

**APICULTURE AND AQUACULTURE WEEK 11: FISH
HEALTH MANAGEMENT AND NUTRITION**

BY

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Examining feeding habits of fish through Analysis of food/stomach contents:

- **Analysis of feed/stomach contents in fish can be done using the following methods:**

1. Numerical method
2. Frequency of occurrence method
3. Volumetric method
4. Gravimetric method
5. Point method
6. Dominance method

Methods of Analyzing feed/stomach contents in fish

- 1. Numerical Method:** This method involves counting the number of each food item present in the stomach of a fish and summing up this number to obtain the grand total number of all food items found in its stomach (Michael et al., 2024). The number of each food item is then expressed as a percentage of the grand total number of all food items. Percentage number of a food item = $\frac{\text{Total number of the particular food item}}{\text{Total number of all food items}} \times 100$.
 - This method expresses the numerical importance of different food items. It gives the relative importance of each food items. A major demerit with this method is that, often, it overemphasizes the importance of small-sized organisms since such organisms occurring in large numbers may not necessarily constitute the most important food items.

Methods of Analyzing feed/stomach contents in fish

2. Frequency of Occurrence Method: This involves counting the number of times a particular food item occurs in the stomach and expressing this as a percentage of the total number of stomachs with food (empty stomach excluded).

- Percentage occurrence of a food item = $\frac{\text{Total number of stomachs with the particular food item}}{\text{Total number of stomachs with food}} \times 100$
- This method presents the food spectrum of the species. Hence, the importance of the food items relative to the population of the species could probably be guessed. This method is, however, biased due to accumulation of digestion-resistant materials. This makes the apparent frequency with which they occur seemingly more than the actual frequency. Besides, it does not show the number of the different food items.

Methods of Analyzing feed/stomach contents in fish

3. Volumetric Method: This method involves measurement of the quantity of food. In this case, the volumes of the different food items are measured by water displacement, using graduated cylinder or convenient apparatus. The volume of each food item is then expressed as a percentage of the total volumes of all the food items in the stomach as follows:

- Percentage volume of a food item = $\frac{\text{Volume of the particular food item} \times 100}{\text{Total volume of all food items}}$
- This method shows the bulk of the different food items. Thus, it removes the wrong impression created by less important but numerically abundant food items. In this method, however, large voluminous food items tend to overshadow small-sized food items and their importance may be over-emphasized

Methods of Analyzing feed/stomach contents in fish

4. Gravimetric Method: This method is similar to volumetric method, but, the weights of food items are measured instead of volume. It is expressed as:

- Percentage weight of a food item = $\frac{\text{Weight of the particular food item} \times 100}{\text{Total weight of all food items}}$
- This method has the same merits and demerits as those for the volumetric method

Methods of Analyzing feed/stomach contents in fish

5. Point Method: This method involves scoring points to different food items depending on their numbers and sizes; one large organisms being equivalent to many small organisms. All the points accumulated by each food items are summed-up and expressed as a percentage of the total number of points accumulated by all the food items as follows:

- Percentage point of a food item = $\frac{\text{Number of points of the particular food item} \times 100}{\text{Total number of points of all food items}}$
- This method has been described as an approximate volumetric method. It is useful for on-the-spot analysis of food items especially in the field. It is a fast and easy method. This method is, however, subjective thereby introducing bias. Different workers may score different point to a particular food items; even an individual may be biased in allotting points.

Methods of Analyzing feed/stomach contents in fish

- **Dominance Method:** This method involves counting the number of stomachs in which each food item occurs as the dominant food.
- Percentage dominance of a food item = $\frac{\text{Number of stomachs that the particular food item is dominant} \times 100}{\text{Total number of stomachs with food}}$
- The merits and demerits of this method are similar to those of frequency of occurrence method. In summary, no matter the method applied, usually when large numbers of samples are examined, the results using different methods come out similar. However, it is advisable to apply a combination of at least two, but preferably three methods for accuracy, putting emphasis on number, occurrence and bulk of food.

Factor Influencing Food and Feeding Habits of Fishes:

1. Size of the fish: Different sizes of some fishes have different food habits. This could be as a result of competition or preference. For example, the fry of *Heterotis niloticus* are planktophagous while their adults are omnivorous. Most juveniles tilapias are omnivorous, while their adults are herbivorous/detritus feeders. Fingerlings of mud catfish, *Heterobranchus bidorsalis* are plankton feeders and they switch to a predatory feeding mainly on fish and prawn as they grow into adults.

2. Sex of the fish: Food habits also vary with sex. Spawning female fish may change depth or location in water. This affects the food available to the fish. Some females even go without food during spawning.

