Observation of Morphological Development and Time of Initial Feeding in Pompano Fish Larvae, Caranx ignobilis, Forsskall) in support of Seed Production and Mariculture Development

Tony Setia Dharma[1 *], *Ketut* Maha Setiawati[1], *Zafran*[1], *Jhon* Harianto Hutapea[1], *Warih* Hardanu[1] and *Haris* Kusmawan[2]

[1]Research Center for Fishery. Research Organizations for Earth Sciences and Maritime. National Research and Innovation Agency
[2]Environmental Resource Management and Development. Brawijaya of Univercity Malang. East Java Province. Indonesian

Abstract. The study aims to determine pompano fish larvae's initial feeding, critical period, and morphology development. The result showed that the broodstock fish spawned at 8.00–11.00 pm. The total number of eggs is 108.000, number of fertile eggs 60.000 pc spread in three fiber tank volume 1 m^3 each fiber tank which filled with 800 L sea water. Then incubation with temperature 28-30 °C. The hatching time was at 08.00–10.00 am, and then the development of morphology larvae was observed. Parameters measured were total length of larvae (TL), development of larvae and initial feeding. The study used ten individuals in every measure. Yolk sac and oil globule volume in newly hatched silver trevally larvae. The yolk sac is completely absorbed at 2-3 days, and the oil globule at 3-4 days after hatching. The initial feeding of Giant trevally commenced after the absorption process of the yolk sac was completed 2-3 days before the absorption oil globule was completed so that initial feeding or exogenous nutrition could be carried out appropriately and produce seeds to support hatchery and sustainable mariculture efforts.

1 Introduction

Research on the hatching and rearing of milkfish (*Chanos chanos* Forsskall), grouper (*Epinephelus sp*, *Plectrofomus sp*, *Cromileptes altivelis*), and several other prospective commodities such as ornamental fish has begun to develop, and most of the technology has

*Corresponding author: tonysetiadharma@gmail.com

been adopted by farmers [16, 17, 18]. Therefore, developing new species as prospective commodities is necessary, which can later be developed in sustainable cultivation efforts. Caranx ignobilis Forsskall, known as Giant trevally or GT and pompano/white pomfret/gerong-gerong). This fish usually lives in shallow coastal waters, corals and rocks, including benthopelagic species [18, 19, 23]. Pompanos have a body length of 60-110 cm, live at a depth of 12 m and are often found in tropical and sub-tropical seas. The meat of pompano has a delicious taste [5, 7, 8, 13]. Although many studies have been published on the spawning of reef fish species and morphological development and initial feeding of larvae, there are very few publications on the genus Caranx. Therefore, this preliminary research will study morphology and initial feeding as the first step in seeding activities. In recent years, the Seriola fish species, which belongs to the genus Caranx, has also been domesticated until it reaches its parents and is ready to be spawned. This needs to be done because, in the hatchery business, the obstacle faced is the high mortality in the early stages of development of the larvae and fry of the trevally. High mortality at the larval stage occurs in the critical period [12, 18, 21]. During this period, there is a change in nutritional sources from endogenous nutrition to exogenous nutrition. The larvae initially absorb egg yolks and oil droplets as endogenous nutrients. However, before the egg yolks and oil droplets supply runs out, the larvae start digesting external food to obtain energy [11, 16, 17]. This research aims to determine the development of larval morphology and initial feeding so that initial feeding or exogenous nutrition can be carried out appropriately and seeds can be produced to support hatchery and sustainable mariculture efforts.

2 Materials and methods

The test fish used in the research were broodstock pompano fish caught in the wild and domesticated. The prospective broodstock caught are maintained in a controlled manner with a running water system in a round concrete tank with a size of 30 m^3 and a depth of 2 m. Water temperature fluctuates between 28-30 °C, with sea water salinity between 33-35 ppt. There are 20 broodstock reared with a length of 55.0-85.0 cm and a weight of between 5.40-12.80 kg. The types of feed provided are trash fish and squid. The feed is mixed with a vitamin mix to improve the quality of the feed. Gonad development was observed based on egg diameter every month. Fertilized eggs will float on the surface of the water and will be carried out along the water flow. Then, they will be filtered into a collection net placed outside the broodstock tank (egg collector). The mesh size is 400-500 µm, considering that the size of the fertilized egg is around 800-900 µm. The tank used to raise larvae is made of fiber with a volume of 1 m^3. The inside of the tank is yellow and filled with 800 L of seawater, 3 of them, each filled with 20,000 eggs. The eggs will hatch at 08.00-10.00 WITA with an incubation temperature of 28.0-29.5 °C; after the eggs hatch, the resistance (SAI) and morphological development of the larvae will be observed [18, 19]. The experimental design used a descriptive design. The parameters observed were spawning, egg quality and larval morphological development. As well as water quality (temperature, salinity, oxygen and pH).

