

An aerial photograph of a fishing boat in the middle of a large-scale fishing operation. The boat is positioned at the center of a massive, circular fishing net that has been cast into the dark blue ocean. The net's mesh is visible as a lighter blue-green pattern radiating from the boat. The overall scene is captured from a high angle, looking down at the water.

# Fish Field Sampling Methods

**RESEARCHER:** Julius Nguku

**TOPIC:** Fish Field Sampling Methods

**THEME:** Fish

**DEPARTMENT:** Ichthyology



*Researcher removing specimens from formalin in the laboratory.  
Source: NMK - Ichthyology*

## **Lesson Objectives**

1. Highlight the methods of fish field sampling and collection.
2. Describe the process for storage of field samples.

## **Learning resources**

1. Text
2. Video
3. Photo

## Introduction

Fish field sampling is the collection of fish from different aquatic systems such as oceans, lakes, rivers and swamps using various fishing gears. Sampling is done for various reasons for example, taxonomy, study, research, educational purposes, making a museum reference collection and sport fishing.

Fish sampling is mainly done by Ichthyologists, students, sport fishers and fishermen.



*Photo of researchers in the field  
Source: NMK - Ichthyology*

## Fish field sampling and collection tools

When planning for an ichthyological or fish field expedition, researchers need to prepare and carry several tools for sampling of fish. These tools include:

- Fishing gears (nets, traps, electro-fisher etc.)
- Formalin (10%)
- Ethanol
- Barrels
- Plastic bags and elastics in different sizes
- Formalin resistant paper and pencil
- Tags and applicator (Pistol)
- Camera
- Detailed maps
- GPS
- Log book (to document the locality: village, road, river basin, river, affluent)
- Dissection kit (scalpel, scissors)
- Necessary documents/permits (local legislation)

- Boat
- Water testing gadgets

Most fishing communities have their own traditional fishing gears suited to the hydrographic systems they inhabit. Some of these gears include: traps, spears, hooks and lines which scientists also make use of during their expeditions.



*Dissection kit*  
Source: NMK - Ichthyology



## **Fish field sampling techniques**

Several collection methods are employed in order to maximise sampling efforts. Some of these methods include:

- Gill netting
- Seine netting
- Cast/throw netting
- Fyke/hoop netting
- Trawling
- Angling
- Backpack electrofishing or Electroshocker
- Baited lines or hook and line
- Traditional fishing techniques (Harpooning, Spearing, Trapping and Fencing)

## 1. Gill Netting

Gill netting is a sampling technique whereby a gill net is used. A gill net is a mesh of synthetic fabric, mostly nylon, set in a straight line which is fixed vertically on the water column. The bottom of the mesh is attached to a lead line while the top is a float line.

Gill nets capture fish by entanglement. A battery of different mesh sizes are available ranging from 10 metres to 50 metres. An example size of a net is 30 metres in length and 1.5 metres in depth. The net to be used depends on the size of the fish targeted.

Gill netting technique requires two trips to the water. One trip is to deploy the net at night or in the morning and the other trip to haul the fish caught.

The advantage of using gill netting is that the net captures large fish specimens, and does not interfere with the juveniles. Juveniles are fish that are not yet sexually mature. The disadvantages of this technique include:

- i. The nets can be destroyed when used in areas with hippos and crocodiles.
- ii. The nets cannot be used in large rivers as they can be hit by branches or may not resist the pressure of the water, especially when leaves or algae are trapped in the nets.
- iii. Gill nets usually damage the fish, reducing the quality of the collected specimens and photographs as the specimens are usually dead.



*Gill netting placed on the seabed.  
Source: NMK - Ichthyology*

## 2. Seine or Purse Fishing

Seine or purse fishing is a fishing method that uses a net that hangs vertically in the water column, similar to a gill net. A seine fishing net can also be described as a flat net with floaters on top and weights at the bottom, whose ends are then tied to two boats or pulled by two individuals from each end. The bottom or lead line has lead weights strung onto it to weigh the net down while the top or float line consists of cork or plastic floats to keep the top of the seine afloat.

In contrast to a gill net, seines are actively dragged in a semi-circle. One boat pulls the net as it moves towards the other and traps the fish in the net. Alternatively, two persons can pull the net depending on the net's size and depth of the water. This method is used in shallow fishing grounds and deployed from the shore as a beach seine or from a boat.

The advantage of using seine or purse fishing is the net collects good specimens which produce good photographs. However, this method is non-selective; all specimen sizes are collected including juveniles.



