

INSTANT IDENTIFICATION
OF
INDIAN FRESHWATER FISH IN THE FIELD
THE GENESIS

- The experience gathered in past decades of teaching and even after retirement (*w.e.f.* 2010) had/has been quite painful to see the deteriorating potentials in the 'Classical Zoology' (or Botany) *i.e.*, the Taxonomy part (the Classification of Animals or Plants). Though many students have fascination of pursuing many modern branches of Biology (like Biotechnology, Microbiology, Biochemistry etc.), they are found lacking expertise in the Classification part of the Animal or Plant Kingdoms. It must be realized that all modern Biological sciences have the word BIOLOGY (= *bios*, life) either as a prefix or suffix. Therefore, without fundamentals of BIOLOGY, no other branch can be grasped in true spirit.
- Imparting education in modern advances (branches) must not be on the cost of cutting short (or ignoring) the 'Classical' part of the studies. Therefore, laying more emphasis on the 'fundamentals' is the urgent need of the hour.

TAXONOMY

It is widely acclaimed that **Taxonomy** is the root of **Biological Sciences** and no other branch of Biology can find firm basis without proper knowledge and records of **Taxonomy**.

Greek words **taxis** (= arrangement) and **nomos** (= law) form the word '**TAXONOMY**', first coined by **A.P. de Candolle** (1813), a Professor of Botany, **Montepeller University** (France). This word was used in his treatise on Botany as '*Taxonomie*', an analogue of *Astronomie*, *Economie*, *Agronomie* etc. In 1819 he spelled it as '*Taxeonomie*', but to the criticism of Greek scholars it was suggested it is to be spelled as '*Taxinomie*'.

Since '**TAXONOMY**' word was established in usage for a number of years, **Taxonomists** preferred to retain the word '**TAXONOMY**', defined variously:

- *“Taxonomy is the synthesis of all the facts about (organisms), into a concept and expression of the interrelationships of organisms”.* [Mason, 1950]
- *“Study of the principles and practices of classification, in particular the methods, the principles, and even in parts, the result of biological classification”.*
[Heslop-Harrison, 1953]
- *“Theoretical study of classification, including its bases, principles, procedures and rules”.* [Simpson, 1961]
- *“A way of arranging and interpreting information”.* [Davis and Heywood, 1963]
- *“Day –to-day practice of handling different kinds of organisms (including the activities like collection and identification of specimens, the publication of data, the study of literature and the analysis of variations shown by the specimens)”.*
[Blackwelder, 1967]

SYSTEMATICS AND TAXONOMY

- The word ‘Systematics’ stems from the Latinized Greek word ‘systema’ applied to the systems of classification developed by Linnaeus in the 4th edition of his historical book *Systema Naturae* (1735). Taxonomy is actually the study of the principles and practices of classification and as such it is only a part of systematics.
- Systematics is a scientific study dealing with kinds and diversity of organisms and any or all relationships among them. [Simpson, 1961]
- Systematics is science which includes both taxonomy and classification and all other aspects of dealing with kinds of organism and the data accumulated about them. [Blackwelder, 1967]
- Systematics includes two parts i.e., taxonomy and evolution. The former (Taxonomy) concerned with describing and naming various kinds of organisms existing today and those that have become extinct million years ago or are on the verge of extinction; whereas the latter (Evolution) concerned with understanding as to how all organisms

originated first and under what circumstances and processes, undergone changes in due course of time to evolve into other organisms.

LEVELS IN TAXONOMY

There are at least three levels while pursuing Taxonomy viz.,

- **Alpha (α) taxonomy**: the level at which the species is characterized and named.
- **Beta (β) taxonomy**: the level at which species are arranged into a natural system of lower to higher categories
- **Gamma (γ) taxonomy**: the level at which analysis is done about the intraspecific variations and evolutionary studies *i.e.*, study of speciation.

WHAT IS EXPECTED OF A STUDENT OF BIOLOGY?