Factor Influencing Food and Feeding Habits of Fishes:

3. Season: Seasonal distribution and abundance of preys and plankton also control the rate at which they are consumed as food. It is generally known that fishes make use of the most available items depending on season.

4. Temperature: Temperature regulates the spatial distribution of most of various fish species as well as most food items. This affects the food habits of the fishes. Fishes generally eat more and digest food faster at higher water temperatures. However, each species has its own suitable temperature range.

Factor Influencing Food and Feeding Habits of Fishes:

5. Habitats/Locality: Food habits of fishes differ with habitats and locality. The occurrence and abundance of different food items in different habitats affects the food habits of fishes therein. For instance, the major fish preys of African pike in Lekki lagoon, Lagos, Upper Ogun River and Ado-Ekiti Reservoir, are tilapias and cyprinids (*Barbus*) while in River Sokoto and Epe Lagoon, Lagos, the major preys are sardines (*Pellonula*).

6. Competition: Food habits of fishes could also be influenced by competitor species. Food habits may change to avoid or minimize competition, and this diversification makes for a fair sharing of the available food items. Overlaps in feeding habits of some species in the same habitat is an attempt to reduce competition for food.

Factor Influencing Food and Feeding Habits of Fishes:

7. Preference/Selectivity: Preference for a particular food over the other (i.e. selectivity) also influences food habits. Although, different food items occur abundantly at a particular time, some fishes show preference in their selection of particular food items. For instance, tilapias actively select phytoplankton as food, while zooplanktons are passively selected.

8. Time of Day: The food of fish could differ with time of day; this is mainly linked to the time the food is available and when fish is feeding. Feeding could be in the day or at night. For many species, peak period of feeding corresponds to peak period of availability of their food. Peak period of feeding of the tilapias, *Oreochromis* and *Sarotherodon* inhabiting Awba Reservoir in Ibadan, is from 1300-1500hrs. This is likely due to high primary productivity during this period; hence increase in abundance of phytoplankton, a major food of these species.

Factor Influencing Food and Feeding Habits of Fishes:

9. Shape and Nature of the Feeding Apparatus/Gut of the fish: The shape of the mouth, teeth, stomach and intestines influence the food and feeding habits of the fishes to a large extent. For example, predatory fishes e.g. Nile perch (*Lates niloticus*), African pike (*Hepsetus odote*) and barracuda (*Spyraena*) have large protrusible mouth armed with powerful teeth to capture or seize large prey such as fish which form the bulk of their food. Their stomachs are larger and their intestines short. Herbivorous and phytophagous fishes, such as tilapias lack powerful teeth. Their teeth are small and they are arranged in many rows on the upper and lower pharyngeal bones, to form grinding surfaces used to crush the hard wall of their plant food.

Conclusion:

- Different fishes have evolved feeding structure and mechanisms that allow them to exploit a vast array of plant and animal food sources, ranging from the indiscriminate filtering of a large ram-feeding planktivore to the precision biting of a manipulating carnivore.

FISH HEALTH MANAGEMENT.

Signs of good health in fish:

- **Active Swimming:** Healthy fish are generally active and swim in a normal pattern without signs of lethargy.
- **Clear Eyes:** The eyes of healthy fish are clear, bright, and free of cloudiness or swelling.
- **Appetite:** Fish in good health show a strong appetite and eagerly come to feed during feeding times.

Signs of good health in fish continue

- **Smooth and Intact Scales:** Healthy fish have smooth, shiny scales without lesions, peeling, or roughness.
- **Bright Colors:** The colors of a healthy fish are vibrant and natural, which is often a sign of good nutrition and well-being.
- **Normal Breathing:** Healthy fish breathe steadily, with gill movement that is neither too rapid nor too slow.

Signs of good health in fish continue

- **Proper Buoyancy:** Fish should maintain a normal, steady position in the water without struggling to stay upright or balance.
- **Clear Gills:** Gills should appear red or pink and free of mucus or parasites, indicating good respiratory health.
- **No Visible Parasites:** Healthy fish are free from visible parasites like lice or spots on their bodies or fins.

Signs of good health in fish continue

- **Responsive to Stimuli:** A healthy fish responds to environmental changes, such as movements near the tank, without showing signs of stress or erratic behavior.
- **Strong Fins:** The fins of a healthy fish are intact, fully spread, and free of tears, fraying, or other damage.
- **Clean Waste Production:** Fish in good health produce waste regularly and it should not trail behind them for extended periods, indicating healthy digestion.

