Fish Diseases-Parasite Questionnaire

## The role of respondents

The majority of respondents in this study were owners of the fish farmers that were visited for the research. As illustrated in [Table 1](#tbl-role) 72% of the respondents were owners of the establishments, 25% were managers while only one farm was owned by a community group. The owners ran their own farms while only a few contracted managers. The majority of the aquaculture farms were integrated with crop farming but a few were purely fish farms and they included Mwea fish farm, kiama fish.

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| Table 1: The Role of respondents in the fish farms   | **Characteristic** | **N = 36**1 | | --- | --- | | role |  | | Farm group | 1 (2.8%) | | Manager | 9 (25%) | | Owner | 26 (72%) | | 1n (%) | | |

## Experience in fish farming

The experience of respondents was determined through the number of years they practiced fish farming and as illustrated in [Table 2](#tbl-experience), experience averaged 6.7 years. However, there were farmers who had entered the space and others who had been in the field for 24 years.

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| Table 2: Respondents aquaculture experience   | **Characteristic** | **N = 36** | | --- | --- | | Experience |  | | Mean (SD) | 6.6 (6.3) | | Minimum | 1.0 | | Maximum | 24.0 | |

## Size of the fish farm

The study targeted both small scale and large scale fish farms depending on the total size of the ponds calculated also from the number of ponds. Majority of the respondents’ land size ranged between 100 and 500 square meters meaning that most were small scale farmers. The illustration of [Table 3](#tbl-farmsize) showed that only 25% had land sizes above 500 metres squared.

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| Table 3: Respondents aquaculture Aquaculture Farm Size   | **Characteristic** | **N = 36**1 | | --- | --- | | farm size |  | | >2000 | 5 (14%) | | 100-500 | 27 (75%) | | 500-1000 | 4 (11%) | | 1n (%) | | |

## Encounter with disease and parasites

[Table 4](#tbl-encdis) shows that 50% of the respondents had not encountered any diseases or parasites or most probably were not aware of any diseases and parasites while 36% had distinctly encountered parasites and diseases in their farms, however 11% were not sure. The results indicated a lack of knowledge of fish diseases and parasites.

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| Table 4: Encounter with disease and parasites   | **Characteristic** | **N = 36**1 | | --- | --- | | disease-parasite encounter |  | | Maybe | 4 (11%) | | No | 19 (53%) | | Yes | 13 (36%) | | 1n (%) | | |

## Observation of fish behavior

As illustrated by [Table 5](#tbl-observ), most of the respondents were highly observant of the behavior of the fish mainly during feeding.

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| Table 5: Fish observation   | **Characteristic** | **N = 36**1 | | --- | --- | | fish behaviour observation |  | | Not Observant at all | 2 (5.6%) | | Somewhat Observant | 2 (5.6%) | | Very Observant | 32 (89%) | | 1n (%) | | |

## Ability to identify abnormal fish behavior

According to [Table 6](#tbl-abnormal), a majority of respondents had the capability of identifying abnormal fish behavior. Some of the abnormal fish behaviors identifiable by the farmers are illustrated in [Table 7](#tbl-abnor).

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| Table 6: Recognition of abnormal fish behavior   | **Characteristic** | **N = 36**1 | | --- | --- | | fish abnormal behaviour identification |  | | No | 9 (25%) | | Yes | 27 (75%) | | 1n (%) | | |

## Abnormal fish behavior and characteristics

Among the most observed abnormal fish behaviors were lethargy, abnormal erratic swimming behaviors, unusual lumps and growth in the skin, change in coloration and lesions and sores presence on the skin. Fish isolation was only observed among ornamental fishes but not tilapia and catfish.

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| Table 7: Abnormal fish behaviors   | **Characteristic** | **N = 36**1 | | --- | --- | | Change in coloration | 13 (36%) | | Lesions or sores | 12 (33%) | | Abnormal swimming patterns | 20 (56%) | | Unusual lumps or growths | 10 (28%) | | Lethargy | 17 (47%) | | Isolation | 9 (25%) | | 1n (%) | | |

## Frequency of monitoring aquaculture water quality

The illustration in [Table 8](#tbl-wqual) shows that quality monitoring was done by the farmers at a higher frequency. However, the monitoring was not done using scientific gadgets and equipment but only through observation.

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| Table 8: Water Quality Monitoring Frequency   | **Characteristic** | **N = 36**1 | | --- | --- | | water quality monitoring |  | | 0 | 3 (8.3%) | | 1 | 7 (19%) | | 2 | 6 (17%) | | 3 | 9 (25%) | | 4 | 1 (2.8%) | | 5 | 10 (28%) | | 1n (%) | | |

## The frequency of fish mortalities

According to [Table 9](#tbl-fimortal), fish mortality were recorded at a lower rate in the fish farms.

