Observation of Egg and Larval Quality of Milkfish (*Chanos-chanos* Forskall) G1 and G0 Broodstock in Controlled Tanks Supports The Development and Cultivation of Milkfish in The Community

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Abstract. Milkfish, a key aquaculture commodity, is vital for industrialization and food security. Obtaining milkfish seeds from nature is challenging, but hatcheries, especially in Buleleng north coast, can produce them in large quantities. However, the varying quality of milkfish eggs has led to a decline in seed quality. Research on G1 and G0 milkfish broodstock development is necessary. The aim is to assess the performance and spawning of G1 and G0 broodstock reared in controlled tanks to aid community cultivation. The study used a descriptive method to evaluate the spawn, eggs, and fry of G0 and G1 broodstock. Results showed that G1 and G0 broodstock have similar spawning and egg quality. G1 broodstock can produce 42,940,000 eggs, with 60-82% fertilization and SAI 2.50-4.12, while G0 can spawn 55,940,000 eggs, with 50-80% fertilization and SAI 2.00-4.40. The G1 derivative's performance and egg quality are consistent, and the eggs are like the G0 natural broodstock. Milkfish fry production and pond culture cultivation continue to develop in the archipelago.

1 Introduction

Milkfish broodstock from natural origin is currently relatively difficult to obtain, because it is only found in certain waters. To overcome this, as an alternative, studies need to be carried out to provide prospective to be used as broodstock who are ready to be spawned from the results of cultivation. It is hoped that with prospective broodstock from cultivation, good quality broodstock will be produced that will not cause genetic decline and are expected to be resistant to disease.

Milkfish is an important commodity for cultivation because it has a delicious meat taste, the price is relatively affordable for all levels of society, is resistant to disease attacks, is not cannibalistic so it can live at high densities, can be cultivated in polyculture with other

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commodities, so many farmers are carrying out cultivation businesses [1], [4], [13], [16-19]. The increasing demand for milkfish seeds for the domestic market is very high and exports to several countries are increasing, so the quality of milkfish seeds produced in household-scale hatcheries must be considered, especially feed management and a controlled environment, so that the quality of the seeds and spindles produced meets export standards. So the role of the milkfish broodstock as the core for producing seeds needs attention in handling, starting from selecting good individual milkfish to selecting seeds, rearing methods and good maintenance water media so that they can produce seeds and spindles that grow quickly in a sustainable manner. Apart from being a fish bait, in recent years milkfish has been in high demand as live bait for catching tuna (*Thunnus sp*) and skipjack (*Katsuwonus pelamis*). Taxonomically, milkfish belong to the class *Pices*, subclass Teleostei, Order Malacopterygii, family *Chanidae*, genus *Chanos*, and species *Chanos-Chanos* (forskall).

Milkfish are marine fish, but can also live in brackish and fresh water, able to adapt to very large changes in salt levels or are euryhaline in nature. Domestication is the process of adapting to the cultivation environment from generation to generation. This is one step towards breeding which includes aspects of exploration, collection, documentation, characterization, and mastery of natural and artificial hatchery technologies and their enlargement. Mastery of seed technology includes gonad maturation, spawning, egg care, larval treatment followed by seed treatment, and disease control. Mastery of domestication can support the availability of consumption fish from aquaculture-based production that is safe from scarcity and sustainable in nature. Based on the level of perfection, there are four levels of domestication, namely: 1) Perfect domestication, namely when the entire life cycle of fish can be maintained in the aquaculture system, 2) Domestication is almost perfect when the entire life cycle can be maintained in the aquaculture system but the success is still low, 3) Domestication is not perfect if only part of its life cycle can be maintained in the cultivation system and 4) Has not been domesticated if the entire life cycle cannot be maintained in the cultivation system [5], [13-14].

At present the problem faced by milkfish cultivators is knowing the origin of milkfish broodstock and the fast-growing seeds resulting from domestication. Prospective broodstock from nature are generally not yet adaptive to the new environment so they are weak and easily die due to not being able to adapt to the new environment. The domesticated milkfish is ready to be bred to obtain seeds and prospective second generation (G2) broodstock in 2015. Utilization of research results in the form of milkfish hatchery technology and biological products in the form of seeds has been used for rearing in community-owned ponds in Indonesia and development milkfish cultivation through a dissemination program carried out by Research Institute for Mariculture Furthermore, science and technology for milkfish cultivation by the Jakarta Cultivation Research and Development Center. From the activities mentioned above, a technology package has been produced for the development of milkfish cultivation, including seeding and enlargement, which is applied in the community. It is hoped that the domestication and technology for cultivating milkfish successfully developed by Research Institute for Mariculture can preserve the genetic resources of native fish in Indonesian waters and increase the number of potential marine fish commodities for cultivation. In connection with the preparation and application for an assessment of the release of milkfish domestication, the description of this academic manuscript has been prepared according to the facts to be submitted.

