

# **A journey of a freshwater fish taxonomist**

**Prof. Waikhom Vishwanath (Rtd.)**

**Department of Life Science, MU**



I was born on March 8, 1954 as the first son of my parents. My father went to an astrologer after my birth, and he was told that I could fit into any subject. That was a matter of concern on how to choose my future career. However, finding good teachers, friends and co-workers had to do a lot in shaping my career.

My early school education started in Tamenglong High School where my father was the Headmaster. First, I was admitted in Class II, but I did not attend classes for long, since the medium of teaching was in the local dialect. My father admitted me in class III in which the medium was either in Manipuri or in English. But I was too young for the class and I had

hard times to understand the subjects. Later I had my education from Chingamakha High School and then Johnstone Higher Secondary School and opted for science subjects.

My parents wanted me to become a medical doctor. After my secondary education, I was told to pursue pre-medical course. I went with some of my friends and got admitted in B.Sc.-I in JSS Science College in Dharwad, a township in northern Karnataka. B.Sc.-I examination conducted by Karnatak University, was equivalent to Pre-Medical Exam. The results of all of us from Manipur, were very unsatisfactory. All my friends left the college out of frustration. But I did not like to show my face to my parents and decided to continue B.Sc. course in that college. I secured highest marks in Chemistry and was thinking to join B.Sc.-II with Chemistry as major subject. However, I was advised to opt Zoology as the major subject by one my teacher, Dr. Ram Mohan Rao. He knew that I was good in animal dissections and that would contribute a lot in the course. That was the turning point in my career. Interestingly, I was the only student who got first class both in B.Sc. II and III in Zoology major from that college respectively in 1972 and 1973. I obtained highest marks in the practical paper of the subject in the final year in that university. I was availing National Scholarship since B.Sc. III till my M.Sc.

Although I wanted to admit in M.Sc. Zoology in Karnatak University, my father wanted me to have experiences of northern India since I had already of southern India. I got admission in the Department of Zoology of Banaras Hindu University on merit basis. I did not do well in M.Sc.-I because I had difficulty in adjusting to the new environment: keen competitions among the bright students who were from different parts of the country and the extreme climate. I offered Fish Biology and Fisheries as my special paper in the final year. Here again, I met Dr. A K Mittal, a young and renowned Fish Biologist and Histochemist. His method of teaching and inspiration on the identification of fishes had really determined my future career of research on Fish Taxonomy. He often took students including me to the nearby rivers at Varanasi. We, including the teacher proceeded to the rivers riding bicycle or cycle rickshaw. He engaged boatman and fishermen in each trips. We were asked to identify fishes caught by the fishermen on the spot itself using guide book and class notes. After my M.Sc., he asked me to join research under his supervision on a topic entitled Enzyme histochemistry of fish skin in fresh and polluted waters. My hard luck was that within two months of my joining his laboratory in the early 1976, and before I was registered for Ph.D. course, he was awarded a Post-Doctoral Scholarship for further research in the University of Leeds, UK. He proceeded for UK and I for Imphal.

By that time all my colleagues who completed M.Sc. from different universities had either joined colleges as lecturers or government offices in different jobs, I spent 2-3 years jobless, sometimes teaching in private schools in the hills districts of Manipur or in private colleges on honorary basis. Then I met then Dr. Hijam Tombi Singh, my mentor and then Ph.D. supervisor. He joined the Division of Life Sciences, Post graduate centre of Jawaharlal Nehru University, Manipur. I started research with him although the department did not have sufficient research facilities. My research involved mostly field collections, classical methods of fish identification using simple stereoscopic microscope and a good SLR camera. Since there was paucity of teachers I was appointed as Part-time teacher in the PG centre to teach Fish & Fisheries and General Zoology. I had opportunities to accompany students offering Fisheries for study tours as teacher-in-charge to different Fisheries institutes of the country, viz, ICAR-CIFRI (Central Inland Fisheries Research Institute), Barrackpore, ICAR-CIFE (Central Institute for Fisheries), Mumbai, Zoological Survey of India, Kolkata etc. I interacted with many scientists, discussed on research and also collected copies of relevant literature as much as possible. When the PG centre became a full-fledged Manipur University of the state of Manipur, I got registered as a formal Ph.D. scholar. I got Ph.D. degree in 1984 in a topic entitled Fish and Fisheries of Manipur and I was the first Ph.D. in science stream of the university and the second of the university. I joined Manipur University as Assistant Professor in the same year. I had already served as lecturer in the government colleges of the Manipur from 1979 until I had joined the university as a regular faculty.

