



Database on catfishes of India

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ABSTRACT

The introduction of computer processing and computer databases have provided opportunities to store vast amount of data and open this vast data store to many new uses (Chapman 1999). The data store managed through database management system provides valuable information especially for decision making and planning. In this communication, we used the database management system and application programming interface (API) to develop the CD version of database for 169 catfishes belonging to 14 families, 15 subfamilies and 55 genera from different ecosystems of India providing information on taxonomy, common name, group name, vernacular name, synonyms, habitat, resident environment, distribution, morphological characters, economic importance, threatened status and fishery information in addition to fish photographs and references. In the database of 169 catfishes, 139 are freshwater species, 01 is marine species, 12 species are common to both fresh and brackish waters; 6 species are common to fresh, brackish and marine waters and 11 species are common to brackish and marine waters. The database contains 102 key references and 200 photographs and was developed using the MSACCES relational database management system and Microsoft Visual Basic 6.0 enterprise edition technologies under Windows XP environment. Open database connectivity (ODBC) programming interface was used in the API to access data in database management system. The principal objective of the study was to provide a low-cost product with recent information on the catfishes from India to the scientific community, researchers, educationists and students of fisheries domain.

Key words: Catfishes, Database, Fish species, Habitat, Taxonomy

The catfishes or the siluroid fishes form the largest group after cyprinids comprising approximately 35 families, 437 genera and 2734 species in their entire range of distribution from South America, Africa, Europe, Asia to Japan (Teugels, 1996). They are commercially important as food, ornamental and sport fishes and widely distributed in India in almost all elevations and temperatures ranging from cold waters of torrential hilly terrains to waters in the plains, brackish and marine waters. Catfishes are mostly freshwater species but some species belonging to the families Ariidae and Plotosidae are found in brackish and marine waters. Out of 2734 catfish species reported globally, about 197 species of catfishes have so far been reported from the Indian region including Pakistan, Bangladesh and Myanmar (Jayaram, 2006). Most importantly, several new species have also been described belonging to the group catfish in the recent years from the biodiversity hot spots regions of India.

Out of approximately 2500 finfishes reported from the

Indian region, 169 species of catfishes have been listed. These fish species are valid catfishes and are native to India belonging to 14 families, 15 subfamilies and 55 genera, out of which 139 are freshwater; 01 is pure marine ; 12 are commonly found in fresh and brackish water; 6 are common to fresh, brackish and marine waters; and 11 species are common to brackish and marine waters.

In recent years, much interest has been developed in the study of taxonomy and phylogenetic analysis of the order Siluriformes as a whole (Jayaram 2006). However, concise work on catfish germplasm resource of the Indian region published so far is very limited (Jayaram 2006, Jayaram 1981, Talwar and Jhingran 1991, Mishra 1976) and due to lack of uniformity in descriptions, makes it of limited use for comparative purpose and for workers on a particular genus or family. The information on the catfishes from different ecosystems of Indian regions so far available with six ICAR fisheries institutes, Central Institute of Freshwater Aquaculture (CIFA), Central Marine Fisheries Institute (CMFRI), Central Inland Capture Fisheries Research Institute (CIFA), Project Directorate of Coldwater Fisheries and Central Institute on Fisheries Education are much scattered and information is available only on group wise capture,

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culture, aquaculture statistics and capture technologies. Moreover, this information is also incomplete in some aspects like taxonomy, genetic resources and phylogeny. FishBase, an online international relational database with information to cater to different professionals such as research scientists, fisheries managers, and zoologists covers around 32100 fish species globally and is very comprehensive online database application that covers 2489 fishes of India, but the information is still incomplete (<http://www.fishbase.org>).

During the last decade progress in information technology (IT) has affected all spheres of science and humane life. One of the major contributions made by information technology is storing the vast amount of information electronically on single tiny chip and managing such electronic data in quicker and easier way within a fraction of second. Database technology and database management systems efficiently manage the creation, modification and access to data with greater level of data security and confidentiality. In the present communication the principal objectives were to (a) record and store the data on key parameters like taxonomy, common name, group name, vernacular name, synonyms, habitat, resident environment, distribution, morphological characters, economic importance, endangered status and fishery information along with photographs and references by developing database, (b) keep the electronically stored records updated and (c) disseminate and share low cost database application product backed with recent information among the scientific community, researchers, educationists and students. The database has been also supported with references and data sources. This is the first version of database on CD for 169 catfishes of India with recent information on scientific name, synonyms, common name, classification, habitat, global and Indian distribution, utility and references along with their images.