The activity of providing broodstock from selection and breeding of milkfish has been carried out at the Gondol Research Institute for Marine Culture Fisheries since 2011-2016 and the broodstock have been successfully reared in controlled tanks and can then spawn naturally, but the quality the eggs produced still vary, so it is necessary to observe the spawning of broodstock from G1 and G0 cultivations of natural origin to see the continuity and quality of eggs from spawning. The research was carried out at the Gondol Research

Institute for Marine Culture Fisheries and Extension maintenance of broodstock produced by G1 and G0 cultivation as well as the efficiency of mass production of milkfish seeds [15-17]. It is hoped that the management and continuity of spawning as well as the quality of milkfish brood eggs will improve, so that the need for seeds for developing cultivation businesses can be met on an ongoing basis and a complete seed technology package can be obtained.

2 Materials and methods

The spawning uses a round concrete tank with a volume of 150 m³ to raise broodstock milkfish produced by cultivating G1 derivatives from selection results with fast growth criteria and G0 from natural origin, reared in a complete hatchery (HL) owned by the community. The size of the weight between 6.50-7.20 kg and a total length of 58.0-70.0 cm as many as 80 and 160 individuals.

The broodstock is maintained using a circulation system with water changes of around 200-300%/day. The feed given is in the form of commercial pellets with a protein content of around 40% to improve the quality of the feed mixed with vitamin mix and fish/squid oil. The feed dose given is around 2-4% biomass per day given in the morning and evening. Fertilized spawning eggs are reared in a controlled manner.

The materials and tools needed for this research are commercial G1 and G0 pelleted milkfish broodstock and fish/squid oil, vitamin E, mix, hormones, artificial feed for larvae, fresh water, research tanks/containers, hoses for aeration, water hose, aeration faucet, filter bag, plankton net, refractometer, DO meter, pH meter, beaker glass, bucket, wash basin, chemicals for water and feed analysis, formalin, H2O2, etc. The parameters observed were spawning, egg quality and growth, and water quality (temperature, oxygen, salinity, pH, nitrite, ammonia), as well as identification of types of disease during rearing. Data analysis was carried out in a descriptively.

3 Result and discussion

The results showed that milkfish broodstock produced by G1 and G0 cultivation could spawn

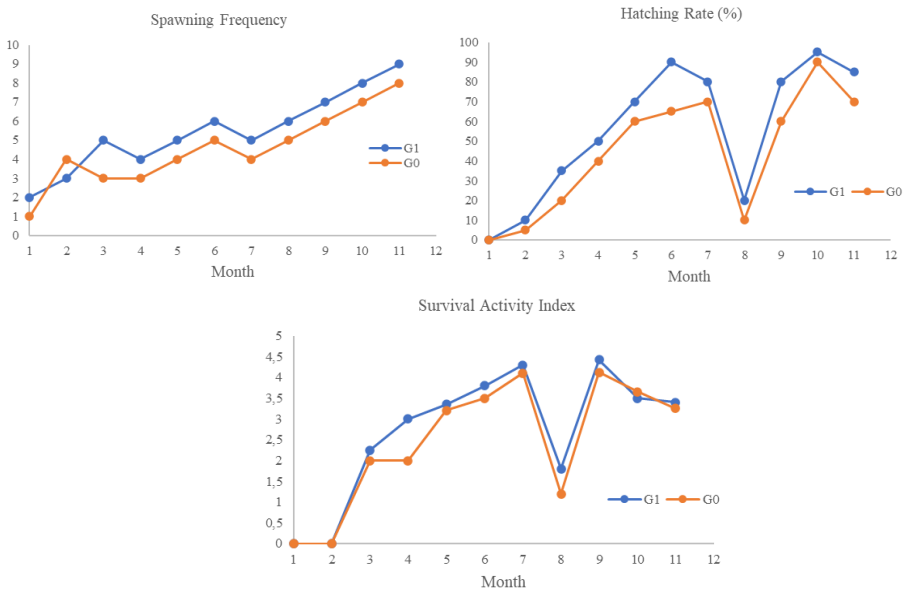

Fig. 1. Spawning and eggs quality performance of milkfish brood stock (*Chanos-chanos* Forsskall) G1 and G0 during the experiment.

continuously. Brood spawning and egg quality of milkfish broodstock in Table 1 and Figure

Table 1. Result of spawning of milkfish brood stock (*Chanos-chanos* Forskall) G1 and G0 at the end experiment.