Prevention of fish diseases

Prevention of diseases is achieved through:

- Good water quality management.
- Maintaining stocking rates at optimum.
- Use of disease free seeds during stocking.
- Good feeding.
- Putting up good sanitary measures.

SIGNS OF ILL-HEALTH IN FISH

- **Reduced Appetite:** Fish may refuse to eat or show minimal interest in food, a typical early sign of illness.
- **Sluggish Movement:** Fish swim slowly, appearing lethargic and less responsive to their environment.
- **Unusual Swimming Posture:** Fish may tilt sideways, swim upside down, or exhibit a loss of balance.

SIGNS OF ILL-HEALTH IN FISH

- **Rubbing or Scratching:** Fish may rub against tank surfaces or objects, which can indicate parasites or skin irritation.
- **Physical Lesions:** Symptoms like hemorrhages, ulcers, bulging eyes, or bloated bellies suggest severe bacterial or viral infections.
- **Fin Damage:** Torn, ragged, or clamped fins can indicate infection, fin rot, or poor water conditions.

SIGNS OF ILL-HEALTH IN FISH

- **Surface Gulping:** Fish frequently rise to the water's surface, gasping for air, often due to low oxygen levels or gill problems.
- **Gill Discoloration or Damage:** Gills may appear pale, swollen, or discolored, indicating possible infection or poor water quality.
- **Increased Mortality:** The sudden presence of dead or dying fish may signal a contagious disease or toxic water conditions.

SIGNS OF ILL-HEALTH IN FISH

- **Abnormal Coloration:** Fish may lose color, appear paler, or develop dark spots as a response to stress or illness.
- **Rapid Breathing:** Labored breathing, often with gill flaring, suggests oxygen deficiency or gill disease.
- **Isolation:** Fish isolating from others or hiding excessively can be a stress response or symptom of illness.

Common fish diseases on fish farms in Uganda

- 1. Aeromonas Infection** (Motile Aeromonas Septicemia): A bacterial disease causing ulcers, fin rot, and hemorrhaging, often linked to poor water quality.
- 2. Columnaris Disease** (Flavobacterium columnare): Also known as "cotton wool disease," it appears as white or gray patches on the skin, fins, and gills and is worsened by high water temperatures (Walakira et al., 2014).
- 3. Ichthyophthirius Multifiliis** (Ich or White Spot Disease): A parasitic infection causing white cysts on fish skin and gills, leading to scratching, lethargy, and respiratory stress.
- 4. Gill Flukes** (Dactylogyrus and Gyrodactylus): Parasitic flatworms that attach to gills, causing irritation, breathing difficulties, and increased mucus production.
- 5. Saprolegniasis** (Water Mold or Fungus): A fungal infection, usually secondary to wounds or stress, resulting in white, cotton-like growths on fish skin and fins.

How can fish diseases be controlled on fish farms in Uganda?

- **Water Quality Management:** Regularly monitor and maintain optimal water conditions (pH, temperature, and oxygen levels) to reduce fish stress and prevent disease.
- **Quarantine New Stock:** Isolate new fish before introducing them to the main stock to prevent potential disease transmission.
- **Regular Pond Cleaning:** Periodically remove sludge, uneaten feed, and waste from ponds to reduce bacterial and fungal growth.

Control of fish diseases on fish farms in Uganda continues

- **Use of Quality Feed:** Provide balanced, high-quality feed to boost fish immunity and prevent malnutrition-related diseases.
- **Avoid Overcrowding:** Maintain proper stocking density to reduce stress, aggression, and disease spread among fish.
- **Biosecurity Measures:** Implement measures like footbaths, restricted access, and disinfection to prevent disease introduction.

Control of fish diseases on fish farms in Uganda continues

- **Vaccination:** Use vaccines for specific diseases like *Aeromonas* or *Streptococcus* where available to improve disease resistance.
- **Regular Health Monitoring:** Observe fish regularly for any early signs of illness, allowing timely intervention.
- **Isolation of Sick Fish:** Remove and quarantine infected fish to prevent the spread of disease to healthy stock.

Control of fish diseases on fish farms in Uganda continues

- **Proper Handling Techniques:** Handle fish gently to prevent injuries that can become entry points for infections.
- **Prevent Overfeeding:** Avoid excess feeding to reduce uneaten food, which decomposes and promotes harmful bacteria.
- **Use of Probiotics and Immune Boosters:** Add probiotics and supplements to feed or water to enhance fish immunity and suppress harmful pathogens.

common fish predators that affect fish farming in Uganda:

- 1. These birds prey on fish (e.g., Kingfishers, Herons, and Cormorants):** fish in ponds, especially in open aquaculture systems, and can cause significant losses.
- 2. Otters:** Known for their skill in catching fish, otters can enter ponds and consume large quantities, leading to stock depletion.
- 3. Snakes:** Various snake species, especially water snakes, invade ponds to prey on fish, particularly fingerlings and smaller fish.

common fish predators that affect fish farming in Uganda continue

4. Frogs: Frogs lay eggs in ponds, and tadpoles can compete with fish for food; adult frogs may prey on fish eggs and larvae.

