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MONITORING AND EVALUATION OF THE BREEDING CONDITIONS OF HETEROBRANCHUS ISOPTERUS IN FISH PONDS IN THE DISTRICT OF KEREMA PREFECTURE OF N'ZEREKORE (REPUBLIC OF GUINEA)

Pascal BILIVOGUI [1], Lanan Wassy SOROMOU [2], Cé II ZOTOMY [3], Véronique MAOMOU [4], Ansoumane SAKOUVOGUI [5]

[1,2,3,4,] Higher Institute of Sciences and Veterinary Medicine of Dalaba - Guinea
[5]Higher Institute of Technology of Mamou - Guinea

ABSTRACT

The objective of this study is to highlight certain problems related to the breeding of H. isopterus in fish pond of Kerema. Based on certain farming conditions, seven (7) fish ponds were monitored and evaluated. The depth of the ponds varies from 1.30 to 1.75 m and 14.28% of fish farmers have a pond that has the right color (greenish). The stocking density of 57.14% of the fish farmers monitored is 20 individuals / are and 42.86% have an unknown density. In food, two types of farming have been identified: Extensive (14.29%) and semi-intensive (85.71%). The results of the monitoring of the distribution frequency reveal that 28.57% of the fish farmers feed the fish at a frequency of 1 to 2 times / day; 14.28% do it once or twice a week; 42.85% feed their fish occasionally and finally 14.29% do absolutely nothing for the fish. 85.71% use pig manure as fertilizer; 14.28% combine pig manure and goat dung and another 14.28% do not provide fertilizer. It emerges from this study that fish farming in Kéréma is experiencing serious problems for its development. Among these pitfalls we can cite among others the non-respect of the density of fish, the lack of monitoring, the extensive fish farming system, the lack of technical and financial assistance in this locality and the lack of training.

Keyword: Monitoring, evaluation, Heterobranchus isopterus, pond, fish farming.

1. INTRODUCTION

The nations of the world have set themselves in recent years the so-called Millennium Development Goals (MDGs), namely the reduction of poverty and the achievement of food security by 2025. This challenge requires the participation of a large number of activity sectors including aquaculture [1]. In sub-Saharan Africa fish covers an average of 22% of protein intake from animals [2].

According to [3], maintaining the current level of per capita consumption of fish requires that Africa increases its fish and fishery production by almost 250% over the next ten years. The growing interest in aquaculture today is mainly due to the decline in natural fish stocks, caused by excessive and uncontrolled fishing. There is also the need to produce 40 million tons of additional fish by 2030 given the stagnation of fishing landings, the increase in the world population and the processing of 50% of the products fishing in oil and flour used for animal feed, including farmed fish [4]. In this context, aquaculture appears to be the only alternative that can meet this high demand for fish for human consumption [5]. To achieve the Millennium Development Goals, the focus is therefore on the short-term impacts of aquaculture: improving incomes, creating jobs and supplying markets with sufficient quantities of fish [6].

In sub-saharien Africa, the emergence of aquaculture since the 1990s has been achieved thanks to the participatory approach. The disengagement of the public sector was compensated by the strengthening of the autonomy and the empowerment of private operators or communities. This has resulted in the transfer of aquaculture properties and means of production to private operators [7]. Satisfying Africa's future fish resource needs requires small, medium and large-scale aquaculture production in a sustainable framework [3].

In sub-Saharan Africa, production of Heterobranchus isopterus was 6900 tonnes in 1991, which ranks second after that of Cichlidae. This production is mainly done in Nigeria, South Africa, Ivory Coast and Ghana. One of the main limiting factors in his breeding is that of the supply of fry and juveniles. Breeding H. isopterus in Africa is a marginal activity due to inadequate infrastructure. In recent years, we have noted in African countries, the unsuccessful introduction into fish farming of H. isopterus. Breeders are often individuals who do not have a mastery of breeding techniques. The speed of growth of Heterobranchus isopterus depends on the breeding conditions [8].

In Guinea, like many other African countries, the fishing and aquaculture sector is identified as an important segment of socio-economic activity, which can contribute to the economic growth of the country, to the improvement of State revenues, poverty reduction, decent employment creation and food security for populations.

In Forest Guinea, there are 4 main farmed fish and each has a name in the different local languages. In this type of culture, Oreochromis niloticus is the main species and Heterotis niloticus, Hemichromis fasciatus and Heterobranchus isopterus are complementary, auxiliary species or even facilitators which increase the yield and the value of fish production. Complementary species can generate positive synergies for all species raised.