- A student of **BIOLOGY** must be a skilled **TAXONOMIST** first *i.e.*, possessing the abilities to identify any living organism (plant or animal) he/she encounters in nature, surroundings, households etc. on the basis of its characteristic features of morphology, at least.
- After proper identification, naming and classification, study in any branch of **BIOLOGY** can be pursued in the right earnest.

A well trained naturalist !

Taxonomy requires as much wisdom and intelligence as any other field of biology. A '**Taxonomist**' is a well trained naturalist or a person who practices taxonomy. His/her prime task is to go to the field and supplement his/her studies with more and more information gathered from **field observations** (as well as from other branches like Cytology, Physiology, Molecular Biology, Biochemistry, Genetics, Ecology etc.).

In all types of **Zoological** (or Biological as a whole) researches, the availability of taxonomic specialists (**Taxonomists**) is a guarantee of correct **identification** and homogeneity of the samples collected. In contrast, a shortage of such specialists leads to serious consequences. If at any stage there are not enough **Taxonomists** available or proper openings are not given to adopt this profession, it is bound to contribute to the decline of **Taxonomy** to such an extent that there may remain no

Taxonomy specialists, resulting into difficulty of identification of any species with any degree of certainty.

A PREREQUISITE FOR ICHTHYOLOGY (FISH AND FISHERIES) STUDENTS

The **Alpha (α) taxonomy** is the starting point of any **Faunistic / Taxonomic** work *e.g.*, **ICHTHYOLOGY**, providing authentic guidelines for academia engaged in routine studies or researches.

All this begins with venturing into the field and procure specimens through various (animal specific) collection techniques.

Whenever a field trip is organized for the UG / PG students pursuing **'Fish and Fishery'** specialization at Bachelor in Fishery Science (B.F. Sc.) or at M.Sc. Zoology level or at Masters of Fishery Science (M.F. Sc.) level or any student is aspirant of carrying out research work on **Fish Taxonomy** or others aspect(s), he/she must be well-acquainted with the kind of fish wealth found in the streams or standing water of hilly areas (like that of Himalayas or Peninsular region) or the aquatic habitats in the plains (like Gangetic plain etc.).

Additionally, the **students hailing from coastal areas** also must develop expertise to identify at least most common fishes (may be cartilaginous or bony) caught by the local fishermen along the sea coasts (or in brackish waters) or know about the fishes being sold in the **market**.

Regular visit to local **fish market**(s) is also a good exercise to have a record of edible small or large-sized fishes.

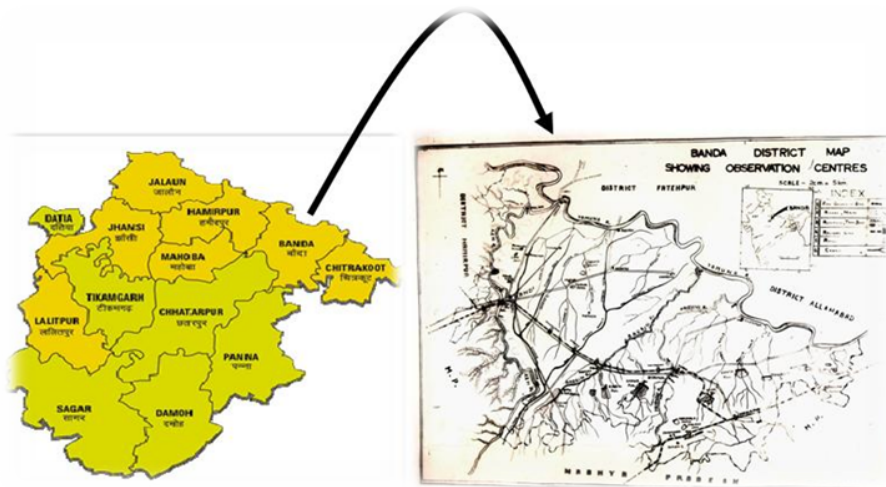
This all can only be possible after rigorous training and getting very sharp **'field tips' for identification under the able guidance of his/her teacher.**

FISH FASCINATION!!

