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Strategies and Guidelines for Sampling, Conserving and Identifying Different Fish Species

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SUMMARY

The field of taxonomy serves two essential roles: naming organisms and categorizing them based on their relationships. These classifications offer valuable insights into the shared characteristics and evolutionary relatedness of species. For example, species within the same genus are expected to exhibit many common behavioral, biochemical, ecological, and biological traits due to their close evolutionary connections. This shared ancestry also means that the impact of factors like pollution on one species in a specific location should be similar to its effect on a closely related species in a different region. Similarly, species within the same family, the next higher taxonomic category, share many but somewhat fewer characteristics. However, the dynamic nature of taxonomic classifications and scientific names, influenced by evolving ideas about species relationships and alterations in nomenclatural rules, presents challenges. Consequently, accurate identification of organisms is crucial for describing species at various taxonomic levels. If decisions regarding the preservation of species are to be made, an understanding of the relationships among species is essential to assess the unique evolutionary traits of each species.

INTRODUCTION

Taxonomy is the scientific discipline concerned with the systematic description and categorization of organisms. It holds crucial significance in both theoretical and applied biology. The term "taxonomy" is rooted in the Greek words "taxis," meaning arrangements, and "nomos," meaning law. Notably, in the field of taxonomy, every skilled taxonomist has never had the opportunity to examine.

Taxonomy and systematics serve two primary objectives:

Primarily of academic interest, it involves the study of the diversity of living organisms and their evolutionary relationships, known as phylogenetics of immediate practical importance; it encompasses activities such as inventories, surveys, the documentation of biodiversity, and the development of tools for species identification. The identification, cataloging, in-depth studies of fish biology, as well as the assessment and evaluation of their specific criteria, have become essential steps in the pursuit of fish conservation and the sustainable utilization of these resources. This chapter provides a comprehensive overview of the systematic approaches employed in classical fish taxonomy. Its primary goal is to facilitate the straightforward identification of freshwater fish species, making it a valuable resource for researchers and practitioners in the field of fisheries and aquatic conservation.

Sampling Fish for Identification
Specimen Collection:

Effective specimen collection requires a comprehensive understanding of the geographic characteristics of the surveyed area. This understanding encompasses various facets, including knowledge of the distribution of different types of vegetation, altitudes, seasonal variations, means of transportation, lodging arrangements, and more. However, it is crucial to prioritize the concept of basins over political boundaries when dealing with aquatic systems. This approach ensures a more accurate and relevant collection of specimens.

Methods of Collection:

Various methods can be employed to collect fish specimens throughout the year. These methods include the use of nets, traps, hooks and lines, electro-fishing equipment, manual hand-picking, and acquiring specimens from local fishermen and local markets.

Data Collection:

Collecting specimens should be accompanied by proper data collection. Specimens lacking associated data are of limited use to taxonomists. Therefore, each collected specimen must be labeled with the following essential information:

Geographical Location:

This should include details such as the country, state, village, drainage basin, and the name of the specific river or lake. A comprehensive understanding of the drainage concept is crucial for a fish taxonomist, as some fish species are endemic to particular basins and may not be found in others. It should have

Date of Collection: Date on which the specimen was collected
Name of the Collector: Name of the fisherman, scientist etc
Coordinates: To be noted using GPS
Colour: Colour of the specimen in fresh should be noted.

Method of Preservation
Fixation and Preservation:

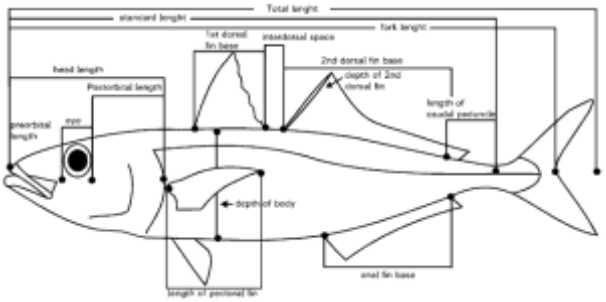
- Collect the specimens.
- First, fix the specimens in preservatives, such as 10% formalin or 70% ethanol. Use a large container to ensure the specimen maintains its original shape after fixation.
- Avoid using tight containers for fixation, as they can distort the shape of the specimen. Fishes may also be preserved in buffered 10% formalin.
- A general rule is not to have more than 40% of biomass per container of formalin during fixation.
- After fixation, place the specimens in glass-topped bottles or screw-capped jars with the snout pointing downwards.
- Fill the containers with freshly prepared preservative.