MATERIALS AND METHODS

Data source: The data collection was entirely based on the primary as well published secondary sources. The primary data was collected from field surveys conducted by scientists of the National Bureau of Fish Genetic Resources (NBFGR), Lucknow, working in various research projects under the mission on collection, cataloguing and documenting the fish germplasm resources of the country using operational strategies of partnership and cutting-edge technologies. The secondary data were collected from published sources like handbooks, journals, conference proceedings, online databases and offline databases such as ASFA. Further, we also used "Handbook on Catfishes of India" authored by Jayaram K C published in the year 2006 as a major secondary data source.

Data structure: The CatfishIND_DB database consists of 3 tables catfish_master, catfish_synonyms and catfish_ref for entry of data on each catfish. The architecture of the database has been shown in Fig. 1. The catfish_master table

contains fifteen fields viz. (i) fish_id (ii) species (iii) picname (iv) valid_name (v) family (vi) common_name (vii) vernacular_name (viii) environment (ix) distribution (x) economic_importance (xi) habitat (xii) subfamily (xiii) group_name (xiv) main_refrence and (xv) remarks. The primary key in this table is fish_id. The second table catfish_synonyms contains six fields viz. (i) fish_id_synonym (ii) fish_id (iii) synonym (iv) author (v) year (vi) reference. In this table fish_id_synonym is primary key and fish_id is foreign key. The third and last table catfish_ref contains three fields (i) fish_id_ref (ii) fish_id and (iii) reference. The primary key in this table is fish_id_ref and the foreign key is fish_id.

Interface and application: We used Microsoft's MSACCESS and Visual Basic 6.0 technologies for developing database and application. Visual Basic 6.0 was used to build the interface integrated with the database. MSACCESS, a relational database management system works at the backend and provides command to retrieve and store data into the database. Visual Basic 6.0 provides interface and functions to fetch and display data from the database. The 'Package and Deployment' tool of Visual Studio 6.0 was used to prepare the setup application after creating the exe format file under Visual Basic environment. The whole software system runs on Intel machine under Microsoft's XP and even higher environment. Visual Basic and MCACCESS combination is quite easy, efficient and cost effective for database management applications.

RESULTS AND DISCUSSION

CatfishIND_DB database contains entries of about 169 catfishes belonging to 14 families, 15 subfamilies and 55 genera in three tables catfish_master, catfish_synonyms and catfish_ref. The catfish_master contains 169 records; one for each individual species of catfish. The catfish_synonyms contains 1348 entries and catfish_ref contains 270 entries. The application and database is much easy to deploy from CD on the Intel x86 machine under Microsoft's XP even higher environment through its in built setup wizard application. After installation of database application from CD it starts with the main screen that facilitates the user to use the utility tools for retrieval and display of information of interest from the database.

Utility tools: For the better retrieval and display of the information on catfish species from database tools search, advance search and browsing were integrated. Besides, fish photographs, references were included to enhance the scope of the database and make it more informative. A sorting function was used and included in browsing interface and search tools to list and display the data in ascending order. The browsing and search tools integrated in CatfishIND_DB database are as follows:

Browsing by scientific name: This tool helps user to retrieve information on catfish species from database by