*Photo of seine fishing using a boat  
Source: NMK - Ichthyology*

### 3. Cast or Throw Net Fishing

In cast or throw net fishing, a throw net is thrown by hand to spread out on the water and sink. A cast or throw net is a circular net with small weights distributed around its edge. Casting is best done in waters free of obstructions such as reeds or branches.

Advantages of using cast or throw net fishing include:

- i. It works best in water not deeper than the radius of the net.
- ii. It is a fast method for obtaining good specimens.
- iii. It is selective, as no juveniles are caught.

The disadvantage of using cast or throw net fishing is that reeds cause tangles and branches can rip nets.



*Sampling using a cast net in the sea  
Source: NMK - Ichthyology*



#### 4. Fyke or Hoop Net Fishing

The fyke or hoop net mechanism allows fish to enter voluntarily into the hoop net, but are hampered from coming out. Fyke or hoop nets consist of cylindrical or cone-shaped netting bags mounted on rings or other materials that cannot bend or break easily making rigid structures. The hoop nets have leaders which guide the fish towards the entrance of the bags while fixed to the floor of the water body with anchors, ballast or stakes. They are usually set in contact to the bottom of the water body.

Advantages of using fyke or hoop net fishing:

- It allows researchers to make visits to the traps every day, collecting the captures and leaving the gears set for several days.
- It is a fast method of obtaining good specimens.
- It's a good method to obtain live specimens for either study or aquariums.

The disadvantages of using this method is that it is non-selective and may result in some by-catch of undersized, juvenile or other aquatic organisms. It is also not applicable in deep parts of the water or in high water currents.



*Fyke or hoop net*  
Source: NMK - Ichthyology

## 5. Trawling

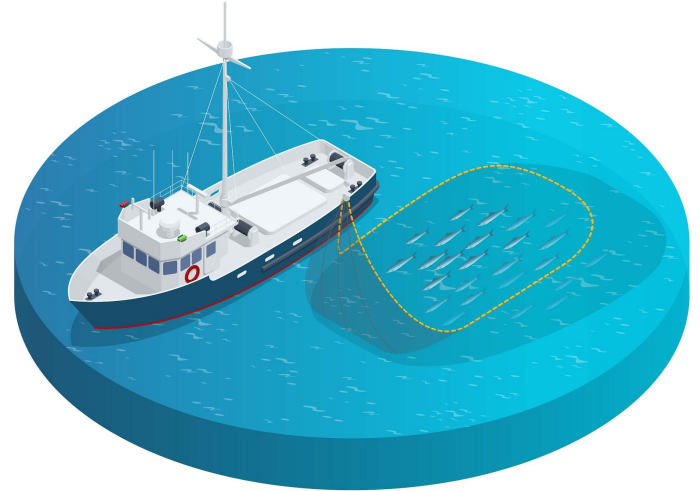
In trawling, a boat pulls a bag or a cone-shaped net in the water body. Fish get into the net and are trapped as the boat pulls. This method is mostly used in deep fishing grounds such as oceans, seas and lakes.

Advantages of using trawling method:

- Quality specimens are collected.
- It is good for collecting large fish required for Museum Exhibitions.

Disadvantages of using trawling method:

- It is non-selective as it traps all marine specimens including juveniles.
- It is very expensive to carry out.



*An illustration of sea trawling  
Source: NMK - Ichthyology*

## 6. Backpack Electrofishing/Electroshocker

In Backpack Electrofishing, also known as Electroshocker, an electrofisher is used to stun fishes or attract them to an electrode in the water, enabling them to be scooped up with a dip net. This technique is conducted in an upstream direction to maximise visibility and enhance collection efficiency as it allows stunned fish to drift downstream, thus facilitating their capture.

A backpack electrofisher consists of an electrofishing device mounted on backpack frames or carried in a normal backpack. The power source is a 24-volt deep cycle battery which a researcher needs to be careful when handling.

This method works well in wade-able freshwater and moderately in brackish water. Waters with poor mineral content are too weak in conductivity for electroshockers. Sea water is too conductive.



*An illustration of backpack electrofisher*  
Source: NMK - Ichthyology

Advantages of using backpack electrofishing:

- It produces good specimens for preservation and photos.
- It is effective for fishes which lie buried in mud or in crevices of stones.