3 Result and Discussion

The spawning results and observations of the morphological development of pompano fish larvae, *Caranx ignobilis*, are in Table 1 and Figure 1. Water quality of condition on an experiment in Tabel 2.

Table 1. Result of spawning pompano fish broodstock, Caranx ignobilis, during the experiment.

Parameters	Fish Broodstock (G0)
Female - Number /pcs - Weight/kg - Total Length/cm	 12 5.40-10.80 55.0-85.0
Male - Number/pcs - Weight/kg - Total length/cm	 8 6.40-12.10 56.80-87.0
Spawning: - Frequency/time - Number of eggs/pc - Floating eggs/pc - Egg diameter/µm - Diameter of oil globule/µm - Hatching rate (HR)/% - Survival Activity Index (SAI)	 2 108,000 60,000 760±15 210±0.5 30.0-50.0 2.00-3.50

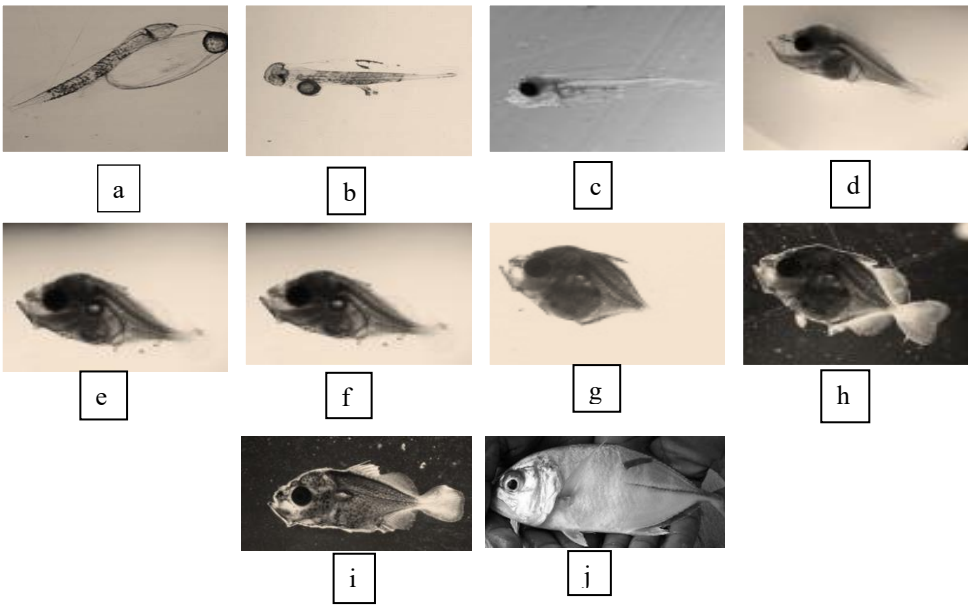

Fig. 1. Development of morphology pompano fish larvae, *Caranx ignobilis*, during the experiment

Remarks: Larvae 1-2 our after hatch (a), 32-35 our old (b), 48,5-50 years old (c), larvae five days old (d), ten days old (e), 15 days old (f), 20 days old (g), 30-32 days old (h) and 45-50 days old phase juvenile have complete of organs (j)

Table 2. Observed water quality for culture pompano fish fry during the experiment.

