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Disease Management Strategies in Fish Farming in Ijebu-Ode Local Government Area of Ogun State, Nigeria

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Abstract

This study investigates disease control strategies in fish farming within Ogun State's Ijebu-Ode Local Government Area, Nigeria. Employing a straightforward random sampling method, 100 fish farmers were selected, and data was collected using a standardized questionnaire and interviews. The analysis, incorporating percentage, mean scores, and standard deviation, reveals that all participants experienced fish mortality in their farms, attributing it to stress, poor water quality, and disease organisms. Water pollution, identified by 76.4% of respondents, and emerged as the primary cause, followed by feed contamination, infection, high stocking density, electrical failure, and environmental factors. Emphasizing the pivotal role of water quality in fish health, the study highlights the challenges, with substantial losses observed at the fry stage (40.8%). During outbreaks, farmers predominantly sought advice from peers (55.6%) and engaged in self-medication (34.7%), indicating limited involvement of professionals. The prevalence of bacterial diseases underscores interventions such as water management and antibiotic use. While fungal diseases are relatively rare, viral diseases like dropsy are identified, with treatments involving salt and antibacterial diets. This study provides crucial insights into the complexities of fish farming, underscoring the necessity for comprehensive strategies addressing water quality, disease management, and knowledge dissemination within the farming community in Ogun State's Ijebu-Ode Local Government Area..

Keywords: Disease Management, Fish Farming, Control Strategies, Water pollution, self-medication

INTRODUCTION

Historically, fishing has played a crucial role in sustaining human nutrition, offering both sustenance and economic opportunities (Bene, 2006). It has significantly contributed to the prosperity and welfare of the global population. A serving of 150 g of fish provides approximately 50–60% of an adult's daily protein needs, establishing fish as a vital source of animal protein in the human diet (FAO, 2014). Thilsted, (2012) notes that fish contributes to the animal protein intake of around 3.0 billion people, representing nearly 20% of their average per capita consumption, and approximately 15% for 4.3 billion people. In 2010, fish comprised 16.7% of the global population's animal protein intake and 6.5% of total protein consumption. Particularly in low-income countries with access to water and fisheries resources, fish serves as a critical livelihood, income, and nutritional resource for rural communities, who are disproportionately affected by malnutrition, including micronutrient deficiencies (Thompson & Subsinghe, 2011).

Despite its significance, the fish supply, especially in Ogun State, faces health-related challenges, with illness posing a considerable risk. The escalating impacts of climate change on aquatic ecosystems are expected to exacerbate this situation. Agnew et al., (2009) argue that several factors contribute to the health issues confronting small-scale fish farmers, including unpredictable weather conditions, improper use of chemical disinfectants and medicines, and aggressive farming practices with inadequate management of feed and waste. A lack of technical knowledge, especially among beginners,

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further compounds these challenges. These issues are prevalent in many small-scale fish farms in the state, leading to an increased vulnerability to disease and infection cycles. Recognizing the need for informed policy, tailored training, and targeted advisory services, ongoing research on fish health and management challenges is crucial, especially given the influx of newcomers to the fish farming industry. Consequently, this study explores strategies for disease management in fish farming within the Ijebu-Ode Local Government Area of Ogun State.

METHODOLOGY

This study was conducted in Ijebu-Ode Local Government Area of Ogun State in southwest, Nigeria. The LGA is with a population of 157,161 and a larger proportion of females, the LGA is 192 km2 in size (NPC, 2006). The main industries are farming, fishing, manufacturing, trading, and the cultivation of crops like melon, oil palm, cassava, and kolanuts. A total of one hundred respondents were chosen at random from the local government area's fishing community. Data was gathered with the use of a structured survey. The acquired data was subjected to mean score analysis, percentage analysis, and frequency table analysis. Haven administered a questionnaire to collect the data, which SPSS statistical software was then used to code, tabulate, and analyse.