As inspired by Dr. A K Mittal, I continued to go for fish collections in the different parts of Manipur and the neighbouring areas of Northeast India and Myanmar. Unable to correctly identify the fishes with the available literature and comparative materials, I used to visit Zoological Survey of India, Kolkata. When I visited ZSI for the first time, I met Dr. P K Talwar in the Fish Section. He sold me some of his personal books on freshwater fishes published by the ZSI. He was then working on marine fishes and the books were of no use to him. He also helped me in getting photocopies of some important publications related to the fishes of Manipur. Dr Talwar told me that Dr K C Jayaram, the then Joint Director, ZSI was nearing completion of writing a book on the freshwater of India and that would be of much help in my research. However, Dr Jayaram was out of station and I did not have a chance to meet him.

In January, 1982, I attended Indian Science Congress in Mysore University. After the inaugural function I visited the book exhibition stall. I just saw a person in his late 50s with distinguished personality, with a name tag 'K C Jayaram' attached to his coat and with a book in his hand. I didn't wait, approached him, introduced myself, told briefly about my interest and asked him if the book with him was the one which he wrote on the freshwater of India. He replied in the positive and told me that he would like to show the book to other people that day and then sell me the next day on payment of Rs. 100. That was great and since then I was in touch with him till his demise in 2010. My first discovery of fish species published in 1986 was named after him as *Puntius jayarami*. I also named *Myersglanis jayarami*, 1999 and *Glyptothorax jayarami*, 2012 after him. I visited him in his Chennai residence after his retirement, received many research papers in his possession, helped him and provided many photographs for his book on the Catfishes of India published in 2006.

I also met Dr. A G K Menon, renowned freshwater fish taxonomists in ZSI, Chennai. He visited Manipur in 1985 in relation to his research project on the loach fishes. He worked in the Fish laboratory of Manipur University for some days and helped me in identifying new fishes in my collection. We jointly published a new fish, *Puntius manipurensis* (now *Pethia*) from Loktak lake. Both Jayaram and Menon encouraged my research, told me that I should collect samples from the remote areas of Northeast India. They told me that the region is a gold mine of fishes and whatever I touch would come out to be gold.

Here I wish to mention that taxonomy is a science of finding, describing and giving a name to an organism. The types of the species are deposited in national repositories with a registration number with the collection data in order to stabilize the identity of the species and to make the scientific name available to science as per the CODE, i.e., International code of Zoological Nomenclature. It involves field collections and critical examination of specimens. The science was long neglected and was confined to a few scientists and dusty museums. Many scientists have become interested in research involving sophisticated instruments, molecular, biochemical and cytological techniques in air-conditioned laboratories. However, correct identification of a species is the first step in any biological study. A new concept has emerged that identification of species based on classical taxonomy should be replaced by molecular techniques. However, renowned classical taxonomists are of the view that the keen eyes and systematic approach by a taxonomist is the key to correct identification. Molecular

techniques have led to recognize species distinguished by a few nucleotides and complex statistics, which is otherwise not distinguishable by human eyes. Aristotle (384-322 BC) commented “one swallow does not a summer make”. In this context, it is translated as - one nucleotide does not a species make. The CODE till today has not given provision for molecular data for recognition of a species. Thus molecular data is a supporting component in the identity of a species based on classical technique of identification.

Earlier studies of Francis Hamilton, 1822, John McClelland (in late 19 century), Francis Day (1878), SL Hora (1910-1954) based on field works and careful examination of samples are still considered as masterpieces in Indian ichthyology. Further studies by Indian workers are mostly based on table work, superficial observations and not on field studies.