Parameters	Broodstock of Tank (30 m³)	Larvae of Tank (1 m³)
Temperature (ºC)	26.30-28.50	27.5-29.0
Salinity (ppt)	35.0-36.50	35.0-36.0
pH	7.80-8.27	8.10-8.57
Oxygen (ppm)	5.42-6.95	5.28-6.25
Ammonia (ppm)	0.080-0.250	0.173-0.504

The results showed that the broodstock fish spawned naturally (Table 1), then the hatched eggs were reared, and the larvae's morphology and rate of absorption of endogenous nutrients were observed. Newly hatched pompano larvae have endogenous nutritional reserves in the form of egg yolk (YS) and oil grains (OG) with volumes of 2,279.10-1 mm³ (±0.06) and 5,57.10-3 mm³ (± 0.02). Yolk material is protein and fat, a source of energy; in observations of embryo development and morphology and absorption of endogenous nutrients in larvae, they can develop normally [20]. The length of the larvae when they hatch is 2.13 mm (± 0.08). According to [12, 20], Ikeda and Mito (1988) in [9, 17] stated that "newly hatched carangid larvae usually have a length of 2.0-4.3 mm, have a yolk sac (YS) which is large, has an unformed mouth, unpigmented eyes and pigmentation will occur during the yolk sac absorption process. This is like the newly hatched Napoleon fish larvae [15, 19]. At 1.5 days after hatching, OG appeared in the middle of YS, the eyes experienced pigmentation, and the digestive tract began to appear. The yolk sac is completely absorbed between 1.5-3 days after hatching. The time required for each fish's complete absorption of the yolk sac varies. In silver pompano fish larvae (*Trachinotus blocii*), the yolk sac was absorbed entirely after 35.30 to 46.30 hours and the oil globule after 52.30 to 64.30 hours. Initial feeding was given when the yolk sac was completely absorbed but before the oil globule was absorbed entirely [4, 20]. Likewise, in Dentex gibbosus fish, the yolk sac is completely absorbed around 72 hours after hatching [2]. The speed of yolk sac absorption can be influenced by several factors, one of which is temperature.

In Greenback Flounder (*Rhombosela tap*ering), efficient yolk sac absorption occurs at a temperature of 15 °C; incubation at this temperature produces large larvae with perfect yolk sac absorption and rapid growth rates [3, 17, 20]. The high absorption rate on day one is thought to be due to the formation of body organs in day one larvae, such as forming the intestines and pigmentation in the eyes. At the age of 1.5-2 days, a high absorption rate of the yolk sac and oil globules occurs. This is thought to be because the eye pigmentation process was getting blacker at that time. The pigmentation process also occurs in the mid-body on the dorsal side and the ventral part on the post-anal and caudal sides; stated that the characteristic pattern of pigmentation development in larvae is that the eyes are pigmented, the mouth and anus are open, so they can function [1, 19, 21]. Until the gill filaments develop, the larva begins respiration through the cut layer (cutaneous respiration), absorbing oxygen through the thin walls of the prospective fin folds. The results of observations of the morphological development of the larvae began to appear on the 2-3rd day; on the third day, the food reserves were only the remains of oil grains and were completely absorbed within

3-4 days. From the description above, the change from endogenous nutrition to exogenous nutrition in *Caranx ignobilis* after complete absorption of the yolk sac ends between 1.5-2 days after hatching but before the oil globules are completely absorbed for 2.5-3 days after hatching. This is because within 1.5 to 2 days, the process of opening the eyes, mouth and anus of the larvae has occurred, so it is estimated that the larvae have started to carry out feeding activities. Kohno et al. (1988) in [3] stated that Rabbitfish (*Siganus guttatus*) larvae also start feeding activities before the oil globules are entirely absorbed. The water quality on the rear of fish larvae was essential [6, 17]. Results of water quality observations during the research included that temperature, salinity, pH, oxygen and ammonia were still normal and met the requirements for the life of pompano larvae and fry, as shown in Table 2.

4 Conclusion

The research results can be concluded that newly hatched fish larvae have nutritional reserves in the form of egg yolk or yolk sacs and oil grains or oil globules. The morphological development of the larvae to reach the pre-juvenile phase can be seen at the age of 25-30 days and then the juvenile phase at 30-45 days. Start The initial feeding of Giant trevally commenced after the absorption process of the yolk sac was completed 2-3 days before the absorption oil globule was completed so that initial feeding or exogenous nutrition could be carried out appropriately and produce seeds to support hatchery and sustainable mariculture efforts.

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