Tissue Sampling for Molecular Studies:

- Collect fresh tissue samples, such as muscle or fins, from certain specimens.
- Preserve these tissue samples in ethanol for molecular studies.

Morphometric and Meristic character:

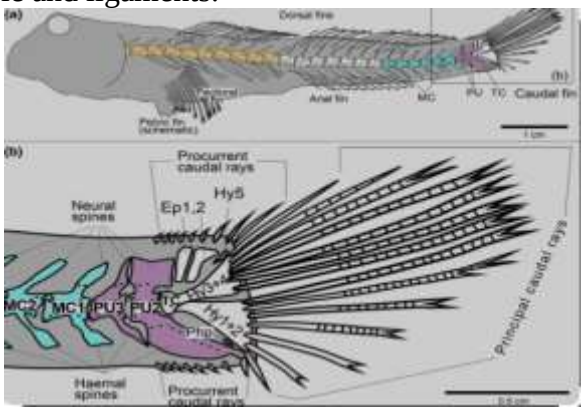
It involves the analysis of an organism's body proportions, while meristic characters pertain to the enumeration of specific features. Whenever feasible, measurements were taken by assessing specific points on the left side of the specimen. Body part proportions are represented as percentages of the standard body length, while head part proportions are expressed in terms of head length. The counts encompass various aspects, including fin rays (soft, hard, spinous, simple, and branched).



In cases where data on a specific species is absent, a specimen is compared based on characteristics such as lateral line features (longitudinal and transverse aspects), predorsal scales, scales around the circumference and near the tail fin, branchiostegal rays, gill rakers, pharyngeal teeth, vertebrae, and other relevant characteristics.

Oesteology:

Osteological information was obtained from specimens that had been cleared and stained with Alizarin. To disarticulate the bones without causing damage, fresh specimens were immersed in a 2% KOH solution, without the use of any preservatives. The specimens were left in the solution for a period of 5 to 7 days to allow the natural decomposition of muscle and ligaments.



Cataloguing of specimens:

When cataloging specimens, a typical format for entries includes the following information in a consecutive order: museum number, scientific name, locality, date, and collector. Specimens gathered from a single location or district during a single expedition are grouped and cataloged together.

Comparison with the Nearest Congeners:

To conduct a comparison with closely related species, the specimen being examined is first evaluated alongside its congeners. This initial comparison begins with species found within the same geographic basin and subsequently extends to those within the same genus. The standard practice involves utilizing the type specimen from the respective type locality for this comparative analysis.

Data sheet:

A data sheet is used to record various quantitative and qualitative characteristics in taxonomic studies. This information includes meristic counts (such as fin and scale counts), different body ratios, general body coloration, and other relevant details. Describing the specimen in this manner is a crucial step in taxonomic research.

Key:

Key is an invaluable tool for species identification. When a new species is being studied, taxonomists often refer to existing keys specific to the genus under investigation. By examining the characteristics of the new species and comparing them to the information in the key, scientists can determine whether the specimen aligns with any known species within that genus. If it does not match any existing species in the key, this can serve as strong evidence supporting the classification of the new specimen as a distinct and previously undescribed species.

Reporting:

A taxonomic description usually comprises primary references that serve as the basis for confirming the identification of the species, a record of the materials or specimens studied, a description that diagnoses the species based on its distinctive characteristics, and information about its geographic distribution.

Diagnosis:

A diagnosis is a concise set of distinctive characteristics that enables the easy differentiation of the species under consideration from other species, particularly those closely related within the same genus.

Systematic description:

A systematic description involves providing a detailed account of the species, focusing on its observable features. This description encompasses the characteristics of various body parts, including their shapes, positions, counts, and proportions.

CONCLUSION

The techniques and protocols for sampling, preserving, and identifying fish species are vital components of fisheries and ecological research. These methods ensure accurate data collection, species documentation, and contribute to our understanding of aquatic ecosystems. By employing these techniques, scientists can study fish populations, biodiversity, and conservation needs. Effective sampling, preservation, and identification protocols are essential for informed management and protection of aquatic environments, as well as for the advancement of our knowledge of fish species and their ecosystem

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