The importance of breeding several species of fish in combination offers the advantage of increasing fish productivity through: the increase in food resources accessible to fish, the possibility of creating new fertilization resources, improvement of environmental conditions (oxygen, mineral salts, etc.), adaptation of the size of the fish to the resources of the environment by controlling the numbers and limiting the risk of colonization by undesirable species.

In this activity, certain conditions seem to be ignored and those that are applied are deficient in their application. The breeding conditions of this species are an important factor in increasing production and productivity. This research is part of this dynamic, monitoring and evaluation of the breeding conditions of Heterobranchus isopterus in fish ponds in the district of Kéréma prefecture of N'Zérékoré in the Republic of Guinea.

2. MATERIAL AND METHODS

2.1. Material

2.1.1. Presentation of the study area

The Prefecture of N'Zérékoré is one of the 33 prefectures of the Republic of Guinea, located in the south of the country. It is located at 7°25 'and 8°20' north latitude and 8°35 'and 9°15' west longitude. The average altitude observed is 520 m. It is bounded to the east by Lola prefecture, to the west by Macenta prefecture, to the north by Beyla prefecture, to the south by Yomou prefecture and the Republic of Liberia. The Kéréma study site is one of ten (10) districts in the Bounouma sub-prefecture [9].

Endowed with a natural richness thanks to the high rainfall (4000 mm per year), N'Zérékoré has known for twenty years a strong of agricultural development. However, the isolation and distance from the coast made it difficult to supply seafood to the region. Livestock remains very underdeveloped, a development hampered by the periodic epizootic.

2.1.2. Equipment used

The equipment used is composed of fishing equipment (seine net, conical net, bucket and sorting box) of material for artificial reproduction (incubator, knife, towel, distilled water, sieve, table, porcelain plate, electronic scale and syringe) and other materials used (survey forms, fish and ponds).

2.2. Methods

This study focused on seven (7) ponds where Heterobranchus are raised, in the district of Kerema, during the period from June 12 to December 17, 2019. To achieve the objectives of this research, the following methodological steps were adopted: the survey of executives of the Prefecture Directorate of Fisheries and Aquaculture, the exploitation of archives, the survey of fish farmers and monitoring the breeding conditions of Heterobranchus isopterus which covers stocking, feeding and fertilization of ponds, (Figure 1, 2 and 3).

Figure 1: *H. isopterus* fry

Figure 2: Stocking

Figure 3: Fertilizer supply

3.RESULTS AND DISCUSSION

3.1. Results

The various results obtained during this study are related to: the specific characteristics of the ponds, the stocking of the ponds, the feeding and fertilization of the ponds. These results are illustrated in Tables 1, 2, 3 and by the graphs in Figures 1, 2, 3 for a good interpretation.

3.1.1. Specific characteristics of stocking ponds

The specific characteristics of the stocking of the Kerema ponds are shown in Table 1.

Table 1: Specific characteristics and stocking of the ponds visited

Ponds	Depths (m)	Areas (ares)	Densities per are	Water colors	Types of pond
E1	1.50	4	20	Light green	Dam
E2	1.75	11	Undetermined	Clear	
E3	1.30	50	20		
E4	1.75	64	20	Ocher	
E5	1.50	10	Undetermined	Green	
E6	1.50	11	Undetermined		
E7	1.30	40	20	Dark	

The depths and surfaces of the ponds are represented by the graph in Figure 4.

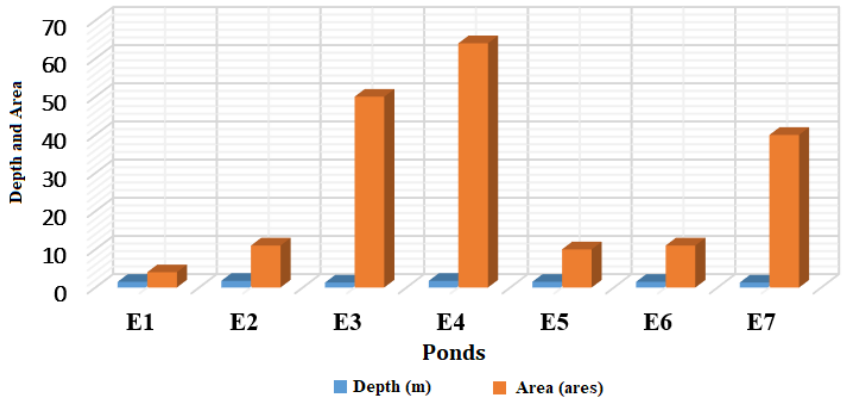

Figure 4: Depth and surface of the ponds

3.1.2. Fish feeding

The fish diet by group of fish farmers is given in Table 2.