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| Table 9: Mortality Frequency   | **Characteristic** | **N = 36**1 | | --- | --- | | fish mortality frequency |  | | 0 | 9 (25%) | | 1 | 6 (17%) | | 2 | 10 (28%) | | 3 | 5 (14%) | | 4 | 1 (2.8%) | | 6 | 2 (5.6%) | | 7 | 2 (5.6%) | | 8 | 1 (2.8%) | | 1n (%) | | |

## Presence of early warning signs of diseases and parasites

Disease outbreak signs were not identifiable to 44% of the respondents but 56% of the respondents indicated presence of early disease outbreak signs as illustrate in [Table 10](#tbl-doutbreak)

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| Table 10: Signs of Disease outbreak   | **Characteristic** | **N = 36**1 | | --- | --- | | early disease outrbreak warning |  | | No | 16 (44%) | | Yes | 20 (56%) | | 1n (%) | | |

## The early signs of diseases and parasites

Fish mortality and erratic swimming were seen as early signs of disease outbreak. Failure to normal feeding was as well observed as early sign. Then onset of cold diseases also mean outbreak of diseases for some farmers. [Table 11](#tbl-edoutbreak) breaks down the early signs of diseases outbreaks.

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| Table 11: Early Signs of Disease outbreak   | **Characteristic** | **N = 36**1 | | --- | --- | | early warnings |  | | Cold season | 3 (15%) | | Erratic swimming | 5 (25%) | | Fin rot | 2 (10%) | | Gasping for air | 1 (5.0%) | | Gill rot | 1 (5.0%) | | Mortalities | 5 (25%) | | Not feeding well | 3 (15%) | | Unknown | 16 | | 1n (%) | | |

## Disease and pest management

Majority of the respondents isolated the sick fish as a form of management in case of a disease outbreak while recording and reporting. They reviewed and adjusted their feeding practices while only a few consulted veterinarians as a few treated with medication as [Table 12](#tbl-dmanage) shows.

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| Table 12: Management of Disease outbreaks   | **Characteristic** | **N = 36**1 | | --- | --- | | Isolate the infected fish | 25 (69%) | | Consult veterinarian | 10 (28%) | | Treat with medication | 8 (22%) | | Review and adjust feeding practices | 15 (42%) | | Record and report | 27 (75%) | | 1n (%) | | |

## Methods of treatment

The respondents majorly used industrial salts, lime, amoxyl and table salt including aloe Vera to treat their sick fish while only a few used copper II sulfate and Potassium permanganate as [Table 13](#tbl-treatment) illustrates.

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| Table 13: Disease and Parasite treatment   | **Characteristic** | **N = 36**1 | | --- | --- | | Formalin | 1 (2.9%) | | Potassium permanganate | 7 (19%) | | Copper II sulphate | 2 (5.6%) | | Industrial salt | 4 (100%) | | Aloe vera | 1 (100%) | | Lime | 2 (100%) | | Amoxyl | 2 (100%) | | Table salt | 5 (100%) | | 1n (%) | | |

## Possession of fish diseases and parasites knowledge

Fish parasites and disease knowledge is very scarce among fish farmers. However, according to [Table 15](#tbl-training), 64% of the respondents had been trained on fish diseases through workshops online sources and experts according to [Table 16](#tbl-trainingsource).

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| Table 14: Disease and Parasite Knowledge   | **Characteristic** | **N = 36**1 | | --- | --- | | disease-parasite knowledge |  | | 0 | 13 (36%) | | 1 | 4 (11%) | | 2 | 6 (17%) | | 3 | 7 (19%) | | 4 | 5 (14%) | | 5 | 1 (2.8%) | | 1n (%) | | |

## fish health-disease formal training

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| Table 15: Disease and Parasite Knowledge Training   | **Characteristic** | **N = 36**1 | | --- | --- | | fish health-disease formal training |  | | No | 13 (36%) | | Yes | 23 (64%) | | 1n (%) | | |

## Sources of information on fish diseases and parasites

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| Table 16: Disease and Parasite Knowledge Training Source   | **Characteristic** | **N = 36**1 | | --- | --- | | Workshops | 20 (56%) | | Online resources | 12 (33%) | | Experts | 24 (67%) | | School courses | 2 (100%) | | Discussions with other farmers | 3 (100%) | | 1n (%) | | |

## Management challenges associated with fish diseases and parasites

Predators and lack of medication top the list of challenges faced by fish farmers as illustrated in [Table 17](#tbl-challenge).

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| Table 17: Disease and Parasite Management Challenges   | **Characteristic** | **N = 36**1 | | --- | --- | | Disease identification | 27 (75%) | | Limited veterinary access | 8 (22%) | | Financial constraints | 13 (36%) | | Inadequate training | 16 (44%) | | Lack of monitoring tools | 12 (33%) | | Climate-related challenges | 7 (19%) | | Lack of access to latest research in fish health | 10 (28%) | | Predators | 6 (100%) | | No medication | 2 (100%) | | 1n (%) | | |

## Interest in fish health management training and the topics of interest

Majority of the respondents would like to trained on disease identification and diagnosis.

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| Table 18: Training prospects   | **Characteristic** | **N = 36**1 | | --- | --- | | Disease identification and diagnosis | 34 (94%) | | Water quality management | 28 (78%) | | Nutrition and feeding practices | 20 (56%) | | Monitoring and early detection | 25 (69%) | | 1n (%) | | |