RESULTS AND DISCUSSION

All of the survey respondents (100%) reported experiencing fish diseases in their farms, as indicated in Table 1. The demise of fish in these farms can be attributed to various factors, including stress from extreme or toxic conditions, suboptimal water quality, presence of disease organisms, and improper feeding practices, among other reasons. Fish mortality often serves as a visible indicator of underlying environmental or management issues. When the early signs of diseases are not effectively addressed, it can result in a significant loss of fish, posing a substantial financial setback for farmers. The presence of a few dead fish floating on the pond's surface may not necessarily be cause for concern, as it could be attributed to natural aging or stress. However, when a substantial number of fish of various sizes are discovered dead or dying consistently over an extended period, thorough investigation becomes imperative to identify the root cause. This proactive approach is crucial for implementing appropriate measures to address the issue and safeguard the overall health of the fish population in the farms.

Table 1. Disease incidence, causes, and source of advice.

Variable	Percentage
Incidence of fish disease and death	
Yes	100%
No	-
Cause of disease in farm*	
Natural	6.9 %
Infection	37.5 %
Environmental	11.1%
Feed Contamination	55.6 %
Water Pollution	76.4 %
High stocking density	19.4 %
Electrical failure	12.5 %
Stage of growth of significant loss to disease	
Fry	40.8 %
Fingerling	28.8 %
Juvenile	15.9 %
Adult	14.4 %
consultations during disease outbreak	
Veterinarians	12.5 %

Research institutes	6.9 %
Fellow Farmers	55.6 %
Self Medications	34.7 %
Local/Private Dealers	4.2 %
Extension Agents	11.2 %

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Cause of Disease in Fish Farm

A majority of the respondents (76.4%) identified water pollution as the primary factor contributing to fish diseases in ponds. Smaller percentages (55.6%, 37.5%, 19.4%, 12.5%, 11.1%, and 6.9%) attributed fish diseases to feed contamination, infection, high stocking density, electrical failure, environmental and natural factors, respectively (see Table 1). The quality of the fish environment, encompassing biological, chemical, and physical aspects of water such as pH, dissolved oxygen, temperature, color, and transparency, significantly affects fish health. According to Sadler & Andrew (2007), the safest water for fish production is sourced from a well and pumped to the pond at an elevated level. Although water recirculation may not introduce new diseases, it can allow existing pathogens to accumulate in fish or intermediate hosts. River water, considered less desirable due to potential pathogens, can be used if properly filtered and held in fish-free ponds for at least 21 days to disrupt the life cycles of parasites and pathogens.

Feed contamination, which includes the use of expired or contaminated feed, overfeeding, underfeeding, and providing the wrong feed size, presents a substantial challenge to fish production. White, (2013) highlights that feed costs constitute a significant portion of total production costs, and improper feeding and feed management can impact farmers' profits. Nutritional imbalances, underfeeding, and overfeeding can lead to reduced fish performance and increased susceptibility to diseases (Bureau et al., 2006). High stocking density is another factor that can make fish more susceptible to diseases due to heightened competition for survival. Fish diseases may result from both microbial factors and management-related issues, with the potential for transmission between ponds, farms, and through the transfer of infected fish. Animals, people, equipment, and contamination by infected fish or fish pathogens serve as additional avenues for the spread of diseases in fish farming.

Loss of Fish to Diseases

Respondents reported significant fish losses due to diseases, with the highest incidence occurring at the fry stage (40.8%), followed by the fingerling stage (28.8%) (refer to Table 1). A smaller proportion observed diseases at the juvenile (15.9%) and adult (14.4%) stages of production. This pattern suggests a decrease in disease incidence as the fish age, possibly attributed to developmental differences among the fishes. These findings align with Sharma et al. (2012), emphasizing that disease plays a significant role in fish mortality, particularly during the early stages of development. Younger fish, such as fries, are more susceptible to disease infestation due to underdeveloped organs, limiting their ability to combat disease conditions. Morphological transformations, including pigment pattern changes, alterations in body shape, fin and eye migration, render them more prone to diseases, hindering their growth and development. In contrast, adult fish are less susceptible, being fully matured with all organs functioning, and they sometimes exhibit resilience in adverse conditions.