I visited Trieste, Italy in 1996 to attend the IX-Congress of European Ichthyologists, where I presented a research paper. Dr. Maurice Kottelat, a stalwart freshwater ichthyologist, with whom I had scientific exchanges for a few years was chairing the session. There was pin-drop silence during my talk for 20 minutes and there was no time for discussions as my paper was quite exhaustive. After the talk, during coffee break, many of them gathered around me and appreciated my original work based on field works. Some of them were giving suggestions. Dr. Petru Banarescu, quite an elderly scientist gave me a few of his newly published research papers for me and also for his friend Dr Jayaram. One Dr Fang Fang of the Swedish Museum of Natural History, Stockholm was excited to see my slides and commented, “It’s interesting to see colour slides from India”. Some of them jointly made one statement, “When a paper is published from India describing a *new species*, we just laugh and say - a *new synonym* is published”. That means ‘*the new*’ is no more a new, but is ‘*the synonym*’ of a species published earlier and the scientist had overlooked the earlier publication. The impression of some Indian scientists by those people outside the country really hurt me. Since then it has been a challenge that I and my team should bring Indian ichthyology to the international standards.

I had two days after the congress and was planning for a site seeing tour to Rome. However, Maurice was interested to be with me for some time and discuss on the manuscript of his unpublished book on the fishes of a Southeast Asian country. We sat on the sea beach of Trieste, hours together, coffee after coffee till dusk. My meeting with Maurice was much

more than visiting Rome. I do not forget my supervisor telling me that I should always interact with renowned persons whenever I get a chance, at lunches or dinners, wherever possible while attending seminars and conferences. These are the best times for sharing and getting knowledges, enrich as much as possible and plan for collaborations. We should as much as possible avoid the habit of eating together and gossiping amongst ourselves and spending much time on side seeing tours.

In the later part of 1996, I was invited at the CAMP (Conservation Assessment and Management Plan) workshop in ICAR-NBFGR (National Bureau of Fish Genetic Resources), Lucknow. Freshwater fish scientists from all over the country participated in the workshop in which we were evaluating the threat criteria of freshwater fishes of the country. Majority of the scientists did not have the update knowledge of Indian ichthyology. I had hard times to appraise of the current status of the subject and to convince each one of them.

In 2009, I was invited to take part in the IUCN (International Union for Conservation of Nature) workshop on the assessment and evaluation of the freshwater fishes of Eastern Himalaya for categorization of the threat criteria and red-listing. Eastern Himalaya is the region covering from eastern Nepal in the west to parts of Yunnan, China and Myanmar in the east through parts of northern India, Bangladesh and Northeast India. IUCN recognizes the region as a freshwater biodiversity hot spot. The workshop was held at Kathmandu, Nepal, in which many fish specialists participated. The process involved GIS (Geographic Information System) mapping of the distribution of each of the fishes using GIS software and then evaluation by feeding scientific data into IUCN-SIS (Species Information Service) online on Population trend, Population size and structure and Geographic range, threats in the area etc. Detailed data were supported with published authentic literature. The system evaluated the threat criteria of the species. When the assessment was about to begin, the list of the fishes of the region was not available. It started with the list of about 300 fishes included in my book “Fishes of Northeast India” published by NBFGR in 2007. Other scientists added to the list and finally it was more than 500 fishes from the region. I was assigned to assess more than 100 species, which I performed in the Department of Life Sciences, Manipur University with the GIS software provided by IUCN and the published information. The final evaluation was conducted respectively at Kolkata and Coimbatore. During the evaluation, I had the opportunities to interact and share information and

experiences with different scientists affiliated to Natural History Museum, London, National University of Singapore, researchers from Nepal and Bhutan and also experts of IUCN. I was assigned to lead the writing of the chapter on the fishes for the red-list. Finally, it was published as Chapter 3: The status and distribution of freshwater fishes of the Eastern Himalaya authored by Vishwanath W, Ng HH, Britz, R, Kosygin Singh L, Chaudhry, S & Conway KW of the IUCN Freshwater Red List 2010.

*Catalogue of Fishes* is an official website of California Academy of Sciences. New publications of fishes from around the world is updated in the catalogue. Researchers find it a ready reference of the status of fish species. There were more than 100 entries of my publications in the catalog till the early part of 2K. William Eschmeyer, the editor, wrote to me that he was happy to see my contributions and regarded me as a new generation of Indian ichthyologist.