THE BACKGROUND

The world over available data has alarmingly estimated that about 20% of **freshwater fish** has become extinct, endangered or vulnerable. This all has continuously inspired the biologists to let the world know about the current status of biotic diversity of a particular area and update the **check-lists**.

- An attempt made here is for the benefit of students and the like, based on studies on the **FISHES** of **Banda district** (UP) and **Doon Valley** (Dehradun district, Uttarakhand) in a span of more than 30 years.
- **Pt. Jawaharlal Nehru (PG) College, Banda** (Uttar Pradesh, India) was the stepping rung of my teaching career *w.e.f.* 1971 up to 2000. During 1975 - 1982 a good deal of time was invested in exploring **FISHES of Banda** district (UP) and it culminated in recording about 84 species from the streams of **Yamuna system viz., Ken, Baghain and Paisuni** (Mandakini Ganga at Chitrakoot). **Banda** is one of the 7 districts (**Jhansi, Lalitpur, Jalaun, Hamirpur, Mahoba, Chirakoot Dham Karwi and Banda**) of **Bundelkhand Region of Uttar Pradesh**. Since the area is free from any industrial waste, the aquatic habitats support a good crop of **FISH**. Interestingly, most of the places along the margins and particularly in river Paisuni (at Chitrakoot) remain heavily infested with weedy growth, serving as the hiding places for a good number of small-sized species.



Map of Buldelkhand Region (UP + MP); District Banda enlarged to show the drainage pattern



Fish Market Banda



Fishing at Baghain, Banda



Spreading Gill-net at Mandakini Ganga (Chitrakoot), Banda



Cast Net



Dragging action



Ram Ghat at Chitrakoot (Paisuni River)



**Mandakini Ganga
(Chitrakoot)**



**Mandakini Ganga
(Chitrakoot)**

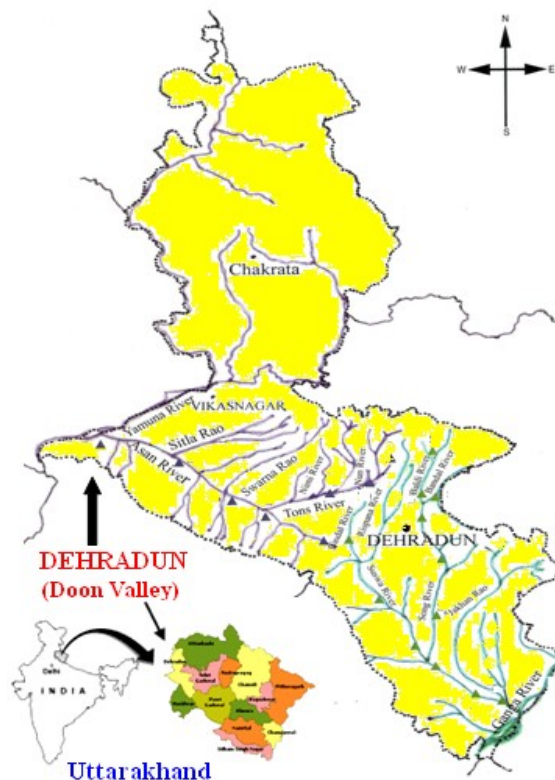


**The then Ken river
(Banda)**



**Confluence of Ken and
Yamuna at Chilla**

- The period between 2000 up to 2010 had been of another working place *i.e.*, **DBS (PG) College, Dehradun (Uttarakhand, India)**. 'A Comparative study of Biotic Diversity in the streams of Eastern and Western Doon with special reference to the Ichthyofaunal status' was accomplished (2007 – 2010) through a major Research Project sponsored by **UCOST** (Uttarakhand State Council of Science and Technology) and interesting results were obtained.
- **Doon Valley (Uttarakhand)**, part of district Dehradun comprises of 2 main river basins , namely , the **Ganga** river basin and the **Yamuna** river basin drained by five main rivers **Baldi, Song, Suswa, Tons** and **Asan**, besides other smaller rivers or streams.