Source of Advice During Disease Outbreak

During disease outbreaks, respondents primarily sought assistance from fellow farmers (55.6%), and a significant proportion engaged in self-medication practices (34.7%) (see Table 2). Consulting fellow farmers, particularly those with more experience, was a preferred approach, possibly due to its ease, speed, and cost-effectiveness. Similarly, self-medication might be a more economical choice, but its consequences could be significant, especially for illiterate or inexperienced farmers. Notably, the utilization of veterinarians, research institutes, extension agents, and professionals was not common. This reluctance could be attributed to economic, institutional, and financial constraints. Many respondents did not reach out to these sources, potentially driven by the perception that small-scale farmers are not prioritized, or it could be due to poor connectivity, limited interaction, or geographical distance from these institutions.

Bacterial Diseases The most prevalent bacterial diseases reported by respondents were fin or tail rot (7 occurrences), *myxobacteriosis* (5 occurrences), and s*epticaemia* (5 occurrences). A substantial percentage of farmers (75%) had experienced fin or tail rot (75.1%), *septicaemia* (38.2%), and *myxobacteriosis* (30.5%) on their farms (refer to Table 2). Although tuberculosis was reported by a significant proportion of farmers (48.6%), it was relatively less common. These findings align with FAO (2014), which emphasizes that bacterial diseases rank as the primary etiological agents in almost every type of aquaculture.

Fin and/or tail rot, caused by *Aeromonas sp* and Pseudomonas sp bacteria, can lead to the death of infected fishes if unchecked. In response to outbreaks, farmers adopt measures such as draining the pond, introducing fresh water, adding salt, and checking water quality parameters. Antibiotics, especially Oxytetracycline, are applied when infections are severe. However, Pandey et al., (2012) suggest prioritizing large water changes and thorough gravel cleaning to remove detritus and waste from the substrate before resorting to chemical or medication dosing, as this approach minimizes the risk of further gill damage. Other bacterial diseases, including fish tuberculosis, are also addressed through water management, equipment/pond disinfection, or antibiotic use in severe cases. Caution is advised in the use of antibiotics due to their residual effects and potential consequences for public health when withdrawal periods are not observed by farmers. Indiscriminate use and access to adulterated drugs further compound issues, affecting efficiency and production costs.

Table 2. Prevalence of bacterial disease and Treatments in Fish Farms.

Signs/symptoms	Percentage	Prevalence	Disease	Treatment
Bacterial				
Swelling of the head and bulging eyes	20.7	2	*Corney bacteriosis*	Treat first with salt then if symptoms persist, then treat with antibiotics like oxytetracycline
Rotted or decaying fin and/or tail	75.1	7	Tail and fin rot	Drain pond and put water up to one block then treat with antibiotics (oxytetracycline or chloramphenicol) and also check the pH of the water and correct if needed
Inactivity, loss of colour or appetite, weight loss, skin defects	48.6	4	Fish Tuberculosis	Disinfect tank, net, etc. to prevent transmission. Wash hands and surfaces well. Antibiotics like oxytetracycline are used in in severe conditions
Erratic swimming, bloating or swelling in body Fish cluster near water inlets of ponds and even try to jump out	30.5	5	*Myxobacteriosis*	Use salt. Keep up on water maintenance to prevent it
Sluggishness, lack of appetite, fin damage, reddish discoloration, and bulging eyes	38.2	5	*Septicemia*	Antibiotic treatment in food form is required.
Fungi				
Grayish white color on skin, damaged fins, and the tissue on the head may be eaten away	28.7	2	Cotton wool disease	Treat immediately with antifungal drug and disinfect tanks and equipments
White or gray fungus on eyes, swelling ulceration.	23.5	2	Cataracts	Antibiotics like eye fungex or any other fungicide.
Viral				

Swelling of abdomen and raised scales around the swollen area	13.6	4	Dropsy (Malawi Bloat) may be caused by internal bacterial infection (if swelling is sudden), parasites, or cancer (if swelling is gradual).	Used 1/8 teaspoon of industrial salt for every 5 gallons of water and monitor for two weeks. Check for signs of bacterial infection or parasites for further treatment.

