

Developing Alternative Feed Sources for *Wader* Fish to Establish Sustainable Tourism Village in Nglipar, Wonosari, Yogyakarta

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ABSTRACT

The Tourism Awareness Group of Klayar Manunggal, located in the village of Kedungpoh, Nglipar District, Gunung Kidul Regency, Yogyakarta, currently consists of more than 30 families and is in the process of developing the Klayar tourism village. This effort is carried out by integrating several tourism components, including the exotic natural scenery of Klayar, the presentation of the local traditional cuisine of *silver rasbora* fish, known well as *wader* fish, and fruit picking. The economic potential of Klayar tourism village is very promising, but the achievements are not optimal, especially regarding fisheries management. The problems currently being faced are the *wader* cultivation that requires a supply of cheap and good quality fish feed in sufficient quantities. This program aimed to implement *wader* fish farming on a mass scale with self-produced fish feed. Furthermore, it is also targeted to provide an understanding of the importance of *wader* fish conservation efforts to the community. The planned programs were implemented well, resulting in a permanent pond for silkworms cultivation and training in worm cultivation.

Keywords: Agrotourism, Cultivation, Feed, Post-Harvest, *Wader* Fish.

1 Introduction

The Klayar Manunggal Tourism Awareness Group (*Kelompok Sadar Wisata*, POKDARWIS), located in Kedungpoh, Nglipar, Gunungkidul, Yogyakarta, is currently developing the Klayar tourism village. Development is carried out by integrating several tourism components such as exotic natural scenery, traditional culinary of *wader* fish as a tourist's favorite menu, and fruit picking tours. The potential of Klayar tourism village is very promising to be developed into one of the mainstays of educational tourism visits and a viable alternative income for its members.

Silver rasbora fish, or *wader*, is a fish with delicious tastes that is considered a fish with high economic potential [1, 2]. Many culinary businesses sell *wader* fish caught from the river [3]-[5]. However, the high demand for *wader* fish might cause extinction shortly [6, 7]. Notably, the body of water in Kedungpoh village is quite broad. Thus, it is possible to make many plots with a non-permanent pool model for the domestication of *wader* fish.

Providing alternative high-nutrition feed additives in fish farming is crucial because it can stimulate growth. Food also greatly influences the reproductive development of fish, especially in the gonadal maturation process [8]. One of the raw materials for fish feed, apart from fish pellets, which can be used as a source of animal protein with high nutrition, is silkworms (*Tubifex sp.*) [9, 10]. Feed ingredients sourced from silkworms have advantages; the price is relatively lower, easy to obtain, does not cause pollution, and is useful for increasing the immune system of fish [10]. Animal Structure and Development Laboratory, Faculty of Biology UGM, has succeeded in developing technology for spawning, breeding, and mass-cultivation of *wader* fish. The *wader* spawning tools have been tested since 2015 and showing consistent results. This program aims to continue the *wader* aquaculture program and empower the community by nurturing silkworms as an alternative feed for *wader* fish in the Klayar tourism village.



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2 Research Methodology

The implementation of the *wader* fish farming program has been developed since 2015. In detail, the activity plan for the current program is presented in the description below:

2.1 Training and Practice of *Wader* Fish Farming with Cycle Continuation

- 1) Maintenance of *wader* fish larvae
 - Treatment of spawning fish larvae, and monitoring of larvae.
 - Stocking density, feeding techniques, and pond and filter cleaning.
- 2) Stage 1 segmentation: grading and transfer of larvae to rearing ponds
 - Collection of *wader* fish larvae in hatchery ponds
 - Grading or separation of larvae based on size,
 - Transfer of *wader* fish larvae
- 3) Stage 1 enlargement
 - Rearing fish in grow-out ponds
 - Pond cleaning and water management
- 4) Stage 2 segmentation: grading and transfer of tillers to final rearing ponds
 - Grading or separating tillers based on size
 - Separation of seedling fish
 - Selection based on body length and enlargement of prospective broodstock
- 5) Stage 2 enlargement
 - Enlargement of fish in rearing ponds
 - Feeding, cleaning rearing ponds, and water management
- 6) Harvesting and post-harvesting
 - Procedures for harvesting fish
 - Post-harvest handling of fish; grading size, cleaning, and packing

2.2 Training and Practice of Making *Wader* Fish Feed

- 1) Manufacture of fish pellets from silkworms
 - Silkworm rearing training
 - Training on making fish pellets from the essential ingredients of pellets mixed with silkworms
- 2) Pellet performance on fish
 - Monitoring the performance of pellets in fish with growth parameters
 - Monitoring of gonadal development
 - Monitoring feed performance on larvae