Fortunately, I had very good dedicated research scholars. My team could publish some very good papers in the reputed journals. Thus research funding was not much a problem. I could obtain fundings from ICAR-NATP, DST, DBT, all with sufficient travel grants. So we could cover different parts of the Northeast India where no fish scientist has ever ventured. Northeast India is criss-crossed with several drainages and are very rich in aquatic faunal resources. Whatever we touch turned out to be new to science. We could discover and publish as many as 12 new fishes from the Eastern Himalaya in 2012 and 13 in 2013. In the Christmas & New Year Greeting published by IUCN-FFSG (Freshwater Fish Specialist Group) in December 2013, all the 13 fishes published by my team were a part of the Christmas tree consisting of 20 new fishes discovered in that year from the region. It was a great moral booster to all my colleagues of Northeast India.

One of our research papers describing new species with supporting characters based on light microscopy was submitted to *Zootaxa* by my co-worker. The editor commented that light microscopy could not confirm the characters. Soon we processed the samples for SEM images in the Physics department of the university and could easily find the differences between taste buds and tubercles. When we submitted the revised manuscript, the editor wrote to my co-worker that it was the best paper he ever received from India and should be a role model for other workers in the field. We found a good reviewer and made the right use of the facility.

I served as members of RAC (Research Advisory Committee) of ICAR-DCFR (Directorate of Coldwater Fisheries Research, Bhimtal and ICAR-CIFRI. Later, I was appointed the Chairman, Research Advisory Committee of NBFGR by ICAR for the period from 2013 to 2016; Co-Chair-IUCN-FFSG of South Asia for a quadrennium from 2013. I was awarded the prestigious E.K. Janaki Ammal National Award for Animal Taxonomy by the Ministry of Environment, Forests & Climate Change, Govt of India (MoEFCC) in 2015. At present, I am the member of RAMC (Research Advisory & Monitoring Committee), Zoological Survey of India, nominated the MoEFCC and also Expert member, Fisheries of the National Wetland Committee, MoEFCC.

I conducted hands-on training of freshwater fish taxonomy in Manipur University in collaboration with NBFGR in which fish scientists from different parts of NE India and ICAR scientists participated. I also participated as resource person in taxonomy training workshops organized by NBFGR, CIFRI, Gauhati University and St. Anthony College, Shillong. I was also involved in the implementations of research projects related to fish diversity in different parts of NE India on the recommendations of ICAR and DBT.

I retired from university service in 2019. My team discovered as many as 100 new fish species till then, a record in Indian freshwater fish taxonomy. When I told of my discovery to Maurice, who is 5 years younger than me by age, just laughed and said, “Vishwanath, I celebrated the 400th new fish discovery before 2012”. He visited Manipur in February 2016 on his way to attend an IUCN evaluation workshop in Singapore. His visit for more than a week enlightened my students both in the laboratory and in the field. We named a new fish from Arunachal Pradesh as *Exostoma kottelati*, 2019 in his honour. I and Maurice could publish a paper in the *Raffles Bulletin of Zoology* from Singapore in 2021 solving taxonomic problems of a fish of Manipur and its related species. **Behold my friends!!** There are workers who have achieved and contributed much more. Let us hold our heads low.

In 2020, a team of scientists of the Bombay Natural History Society, Mumbai; Kerala University of Fisheries & Ocean Science, Cochin; and Indian Institute of Science Education & Research, Pune discovered a new genus of barb and named it *Waikhomia* in honour of me recognizing my contribution to the field of Indian fish taxonomy. One of the authors, Rajeev



Raghavan stated (TOI) that I am the only living fish taxonomist who have discovered 100 new species and published my discoveries in the leading international fish taxonomy journals thus making my research at global standards. It is also another morale booster to my colleagues pursuing in this field. I was awarded UGC-BSR Faculty Fellowship for three years by the UGC after my retirement. As a result, I could write a book *Freshwater Fishes of the Eastern Himalayas* which was published by Elsevier-Academic Press, New York in 2021. It contains description of 512 fishes with illustrations and colour images of the fishes. This is a compilation of my works and also other literature scattered in the form of research papers of the region.

Here I wish to convey to my fellow and junior colleagues that before we start any study-research, we need to have the complete information on the particular subject, from the remote past till date. With the advancement of information technology, finding relevant literature become much easier than it was before. Accordingly, it has become necessary to catch up with the new finds and concepts and update our knowledge. Instead of copying the works of some other person, we need to know the requirements in relation to our area of coverage, geographic or subject where little work has been done. We may think that would not be necessary may turn out to be a matter of great interest to other workers. Research and revealing the fact would be of much interest to the scientific community. Thus your contribution would be of much value.