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Bacterial diseases

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Other bacterial diseases, including fish tuberculosis, are also addressed through water management, equipment/pond disinfection, or antibiotic use in severe cases. Caution is advised in the use of antibiotics due to their residual effects and potential consequences for public health when withdrawal periods are not observed by farmers. Indiscriminate use and access to adulterated drugs further compound issues, affecting efficiency and production costs.

Fungi disease

Fungal diseases are relatively uncommon in fish farms, with respondents reporting only two occurrences in the last two years on their farms. Approximately 29% and 24% of farmers observed cotton wool disease and cataracts diseases, respectively (see Table 2). These findings contrast with the report by Foster & Smith (2015), which suggests that fungal infections are among the most common diseases in fish, given the widespread presence of fungal spores in all fish.

Cotton wool disease, resulting from fungal infections affecting the skin, fins, and mouth, typically manifests as fluffy white growth in areas with previous infections, parasites, or injuries. Farmers addressed these issues by using antifungal drugs and salt. Foster & Smith, (2015) advocate for a more cost-effective approach through the disinfection of farm equipment and maintaining a clean environment, emphasizing hard work and consistency. Cataracts, fungal growth causing opacity in the lens and inefficient light transmission, were treated by farmers with antifungal drugs like eye fungex or other fungicides. This practice carries risks, as farmers might lack knowledge about the correct therapeutic dose. Foster & Smith, (2015) propose a preventive approach, emphasizing a balanced diet with fresh food (commercial food less than 6 months old) to help prevent cataracts.

Viral disease

Dropsy, reported by 13.6% of respondents and occurring four times, was the most prevalent viral disease (see Table 2). Dropsy is characterized by the accumulation of excessive fluid in the tissues or inadequate water elimination from the system. Farmers reported the use of salt as a highly efficient and effective treatment for dropsy, attributing its ability to extract extra water from the belly and improve the overall health of the fish. Additionally, an antibacterial diet, consisting of a combination of

antibiotics such as tetracycline with fish food for a minimum of 10 days, was also reported as very effective by the farmers.

Table 3. Prevalent parasitic diseases and treatment in small scale fish farms.

Symptom	Percentage	Prevalence	Disease	Treatment
Lesions (wound) on the body	50.7	4	Anchor worms	Drain pond and disinfect with lime till the symptom disappear
Restlessness and discomfort Rubbing body on pond bottom	34.3	3	Fluke disease	Apply formalin or malachite green
Fish restless Red spot on point of infection Mass mortality	28.2	4	Fish Lice	Drain ponds, add a little water up to one block then apply industrial salt. But if the symptom persist disinfect pond with lime for 2 weeks. Formalin and malachite green can also be used.
White spots on the body Restlessness of fish by rubbing body on pond wall	66.4	5	*Ichtyophthirias* (white disease)	Drain pond then apply formalin., OTC Medication can also be used.
Bloated stomach Fish becomes restless, losses weight or become inactive	47.9	4	Tape worm	Drain pond and disinfect with salt. Apply antibiotics mixed in the feed.
Irregular white patches on head or body, scratching, stop feeding and may isolate themselves	33.5	4	*Trichodiniasis*	Salt treatment.
Yellow to dirty white spots on skin	40.6	5	*Epistylis* disease	Dip fish in salt solution

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Ichthyophthirius (white disease), which occurred five times, and *epistylis* disease (40.6%) were the most common parasite disorders reported by respondents (Table 3). On their farms, *trichodiniasis* (33.5%), fish lice (28.2%), anchor worms (50.7%), tape worms (47.9%), and *trichodiniasis* (33.5%) were less common, occurring only twice in the previous two years.