3 Theory

Wader fish (*Rasbora lateristriata* Bleeker, 1854) is a widespread freshwater fish in Indonesia. The distribution of *wader* fish covers the regions of Sumatra, Java, Kalimantan, Bali, Nusa Tenggara, and Sulawesi. Domestication is an effort to maintain wild fish obtained from nature so that they become tame and accustomed to living outside their natural environment [11]. The main factors for the success of domestication are divided into two, namely ecological factors and biological factors. Ecological factors refer to adjusting the environment/artificial living media to the type of fish to be domesticated. Meanwhile, biological factors are more complex, including types and habits of feed, reproductive characteristics, and the ability to spawn. In empowering or domesticating *wader* fish, it is essential to pay attention to the feed

used so that the empowerment goes well. The feed quality depends on the composition and how much feed components can be absorbed and utilized by fish [12]. *Wader* fish eat food that floats and does not sink immediately into the waters. In their natural habitat, *waders* feed on plankton, fish larvae, small shrimp, insects, and small animals floating in the water. A good feed composition for *wader* fish contains balanced amino acids, fatty acids, minerals, and vitamins [13].

Silkworms (*Tubifex* sp.) are small hair-sized worms with a length of about 10mm-30mm per individual and have a body shape resembling a silk thread. This worm is known to have a reddish body color because it contains much hemoglobin [14]-[16]. Silkworms have a protein content of up to 52.49% and 13% fat which is suitable for feeding fish larvae [17]. Fish farmers often use silkworms as feed because they have several advantages, including high nutrition, moving slowly so that the larvae easily catch them, tiny in size, and easy to digest. Feeding silkworms to fish seeds/larvae improves the quality of fish color pigments [14]-[16]. In addition, silkworms are relatively easy to breed, so their use is more flexible [18, 19].

4 Results and Discussion

Based on a series of stages of activities that have been carried out in 2021, the results achieved are as follows:

4.1 *Wader* fish cultivation training

Fish farming training begins with the socialization of fish biological information and the stages in *wader* fish cultivation, followed by the provision of tools to support the cultivation program that POKDARWIS will carry out. The stages can be seen in Figure 1-3.



Figure 1: Selection of *wader* broodstock



Figure 2: *Wader* spawning and cultivation practices



Figure 3: Training and practice of wader fish farming

The practice of spawning techniques, selection of broodstock, preparation of mating chambers, broodstock pooling, and egg collection followed the introduction of semi-mass scale *wader* spawning techniques. The cultivation practices were implemented in one rearing cycle starting from spawning, egg selection, hatching, maintenance of segment 1, segment 2 larvae, and broodstock production (Figures 1-3).

4.2 Initiation of Providing Natural Food for *Wader* Fish Cultivation

The implementation of *wader* fish cultivation requires the availability of sufficient amounts of feed. One of the efforts made is the provision of natural food for *wader* fish in the form of silkworms. The maintenance of silkworms will be carried out in worm-rearing ponds. Currently, worm maintenance initiation has been carried out using the following methods:

- Maintenance with the apartment method. The apartment method was chosen because it has several advantages: it can be done indoors and requires less/narrower space (Figure 4). However, the productivity level of this method is still deficient, so an alternative approach was performed by the rearing pond method (Figure 5).



Figure 4: The apartment method for raising silkworms implemented at Klayar

- Maintenance using the open pond method. The results of silkworm cultivation using the mini pond method are expected to be used as a source of feed in *wader* fish cultivation (Figure 5).



Figure 5: The process of making ponds for raising silkworms implemented at Klayar

4.3 Program Finalization

Maintenance of natural feed for silkworms using the open pond method has been carried out. It started with training in collaboration with silkworm breeders from Kulon Progo. The results of cultivating silkworms using the mini pond method help reduce feed costs while increasing the productivity of *wader* fish (Figure 6-7).



Figure 6: Program discussion of wader fish cultivation by the provision of natural silkworm feed



Figure 7: Finalization of permanent ponds for silkworm cultivation as natural food for wader

5 Conclusions

The development of the Klayar tourism village is being carried out by the Klayar Manunggal Tourism Awareness Group (Pokdarwis). The cultivation of *wader* by Klayar Manunggal has excellent potential from

the economic aspects. The present issue is that *wader* cultivation needs access to a substantial quantity of affordable, high-quality, and readily available fish feed. The program aimed to create *wader* fish farming on a large scale with self-produced fish feed. The intended activities were successfully carried out, and the Klayar Manunggal group now has a permanent pond for silkworm rearing that will be used as an alternative source of feeds for *wader* fish.

6 Declarations

6.1 Funding Source

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6.2 Competing Interests

The authors have no competing interest to declare.

6.3 Publisher's Note

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