5. Monitor Lizards: These reptiles can enter fish ponds and feed on fish, often consuming juveniles and fingerlings.

6. Mongoose: Though primarily terrestrial, mongoose may hunt around fish ponds, particularly when fish are near the surface or close to the pond's edge.

common fish predators that affect fish farming in Uganda continue

7. Insects (e.g., Water Beetles and Dragonfly Larvae): These insects and their larvae can harm young fish by preying on eggs and small fry.

8. Cats: Domestic and feral cats may hunt around fish ponds, capturing smaller fish at the pond's edge or during low water levels.

9. Rats: Rats are opportunistic feeders and can disturb ponds by eating fish feed, eggs, and occasionally fish themselves.

10. Humans (Poachers): Unauthorized harvesting by poachers can cause significant losses, especially at night, reducing stock and affecting farm yields.

Practical methods of controlling predators on fish farms in Uganda

- **NOTE:** Controlling fish predators in Uganda's aquaculture systems requires a combination of practical and environmentally friendly strategies. Here are ten methods, along with examples for each predator:

1. Netting and Fencing: Example: Use fine nets or mesh to cover ponds, preventing birds, particularly herons and kingfishers, from accessing the fish. Additionally, erecting a fence around the pond can deter otters, monitor lizards, and mongoose.

2. Decoys and Scare Devices: Example: Positioning scarecrows or owl decoys around ponds can deter birds like cormorants and herons. Sound deterrents, such as wind chimes or recorded bird calls, can also discourage these predators.

Practical methods of controlling predators on fish farms in Uganda

3. Habitat Management: Example: Keeping the pond's edges clear of vegetation can reduce hiding spots for snakes and monitor lizards, making it less attractive for them. This measure can also facilitate easier monitoring of the pond.

4. Adding Complementary Species: Example: Introducing species such as tilapia, which can provide a food source for some predators (e.g., frogs) while being more resilient to competition. This approach helps to balance the ecosystem without over-relying on any single species.

5. Fish Stocking Practices: Example: Deep-water fish species, such as catfish, can be stocked in the pond as they can avoid predation by staying submerged, whereas shallower species can be bred in deeper sections of the pond during critical stages.

Practical methods of controlling predators on fish farms in Uganda

6. Biological Control: Example: Introducing specific species of fish that feed on frog larvae and insect larvae, like Gambusia (mosquitofish), can help control populations of frogs and harmful insects without introducing chemicals.

7. Creating Structured Habitats: Example: Installing underwater structures, such as bricks or concrete blocks, can provide refuge for fish while making it more challenging for predators like otters and snakes to hunt efficiently.

8. Regular Monitoring and Maintenance: Example: Conducting regular checks for the presence of specific predators allows farmers to calculate the extent of the threat and take immediate action, such as trapping snakes or removing diseased frogs.

Practical methods of controlling predators on fish farms in Uganda

9. Preventive Feeding: Example: Feeding fish at specific times and locations discourages natural predators like cats and rats. By training fish to associate feeding with noise or other signals, farmers can attract fish to safer areas away from the pond edges.

10. Community-Based Management and Education: Example: Organizing local workshops to educate fish farmers about sustainable fishing practices, the importance of biodiversity, and collective strategies for deterring poaching. Engaging the community in protecting local fish populations can lead to more sustainable management.

References:

Michael, K. G., Ahmed, F., Jidauna, S. B., and Ahmed, Y. M. (2024) Food and Feeding Habits of *Citharinus citharus* from Upper River Benue Yola, Adamawa State, British Journal of Multidisciplinary and Advanced Studies: Agriculture 5(4):1-9.

<https://doi.org/10.37745/bjmas.2022.04121>

Walakira, J., Akoll, P., Engole, M., Serwadda, M., Nkamba, M., Namulawa, V., Kityo, G., Musimbi, F., Abaho, I., Kasigwa, H., Mbabazi, D., Kahwa, D., Naigaga, I., Birungi, D., Rutaisire, J. and Majalija, S. (2014). Common fish diseases and parasites affecting wild and farmed tilapia and catfish in Central and Western Uganda. Uganda Journal of Agricultural Sciences 15(2):113-125.

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THANK YOU

WE WILL MEET NEXT WEEK 12