Fish Fauna of Doon valley has suffered a lot in the past due to rapid urbanization and developmental activities in the hilly state. Frequent surveys to the aquatic habitats have revealed the impact of the same in terms of the fact that the quality and quantity of fish has gone down alarmingly. Simultaneously, the associated biota also tells the related story.

Some fishes of the **Himalayan ecosystem** (rated as **Hill Stream Fishes**) are distinctive in possessing special features for survival in **torrential environment**. A total 46 species from Song, 43 from Suswa, 30 from Tons and 35 from Asan were recorded.

- **More details may be gathered from:**

- https://www.researchgate.net/publication/322270225_Fish_fauna_of_Do...; scienceandnature.org > IJSN_Vol8(1)M2017 > IJSN-VOL8(1)17-18;
- www.mutagens.co.in/jgb > vol.06;
- www.indianforester.co.in/index.php/indianforester/article/view;
- Water quality assessment of Doon Valley streams using multivariate statistical analysis, D Rana, SK Gupta *Octa J Environ Res*, 4 (3), 264-276]



**A panoramic view of the Suswa River
River**



**A panoramic view of the Suswa
River**



A panoramic view of the Song River



A panoramic view of the Asan River

THE FOCUS !!!

FISH IDENTIFICATION IN THE FIELD

- The working experience (specially with the fishes of Doon Valley) infused inspiration to share a novel idea concerning with giving tips to instantly identify Fish in the field itself up to Generic or even up to specific level, without going into the intricacies of established Taxonomic norms, to be followed later on in laboratory as a confirmatory test.
- For routine 'Taxonomic' identification, meristic and morphometric analyses, standard works like those of Day , 1878; Jayaram, 1981 & 1999; Talwar and Jhingran, 1991; Nelson , 2006 & 2016; Vishawanath *et al.*, 2007 etc. can be consulted along with the details available with FishBase: A Global Information System on Fishes
[\https://www.fishbase.se/; <https://www.catalogueoflife.org> > col > details > database;]

WHY FIELD IDENTIFICATION?

The prime logic of suggesting instant 'Identification of fish in the field' is because of the fact that the colourful adornments of FISHES can only be recorded when they are live. It is not to be emphasized that most fishes have their Genus/Species specific colourations which mostly fade out on preservation over a period of time. Other taxonomic exercises (like meristics or morphometrics) can be performed even after preservation but observing and recording characteristic colour patterns is possible in the field itself.

Moreover, a good photographic camera can serve the purpose in a better way, snapping all details in close-ups. In this case, study can be done with the photographs at one's own convenience in laboratory. Studies to be published can tell the story very well if live photographs are supplemented with the textual matter.

FIELD IDENTIFICATION TIPS

Not strictly going by the taxonomic technicalities, certain **field 'TIPS'** can be fruitful to identify and know the fish (tentatively) caught in the field. A particular fish may be examined for:

- A characteristic shape and size.
- **Prominent colour markings or colour patterns on the body.**
- **Prominent structural modifications for special use.**
- **Prominent sex distinctive colours or structures.**

All these are not usually overlapping with any other Genus or species. If these are observed in the catch, very close identification of the Genus or even a particular species can be done in the field itself. Similar tactics can be adopted when one happens to visit a local fish market where fresh fishes are brought from nearby aquatic habitats.

Besides, the **fish caught from a particular habitat characteristic** can give an indication of either or other fish or its Family.

