoonful's, this is usually done because of Chevron Snakehead, at night it is relatively tame so that it is easily caught, especially Chevron Snakehead that have got many prey, after being hit by the light the lights are usually silent and that's when catching.

3.3. The types of Chevron Snakehead found and their characteristics

Channa striata is a type of Chevron Snakehead that is commonly found and has a relatively small body size. This Chevron Snakehead has a large head and is somewhat flat like a snake's head (so called snakehead) [8]. There are large scales above the head. The gilig round body is elongated, like a missile or torpedo. Elongated dorsal fin and caudal fin rounded at the ends. The upper side of the body from head to tail is dark, brownish black or greenish. The lower side of the white body. The side is dotted with striata like the big mouth, with big and sharp teeth. The morphology of Chevron Snakehead which found in this research could be seen on Figure 2.
3.4. Reproduction system
The reproductive system in fish consists of genitals (genital organs) and expenditure devices (organs uropoetica / excretoria). The genitals found in individual fish are called gonads, the gonads inside the male fish are called the testes while the gonads inside the female cavity are called the ovary. The spreading device consists of mesonepros, ureters (ductus mesonephridicus) and urinary bubbles (vesica uraria).

Differentiating male and female Chevron Snakehead in this study used observations in two ways, namely observation by looking at signs of secondary sexuality (phenotype) and signs of primary sexuality (genotype). The signs of secondary sexuality to estimate the sex of the Chevron Snakehead include body colour, body shape and other body parts and genital organs. For primary sexual organs, observation is done by dissecting it. The observation of the primary sexual organ is executed by dissecting the fish. The gonad and ovary of the fish could be seen on Figure 3.

3.5. Chevron Snakehead growth pattern
To find out the growth patterns of Chevron Snakehead caught both in rivers and those caught in irrigation channels, as well as for male and female Chevron Snakehead, the growth pattern of Chevron Snakehead is carried out by using the long-weight relationship method, and the results are as follows:

Based on the results of the regression on the parameters of the length of the relationship Chevron Snakehead (Channa Striata) can get the results of growth patterns. The T value of the table obtained is smaller than T count, so that it rejects H0, so the growth of allometric fish is expressed [9].

The allometric growth pattern is growth length not equal to weight [10]. The value of b obtained <3 is the value of b from female = 2.8696 and the value of b from male = 2.3335, so that the growth pattern of Chevron Snakehead is negative allometric, negative allometric is the increase in length is more dominant than the increase in weight. Which shows that Chevron Snakehead grows in length faster than widen or gain weight. The value of R2 in female Chevron Snakehead during observation is an average of 0.9, so the model is said to represent the actual state of nature by 90% or the level of truth in accordance with the actual situation is 90%. While the value of R2 in male Chevron Snakehead during the observation is an average of 0.8, the model is said to represent the actual state in nature by 80%. The neurological model can be seen in Figure 4 below.

Figure 2. Morphology of Canna striata Chevron Snakehead.

Figure 3. Testicles and gonads in Chevron Snakehead.
Figure 4. Graph of the length and weight of Chevron Snakehead.

From the graph, it can be seen that the growth patterns of female and male Gabus fish do not show different growth patterns, which means that the sex does not affect the growth pattern of the Chevron Snakehead.

3.6. Water quality

The parameter of the river water quality was executed by measuring the river water in the morning around 09.00 wita, including temperature parameter, dissolved oxygen (DO), Ph, Nitrite, and ammonia. The result of the parameter of the river water quality could be seen on Table 1.

Table 1. Observation results of water quality parameters on the river.

| No | Observation Parameters | Value  |
|----|------------------------|--------|
| 1  | Temperature            | 24 °C  |
| 2  | DO                     | 9 ppm  |
| 3  | pH                     | 7      |
| 4  | Ammonia (NH3)          | 0 mg/l |
| 5  | Nitrate (NO3)          | 0 mg/l |

The parameters of dissolved oxygen in the 9 ppm section of the river are caused by riverbed substrate dominated by mud and sand, while beside the riverbed the sloping subtract the riverbed is more in the form of large rocks and chunks, thus there will be stirring the river water higher which results in higher diffusion of oxygen from air to water. The dissolved oxygen (DO) content of 9 ppm is still the optimal limit for the life of Chevron Snakehead, thus this dissolved oxygen content is not a parameter that affects the life of Chevron Snakehead in Tukad Yeh Sungi.

Temperature plays an important role on the life of Chevron Snakehead [11]. Temperature parameters ranging from 24°C to 25°C are the optimum temperature for Chevron Snakehead so that these parameters also do not affect the presence of Chevron Snakehead. Temperatures of 24°C occur due to the closure (conopi) of the river by various tall plants, especially on the edge of the left and right of the river is relatively more tight so that the sun's radiation becomes more limited as a result the temperature becomes lower. Ammonia parameters are low due to very little pollution in the river. The parameter values of ammonia and nitrate also have no effect on the presence of Chevron Snakehead.

4. Conclusions

Based on the results of the research activities carried out in the Yeh Sungi river and tukad irrigation can be concluded as follows Chevron Snakehead found in rivers in this study, for Channa striata species are more commonly found in relatively deeper waters with rocky bottom and sandy waters. Thus it can be said that the habitat of Channa striata is in relatively deeper and darker river waters. The living habits of Chevron Snakehead (Channa striata) in their habitat are found to have eating habits that are out looking for food at night. Whereas the type of food eaten by Chevron Snakehead is from animal groups and from the results of stomach contents analysis there is no food found from vegetable sources (plants) so that it
can be said that the food habit of Chevron Snakehead belongs to the carnivore fish. Seeing the gonad maturity of Chevron Snakehead for male fish weighing testicles that can be weighed is the lowest body weight which is 19.9 gr in length 12.9 cm with the testicular weight obtained is 0.1 gr, and the highest body weight is 54.15 gr length 17.4 cm with testicular weight 0.85 gr. Whereas for gonad-weight females that can be weighed with the lowest body weight is 18 gr 12 cm long with gonad weight is 0.5 gr, and the highest body weight is 59.4 gr 18 cm long with gonadal weight 1.86 gr. Chevron Snakehead are found to have allometric growth patterns. The value of b obtained <3 is the value of b from female = 2.8696 and the value of b from male = 2.3335, so that the growth pattern of Chevron Snakehead is negative allometric, negative allometric is the increase in length is more dominant than the increase in weight.

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