I would strongly suggest to my fellow and junior colleagues that we should not give a topic of research in which I do not have the basic knowledge. A student respects a teacher only when he is the primary source of information. A teacher should be able to demonstrate the basic methodologies of research. Once the student imbibed the idea and the methodology, he or she would pursue the work automatically with enthusiasm and deeper details. There would be no looking back. Whenever they need any literature, I should be able to supply. They should also be free to request any fellow researcher to supply the same.

It so happens sometimes that a research paper submitted comes back with certain queries. To cite an example, the specimen required for comparison of my proposed new fish was described by John McClelland in 19C and was in the Natural History Museum, London. We did not have access. But I tried through one friend that he might kindly examine the specimen

and send the photos and measurements. I fortunately got it. But the received data would not also solve the problem. My student and I, both frustrated, came back home. I made an in depth study of the papers published earlier in that night. Fortunately, I found a paper by Dr. S L Hora which made a detailed study of the fishes in that group. He wrote that the fish McClelland reported was a juvenile and the data was not valid for that species. He presented a revised description of the fish. Next day we revised the paper accordingly and resubmitted. You will not believe it was accepted within hours of the submission. This happiness is limited within my small circle. Why? because you have not ever felt it. You will, only when you are in to it. All my students get requests for reviewing research papers submitted to many international journals of high impact factors, viz, *Zootaxa*, *Ichthyological Exploration of Freshwaters*, *Journal of Fish Biology*, *Ichthyological Research*, *Vertebrate Zoology* even before they are awarded Ph D degrees. That gives me relief and gives them confidence and incentive for hard work.

Dr Jayaram wished that I should pursue research on the osteology of fishes (study of bones) which he could not do in his life time. He handed over important relevant papers to me. The body structure of a man depends on his skeleton. If an animal has to evolve to a body which suits and adapts to a challenging environment, it has to modify its skeleton first. So by studying the detailed bony elements we may be able to assess the level of evolution of a fish for a particular habit of life. For example, bones of tail show how effective is the fish in propulsion compared to other fishes. My team could examine bones of 12 small sized fishes of Northeast India, under the genus *Puntius* and could categorize them into three groups based on the osteology, a paper published in 2006. However, we could not elevate the groups into higher taxa because of the limited number of samples. In 2012, Rohan Pethiyagoda, a scientist based in Australia, referring to our work, examined bones of 50 specimens, and with the support of molecular data, divided genus *Puntius* into five different genera. Even though we could not divide the genus, our work was the inspiration for Rohan. So our work is original and is recognized. You may not feel, but we feel the recognition. So happy.

One more important thing is that we should have good foundation of the relevant subjects which may have bearings with the field of study. For example, fish inhabits aquatic environment. So a water body or a drainage basin is the boundary of a particular fish species and it is not supposed to exist in other water bodies, unless it is transported and introduced

elsewhere. Fish do not migrate to other water body via dry land masses except for a few air breathing species. We must have an idea of evolution of a water body/river basin and the geomorphology which is related to the tectonic movements in the past which resulted in the present status. Species which were earlier considered widely distributed, have now been identified as different. The concept has also been supported by molecular studies.

So now, inventory of biodiversity is essential to have a data base of the fauna and flora of a particular country/river basin. We need to categorize them of their threat criteria and take up measures for the conservation. Biodiversity is considered bioresource. Each species has its role to play in the nature and in maintaining the ecological balance. Species which were neglected to have little commercial value have now turn out to be of ornamental and medicinal values. Small sized fishes with bony consistency but with attractive colourations or those exhibiting interesting behaviour attract aquarium hobbyists and now fetch high prices in the international market. It is reported that majority of the population of Bangladesh and Northeast India do not suffer from anaemia and night blindness. It is related to the consumption of small sized fishes which are rich in iron and micronutrients although poor in muscle protein. These fishes are now cultured. Several species have now been recognized as indicators of climate change, pollution etc.

Northeast India is an aquatic biodiversity hotspot. Let us know our resources. There are ample scopes for research and for contribution to science; exploring possibilities of culture and propagation; entrepreneurship development and job opportunities. Let us enlighten our future generation on the role they have to play to save our resources. Unless we pay attention, credit will go to someone/somewhere else and will not be able to provide scientific inputs to our public and planners. Let us also do some deeper research before our species become extinct due to natural or anthropogenic activities and improper plannings.