SOME MOST PROMINENT 'TIPS' TO SEGREGATE FISH(ES)

With special reference to recently worked out fish diversity
in the streams of eastern and western Doon
(Uttarakhand)

[The same tactics may be applied for identifying fishes in plains]

In an **assemblage of fish catch**, fishes can be sorted out and put in store by putting tentative labels on them. The following may be observed.

The following is not in Taxonomic order (deliberately done) just to lay emphasis on the instant exercise (observing more attracting or prominent characteristics) in the field.

The real Taxonomic exercise can be accomplished after consulting the literature (hard copy or soft/web copy resources) available.

For the present, as many as **14 lots** of sorted fishes are presented here with **tentative characterisations**. Each lot will be examined in laboratory for final results, as incorporated lotwise separately here afterwards:

Lot 1.

Sort out small sized fishes with a prominent **BLACK BLOTCH** at the base of caudal fin, along with one behind gill cover or one at the base of dorsal fin:

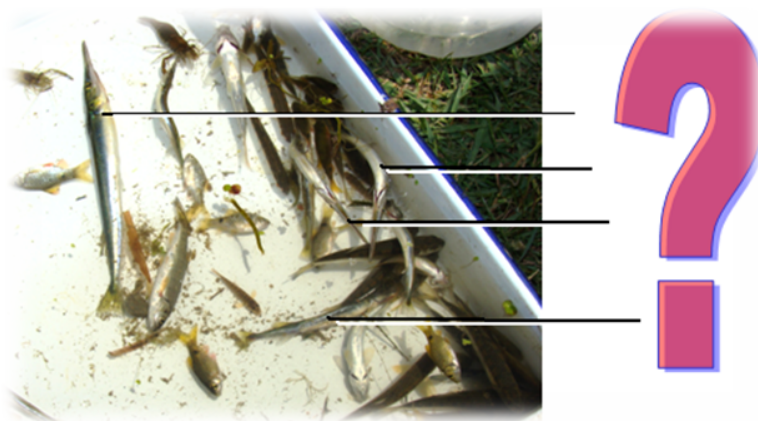
.....place them labeled as Puntius sp. may be!



Lot 2.

Sort out the fish which have **jaws prolonged into a beak**:

.....place them labeled as Needle Fishes or Belonids may be !



Lot 3.

Sort out bright silvery, laterally compressed fish with a black spot at base of every scale and ‘=’ – like black spot marks along the lateral line or vertical bands on the sides:

....place them labeled as Barilius sp. may be !



Lot 4.

Sort out any fish having oblong bluish spots along sides of the body:

.....place them labeled as either Barilius or Raiamas sp.



Lot 5.

Sort out the fish(es) with a dark bluish black band running from snout to the base of caudal fin:

..... place them labeled as either Rasbora or Esomus sp.



Lot 6.

Sort out small-sized fish with metallic blue lateral bands on the sides as well as on caudal and anal fins:

..... place them labeled as Danio sp.



Lot 7.

Sort out small-sized laterally compressed fishes with peacock blue hue below lateral line, yellowish vertical bands and a stripe of dark pigmentation along mid lateral side, terminating at the base of caudal peduncle or beyond:

..... place them labeled as

Devario sp.



Lot 8.

Sort out the brightly or dull coloured, laterally compressed fish(es) with long spiny and soft-rayed dorsal and anal fins and obliquely running vertical bands or oblong spots on the sides:

..... place them labeled as either Trichogaster / Colisa /

Badis sp.



Lot 9.

Sort out the fishes which have a **SNAKE (= Eel) LIKE** body:

..... place them tentatively labeled as Freshwater spiny eels or Mastacembelids.



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Lot 10.

Sort out the fish which have **long dorsal and anal fins** and **large scales on the body extending up to head:**

..... place them labeled as Snake Heads or Murrels or Channids.



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Lot 11.