Disadvantages of using backpack electrofishing:

- It is time consuming.
- It is heavy work considering the weight of the electrofisher.
- It is expensive, bearing in mind the cost of the labour and equipment.
- It needs electricity which is produced by the battery and can harm the researcher.
- It is non-selective; many specimens of various ages and species suffer from the electric shock.



## 8. Baited or Hooks and Line

The baited or hooks and line method involves a line and a single or multiple hooks that are baited. Fish are trapped by the hooks as they try to eat. The bait is set overnight or during the day at various depths in rivers. Long lining is applicable in open waters where a boat pulls the line with multiple hooks and bait.

Advantages of using hooks and line:

- This method is selective as it catches specific fish based on the bait.

Disadvantages of using hooks and line:

- It is time consuming, the lines need to be checked regularly as predators will damage or destroy any catch.



*An illustration of sea trawling  
Source: NMK - Ichthyology*

## 7. Rotenone or Chemical Fishing

This method uses Ichthyotoxin in a select area of the river (+/- 25-50-100m) in water that is not deep, about 25-50 cm. It is preferable that the water has good visibility to see the floating and/or sinking of affected specimens. A gill net with small mesh is placed in the section above the selected area of the river. At least two other gill nets are placed in various distances below the selected area of the river (50m – 100m). Researchers should use adequate doses to reduce the effects downstream.

Cyanide fishing is also a specific method of collecting live fish, mainly for use in aquariums, which involves spraying a sodium cyanide mixture into the desired fish's habitat in order to incapacitate the fish.

Chemical fishing is also widely used in aquaculture.

Advantages of using chemical fishing:

- It is a fast method of obtaining specimens.
- It produces quality photographs.
- It yields quality specimens, which are not damaged by gill nets.
- It can be used to collect specimens in rocky and rapid habitats.

Disadvantages of using chemical fishing:

- It is expensive.
- It is non-selective as various aquatic organisms can be affected.
- It has a general negative perception from the local community.
- It is not possible to sample within all habitats.

## Preparation of the Specimens

After the specimens have been collected using various methods the following processes are required:

1. Preservation and storage
2. Labelling
3. Catalogue and Database

### 1. Preservation and Storage

**Field preservation:** Immediately after capture, the specimens are fixed and preserved using formalin (10%) either by dipping them in a barrel with formalin or injecting formalin into the muscles before decay sets in.

This process is especially important in the tropics. Formalin should be handled with care as it is a noxious chemical which irritates the eyes and nose and is painful in skin cuts.



*Researcher removing specimens from formalin in the laboratory.  
Source: NMK – Ichthyology*

**Preservation at the Museum:** Here specimens are preserved whole without removing the guts or gills so that no key characters are lost. Specimens are washed in running water to remove all traces of formalin. They are then sorted, identified and permanently preserved and stored in 70% alcohol. Preservation in alcohol is preferred because formalin becomes acidic over time and can damage specimens.

All identified specimens are thereafter shelved in the collection room where the required alcohol levels are maintained with minimal exposure to light.



*Specimens stored together in a plastic bag inside a barrel*  
Source: NMK - Ichthyology



*Specimens preserved in alcohol*  
Source: NMK - Ichthyology



*Specimen being cleaned in running water*  
Source: NMK - Ichthyology



*Collections stored in shelves*  
Source: NMK - Ichthyology



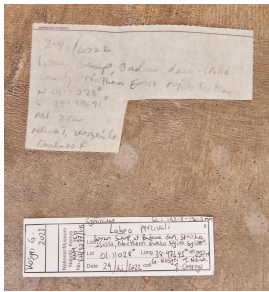
## 2. Labels and Data

**Label:** A label is a piece of paper, cloth, metal or other material affixed to a container or article which provides information concerning the specimen. The label is as important as the fish itself, as an interesting specimen is of little or no scientific value if there is no locality data.

Characteristics of label material for Ichthyological collections:

1. Paper labels should be made of strong, good quality paper for example, bond-quality paper or photographic paper. Ordinary paper or cardboard rapidly disintegrates in liquids.
2. Use Carbon ink or graphite pencil, as ballpoint pen or ordinary ink washes out quickly.

**Data:** These are groups of information that represent the qualitative or quantitative attributes of a variable or set of variables.