Table 2: Fish diet by group of fish farmers

Groups	Types of food	Distribution quantities	Distribution frequencies	Number of fish farmers	% of fish farmers	Types of breeding
GI	Rice bran	3.2 kg/are	1 to 2 times/day	2	28.57	Semi-intensive
	Decanted palm oil	3.5 liters/are				
GII	Decanted palm oil	3 liters/are	1 to 2 times/week	1	14.28	
	Rice bran, Cassava and potato leaf	3 cuffs				
GIII	Rice bran	Undetermined	Occasional	3	42.85	
GIV	No food	-	No food	1	14.28	Extensive
Total				**7**	**99.98**	**-**

The rates of the types of food given to fish are shown in the diagram in Figure 5.

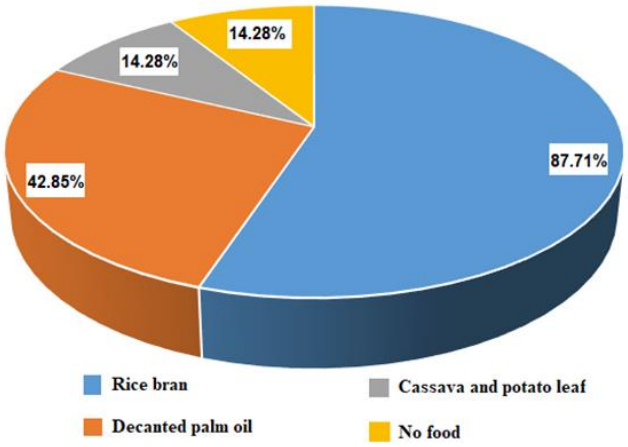

Figure 5: Rate of the types of food given to fish

3.1.3. Fertilization of ponds

The fertilization of ponds by group of fish farmers is given in Table 3.

Table 3: Fertilization of pond

Groups	Types of fertilizer	Distribution quantities	Distribution frequencies	Number of fish farmers	Percentage (%)	Types of breeding
GI	Pig manure	2.8 kg/are	2 time/day	3	42.85	Semi-intensive
GII	Goat droppings	2 kg/are	2 times/week	1	14.28	
	Pig manure	1.2 kg/are				
GIII	Pig manure	Undetermined	1 time/day	2	28.57	
GIV	No fertilizers	-	-	1	14.28	Extensive
Total				**7**	**99.98**	**-**

The groups of fish farmers by diet and fertilizer are shown in the graph in Figure 6.

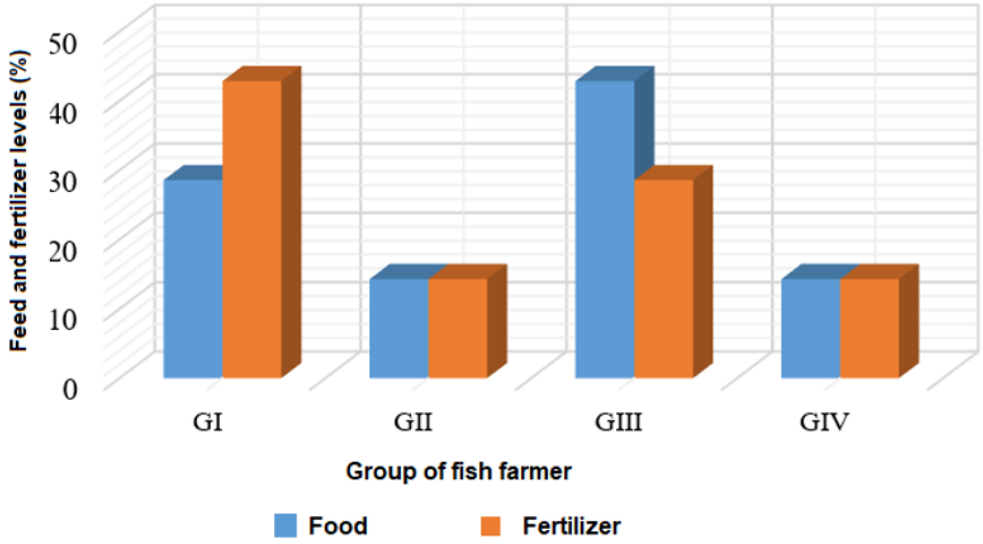

Figure 6: Feed and fertilizer rate by group of fish farmers

3.2. Discussion

The ponds encountered for the breeding of Heterobranchus isopterus in the district of Kerema are of the dam type. This depends not only on its low construction cost but also on the availability of waterways in the forest area.