Sort out fish(es) having the presence of considerably long filamentous extensions of skin around mouth (barbels):

.....place them labeled as CAT

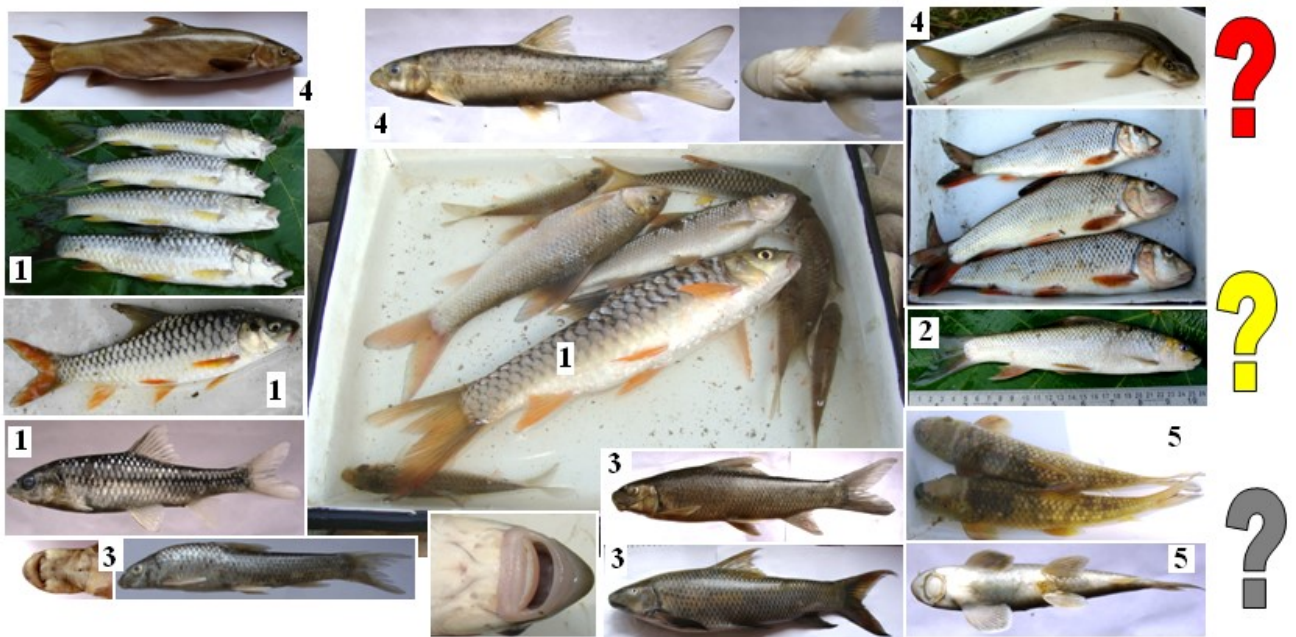
FISHES.



Lot 12.

Sort out fish(es) with elongated cylindrical or compressed body with long caudal peduncle, deeply forked caudal fin, very large (somewhat hexagonal) to small scales, orange or yellowish or pinkish hue on the fins, shining silvery to dull grey or brown shades etc.:

..... place them in one lot collectively labeled as Minnows or Minor Carps or Mahseers or Suckerfish etc, as numbered 1 – 5 in assemblage below.



Lot 13.

Sort out small-sized silvery fishes with deciduous scales, blunt snout, eye almost in the middle of the head, dorsum (back of the body) brownish and some exuding more turmeric yellow mucous from below the rounded abdomen:

..... place them labeled as

Aspidoparia sp.



Lot 14.

Sort out small-sized worm-like to fusiform fishes caught while dragging at the bottom through pebbly, sandy, muddy or weedy bed. Such fishes will be drab or light coloured (greenish grey, brownish, drab yellowish) with spots, vertical bands, lateral band, tiger-like wavy bands, black ocellus at the base of upper caudal lobe, a dark stripe / band at the base of caudal fin and have prominent barbels around mouth:

.....place such fishes labeled as **Cobitids (Loaches)**