Parameters	Milkfish Breeder G1		Milkfish Breeder G0	
	Initial	Final	Initial	Final
Female breeder				
Number of breeder / pcs	25	25	50	50
Weight/kg	6.50-7.20	6.70-8.20	6.50-7.20	6.60-8.10
Total length /cm	58.0-70.0	62.0-75.0	60.0-70.0	61.0-76.0
Male breeder				
Number of breeder / pcs	15	15	30	30
Weight / kg	6.50-7.20	6.70-8.20	6.50-7.20	6.80-8.40
Total length / cm	58.0-70.0	65.0-78.0	60.0-70.0	63.0-76.0
Spawning:				
Frequency / time	-	50	-	60
Number of eggs / pcs	-	42,940,000	-	55,940,000
Fertility / %	-	21.470.000	-	36.361.000
Eggs diameters / micron	-	950±60	-	960±50
Hatching rate / %	-	60-82	-	50-80
Survival index activity (SAI)	-	2.50-4.12	-	2.00-4.40

1.

Observation results showed that the G1 milkfish broodstock spawned 50 times with a total number of eggs of 42,940,000 eggs. The quality of the eggs produced is still not optimal with hatchability (HR) and level of larval resistance (SAI) still varying, namely around 60-82% and 2.50-4.12, where the eggs produced are almost the same as the G0 broodstock. found in the community, this is because the G1 parent fish already has good and optimal performance, but still requires further maintenance time to develop milkfish cultivation in the community.

When compared with the G0 broodstock which comes from nature, the size and weight of the G1 milkfish broodstock, the development of the gonads is still not optimal, which means that the formation of organs from the gonads in the form of egg cells and sperm from the female and male broodstock cannot develop optimally so it takes time and good quality feed. The development of gonads and broodstock sperm generally develops to medium and large vitellogenin (MV and LV) with diameters of 250-450 µm and >450 µm, then the development of male broodstock sperm becomes positive 1-3.

The controlled reproductive process is very important. Several types of fish, such as milkfish weighing 3.7-5.5 kg, have been successfully spawned by injection of vitamin E which is formed in the form of pellets and Nassau grouper fish, *Epinephelus striatus* [9; 10]. Vitamin E can improve the function of cell membranes which function as the formation of egg cell tissue. This is in accordance with opinion that vitamin E can improve cell membrane function [7]. Then the opinion of was that using low doses of vitamin E on ayu sweet fish, *Plecoglossus altivelis* resulted in one third of the number of females not spawning [10-11]. Theaddition of vitamin C in feed will tend to increase the vitamin C content in the body and resistance to stress. Besides that, Vitamin C can play a role in the formation of collagen [10]. Inhibition of collagen formation will cause the adhesive tissue to weaken, this can cause

imperfect growth [9]. According to [9] vitamin C can prevent abnormal fat metabolism, such as reduced levels of fatty acids and disruption of body fat use when not eating. Furthermore, the levels of fatty acids needed for the reproductive process in the parent fish will be disturbed, this can be seen in variations in the level of larval resistance (SAI) around 2.00-4.40. It is suspected that the low resistance of the larvae is related, among other things, to the low vitamin E content, so this will cause a decrease in quality. eggs produced. In the process of reproduction, the addition of weight is in line with the increase in gonadal development when the mother wants to spawn. According to [5-6], [22], in the reproductive process most of the metabolic products are used for gonad development. stated that a lack of essential fatty acids in feed will cause low growth, reduced feed efficiency, and in some cases increase fish mortality [10-11]. The growth of the resulting cultivated broodstock is slow. states that essential fatty acids (EPA and DHA) play an important role in the formation of components of body cells [11]. It is hoped that it can help in providing energy and the development phase of the gonads and spine can proceed well. This requires a more specific handling pattern through food and environmental management [16-18]. The results of water quality observations during the research including that temperature, salinity, pH, oxygen, and ammonia still meet the requirements for the life of milkfish broodstock can be seen [3-4], [6] in Table 2.

Table 2. Observed of water quality in the tank culture for milkfish brood stock during experiment.

Parameters	G1	G0
Temperature (ºC)	26,3-28,3	26,5-28,5
Salinity (ppt)	33,0-35,0	33,0-35,0
PH	8,15-8,32	8,10-8,37
Oxygen (ppm)	5,48-6,20	5,38-6,10
Ammonia (ppm)	0,171-0,204	0,173-0,206

4 Conclusion

The results showed that G1 and G0 milkfish broodstock have size around 58.0-70.0 cm and 6.50-7.20 kg weight and 6-8 years old had spawned regularly and the supports development and cultivation eggs and milkfish fry in the community. Have spawning and quality of eggs produced G1 broodstock can spawn 50 times the total number of eggs 42,940,000 eggs, 60-82% fertilized eggs, with SAI 2.50-4.12 and G0 spawn 60 times the total number of eggs 55,940,000 eggs, fertilized eggs 50-80%, with SAI 2.00-4.40. Thus, the spawning performance and the quality of the broodstock eggs produced by the G1 derivative have spawned continuously, the eggs produced are not different from the G0 natural broodstock. Production of milkfish fry to developed cultivation and to support in the pond culture continuously in archipelago.

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