The parasite *Ichthyophthirius multifiliis* is the cause of *Ichthyophthirius*, also referred to as Ich, which causes white spots on the fish's skin that resemble salt sprinkles. Fish losses can be reduced and Ich can be controlled with early diagnosis and treatment. Farmers use a variety of techniques, including filling the pond with water, covering the fish with a little amount of it, and adding formalin or salt. Since not all phases of Ich's life cycle are impacted by therapies, oxytetracycline is also utilized in response to its resistance to treatment (Durborow et al., 1998). Farmers must make an early diagnosis because it takes several treatments to target specific Ich organisms at vulnerable phases.

Because the parasite burrows into the fish's skin, anchor worms, which are produced by *Lernea sp*., cause sores on the fish's body. The pond is lime-treated for one to two weeks after the diseased fish are taken and exterminated. Treatments for other parasite illnesses seen in agriculture include formalin, salt, parachute, and lime disinfection.

REFERENCES

Agnew, D. J., Pearce, J., Pramod, G., Peatman, T., Watson, R., Beddington, J. R. & Pitcher, T. J. (2009). Estimating the worldwide extent of illegal fishing. Retrieved from http://www.plosone.org/article/info:doi/10.1371/journal.pone.0004570. Accessed 31th March, 2015.

Béné, C. (2006). Small-scale fisheries: Assessing their contribution to rural livelihoods in developing countries. FAO Fisheries Circular. No. 1008. Rome: 46.

Bureau, D.P., Hua, K. & Cho, C.Y. (2006). Effect of feeding level on growth and nutrient deposition in rainbow trout (Oncorhynchus mykiss Walbaum) growing from 150 to 600g. Aquaculture Research, 37: 1090-1098.

Durborow, R. M., Andrew, J. M & Crosby, M. D. (1998). Ich (White Spot Disease). Publication of Southern Regional Aquaculture Center, No. 476.

FAO (2012). The state of World Fisheries and Aquaculture World Review of Fisheries and Aquaculture), Rome.

Food and Agriculture Organization (FAO), (2014). The State of World Fisheries and Aquaculture 2014. The growing role of fish in feeding the world http://www.fao.org/news/story/en/item/231522/icode/FAOHighlights:http://www.fao.org/3/a-i3807e.pdf. Accessed 17th March 2015.

Foster and Smith (2015). Aquarium fish health and diseases. Retrieved from http://m.liveaquaria.com/PIC/article.cfm?aid==80. Accessed 22nd October 2015

Pandey, G., Sharma, M., Shrivastav, A. B., and Sahni, Y. P. (2012). Overviews of the treatment and control of common fish diseases. International Research Journal of PharmacyVol. 3(7): 123-127.

Sadler J. O. and Andrew G. (2007). Disease Prevention on Fish Farms. Southern Regional Aquaculture Center – A Publication, No 4703, December 2007.

Sharma, M., Shrivastav, A. B., Sahni, Y. P.,and Pandey, G. (2012). Overviews of the treatment and control of common fish diseases – A review. International Journal of Pharmacy Vol.3(7) : 123-127.

Thilsted, S.H. (2012). Improved management, increased culture and consumption of small fish species can improve diets of the rural poor.In: Sustainable Diets and Biodiversity: Directions and Solutions for Policy, Research and Action. FAO, Rome : 176-181.

Thompson, B. & Subasinghe, R. (2011). Aquaculture's role in improving food and nutrition security. In B. Thompson & L. Amoroso, (Eds), Combating micronutrient deficiencies. FAO. Rome: 150-162.

White, P. (2013). Environmental consequences of poor feed quality and feed management. In M.R. Hasan and M.B. New, eds. On-farm feeding and feed management in aquaculture. FAO Fisheries and Aquaculture Technical Paper No. 583. Rome, FAO. : 553-564.