The diagram in Figure 4 shows that the depth and surface of the ponds vary from 1.30 to 1.75 m and from 4 to 64 ares respectively. Among the 7 ponds, that of (E1) with a depth of 1.50 m and a surface of 4 ares has dimensions that correspond to village standards. Pond E4 has large dimensions (1.75 m deep and 64 ares of surface), which leads to maintenance difficulties [10].

Table 1 shows that, out of the seven (7) ponds, four (4) meet the stocking standards, i.e. 20 individuals (fry) per are. This standard is not respected at the level of the other three ponds. The water in the ponds has different colors: ocher, dark, clear and green which is considered bad. Good water for fish farming should be slightly green which has been encountered in the pond (E1).

With regard to the graph in Figure 5, rice bran is the food most used by fish farmers in Kéréma, ie a user rate of 87.71% followed by the decanting of palm oil, i.e. 42.85% of fish farmers. These two agricultural by-products are used more because of their abundance in the forest area, but also for their beneficial effect on the rapid growth of fish. Cassava and potato leaves are little used by fish farmers, at a rate of 14.28%. This is due to the fact that these leaves are difficult to obtain by fish farmers, as they are also consumed by humans. These types of food are distributed at a feeding quantity and frequency presented in tables 2 and 3.

The diagram in Figure 6 shows that the quantity of food and fertilizers depends on four groups of fish farmers. The group (GI) uses more fertilizer than food in ponds, on the other hand the fish farmer group (GIII) uses more food than fertilizer. The groups (GII and GIV) use the same amount of food and fertilizer in the ponds.

The first three (3) groups of fish farmers quantify the food intake per pond, of which 2 fish farmers distribute 1 to 2 times per day, i.e. 28.57%, a single fish farmer feeds the fish once or twice a week or 14.28%; three (3) fish farmers bring food occasionally (42.85%) and one fish farmer contributes absolutely nothing to fish (14.28%) (Table 2). These results suggest that none of these fish farmers meet the standards for feeding fish in the pond visited. Nevertheless, two fish farmers are approaching the standard which is 3 times a day. In addition, one of the fish farmers brings absolutely nothing to the fish, which implies that his fish still live at the mercy of nature.

In addition to the monitoring of feeding activities, the quantities of fertilizers and their distribution frequencies were also observed. Pig manure is

used by the first 3 groups of fish farmers, ie 85.71%. This is due to its great ability to fertilize ponds, but also because a good part of this fertilizer is directly consumed by fish when it is put in the water. Goat droppings are used by 14.28% of fish farmers and finally 14.28% of fish farmers do not fertilize their ponds. The low use of goat droppings is due to its low power to dissolve in water for rapid fertilization. The lack of fertilization is a brake on the development of plankton which is an important element in regulating the oxygen level in ponds. The quantity of distribution varies according to the fish farmers, that is 2.8 kg / are for 42.85% of the fish farmers with a distribution frequency of 2 times / day. The GI uses 2 kg / are of goat droppings and 1.2 kg / are of pig manure twice a week. The amount used by the GIII is undetermined (see Table 3).

4.CONCLUSION

All the factors preventing the development of fish, such as: extensive farming, shallow ponds, the enormous density of fish in the pond, pollution of pond water under the effect of fertilizers, should be corrected as much as possible.

This research shows that, in the district of Kéréma, the farming techniques are different from one fish farmer to another in terms of the type, quality, quantity, frequency of feeding and fertilizer supplied to Pisces. This generally leads to low yields. Monitoring and evaluation of other conditions (measurement, evaluation of the water quality of ponds, economic evaluation) for the breeding of Heterobranchus isopterus in fish ponds in the district of Kerema, will subject of another research.

5.RECOMMENDATIONS

In light of the results obtained in carrying out this study, we recommend the following:

- The construction of ponds 1.50 to 1.75 m deep with a maximum water level of 1 m;
- Introduce fry of H. isopterus at a density of 15 to 20 individuals per are;
- The fertilization of ponds at a quantity of one and a half (1/2) to one (1) wheelbarrows per week on a surface of 4 ares;
- Periodic training and financial assistance for fish farmers on the breeding of H. isopterus.

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