*Field and lab label (institutional label)*  
Source: NMK - Ichthyology



*Transferring labels*  
Source: NMK - Ichthyology



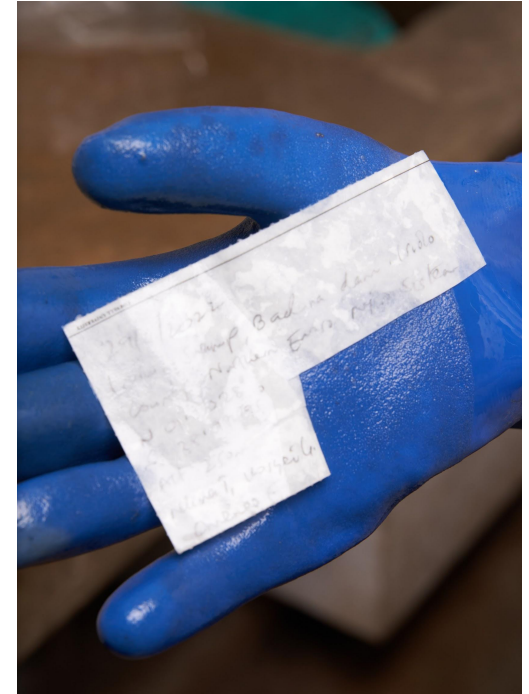
*Inserting labels to each collection batch*  
Source: NMK - Ichthyology

## Labelling in the field

The first labelling is done at the time of capture and includes details such as:

- Site and locality,
- Water bodies for example, lake, river, swamp, ocean or spring.
- Nearby town or village
- Geographical coordinates,
- Collector's name,
- Collection date,
- Collection method and gears used.
- Depth (from bottom to the surface),

Notebooks and field sheets are also used to include all the other data which cannot be put on a small label. Such data include: ecological data such as habitat information, season, harvesting condition and other details depending on the specific study. The extent of data collected will be determined by the study.



*Field label*  
Source: NMK - Ichthyology

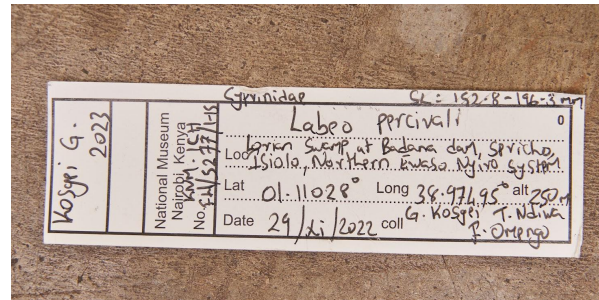
## Labelling in the laboratory

The second labelling is done in the laboratory after the specimens are identified. The second label is an Institutional Printed Paper with fields to fill. Information from the first field label is duplicated while more information is added such as:

- Scientific Name.
- Unit information (size).
- Specimen catalogue and accession number.
- Water body denoting Freshwater as FW and Marine water as MW.
- Number of Specimens (per label).
- Storage (the location for storing specimens within the National Museums of Kenya).



Rewriting on institutional label  
Source: NMK – Ichthyology



Institutional label  
Source: NMK – Ichthyology

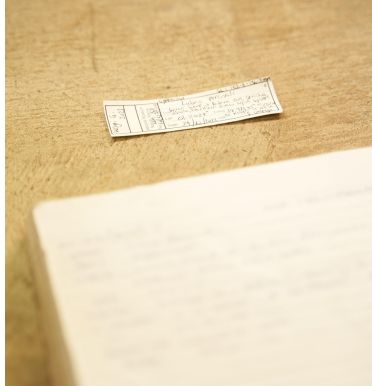


Place labels to be visible when on shelves  
Source: NMK – Ichthyology

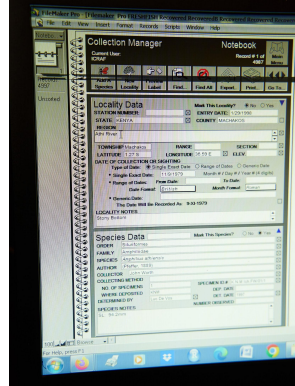
## Catalogue and Database

A catalogue is a register of all fish specimens. Data is created within a hand written catalogue book, and all the information from the institutional label is transferred to the catalogue book including the fish family name while referencing the author of the species. Specimens without labels or adequate data are not catalogued; instead they are stored as student collections to be used for learning purposes.

All the information from the catalogue book is then entered into a computer database using an appropriate programme. A database is important for future retrieval of information.



*Catalogue book*  
Source: NMK - Ichthyology



*Computer database page*  
Source: NMK - Ichthyology



*Researcher entering data into digital database*  
Source: NMK - Ichthyology