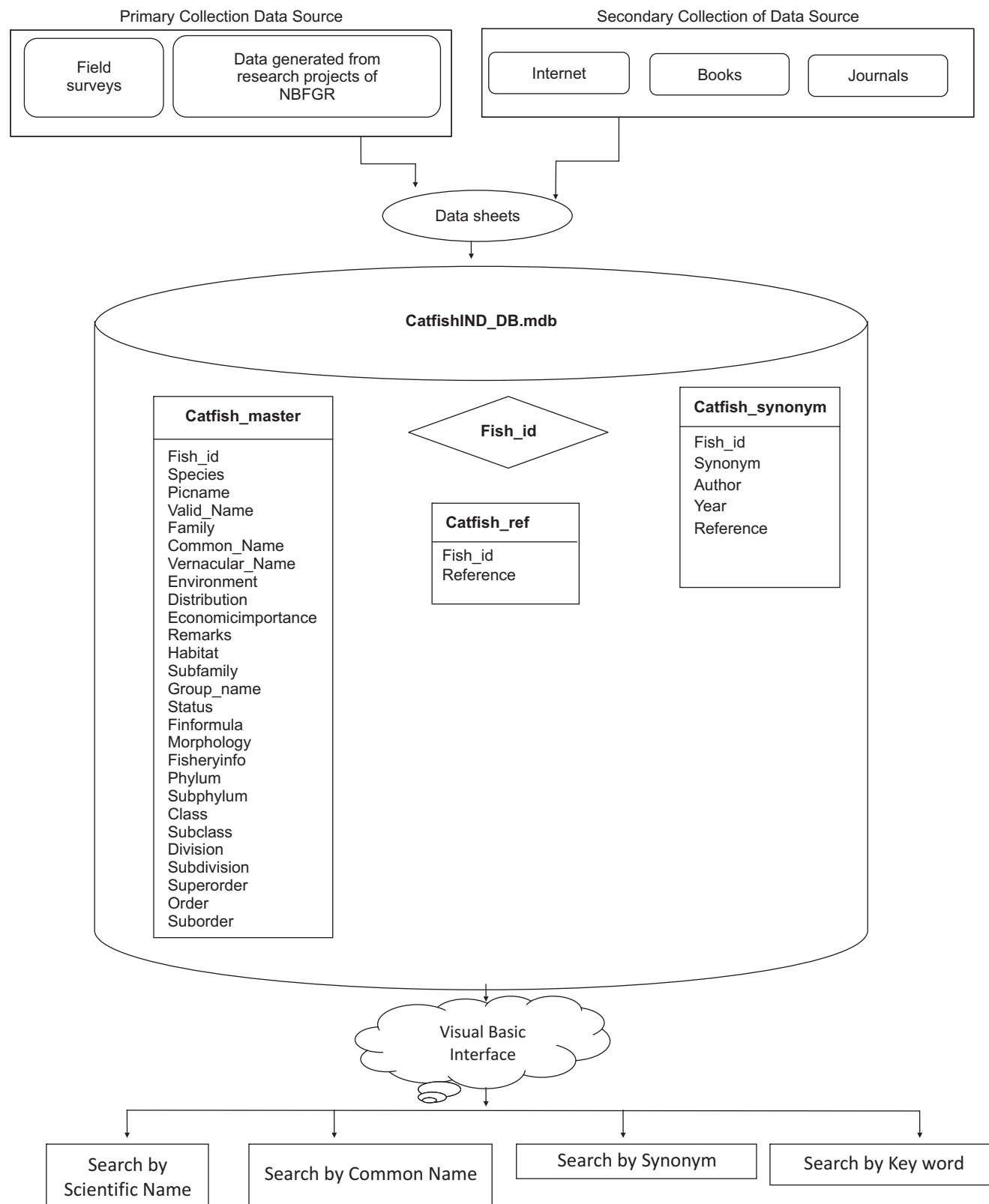


Fig. 1. Data flow diagram of catfish India.

selecting the desired scientific name of fish species from combo box. If user selects '*Eutropiichthys murius*' scientific name of a species from the combo box provided against to 'Select scientific name', the user will get the result of the query.

Browsing by synonyms: This tool helps the user to retrieve information on synonyms of catfish species from database by selecting the desired scientific name of fish species from the combo box. If user selects '*Ailia coilia*' scientific name of a species, the user will get the result of the query.

Browsing by common name: This tool helps the user to retrieve information on catfish species from database by selecting the desired common name of fish species from the combo box. Here, if user selects 'Goan catfish' as common name of a species, the user will get the result of the query.

Browsing by reference: This tool helps the user to retrieve reference information on catfish species from database by selecting the desired scientific name of the fish species from the combo box. Here, if user selects '*Ailia coila*' scientific name of a species against the 'Species' label, the user will get the result of the query.

Keyword search: A simple text search tool has been included that makes the user free to display information about fish species of interest by providing the scientific name of the fish species as keyword in the search text box.

The database on catfish species has not only shown great potential in displaying the recent information on catfish species but also storing and analyzing the database content. The beauty of the system that makes it user friendly and easy lies in wizard based setup application in which database and application are integrated that can be deployed on low-cost secondary storage devices like CD-ROM, Pen drive etc. These secondary storage devices can be used to install the application along with database on any Intel x86 machine under Microsoft's XP or in higher environment. The use of MSACCESS relational database management system and Visual Basic has lowered application cost and further deployment of the database application on low cost secondary media like CD-ROM, Pen drive etc. facilitated to easily distribute and share among users. Users can also explore the information on catfish species for identification and browsing the information on different aspects like synonyms, distribution, morphology, and economic importance etc. prior taking the species of interest for further studies. Thus, the application provides the baseline information on catfish species that could be used as valuable reference of much value. The database needs to be updated frequently in order to keep and provide the recent information. Keeping this in view, there is a need to collaborate the work with other agencies working in the similar area. In the past, several comprehensive databases on fishes have been developed but there has been no exclusive database on catfishes of this region so far. Some databases available worldwide like 'Fishbase' (<http://www.fishbase.org>), 'Fishwise' (<http://www.fishwise.co.za>) and 'Catalog of Fishes' (<http://www.calacademy.org/>) are very powerful comprehensive online reference databases and covers all the fishes of the world. These reference databases are good data source for collecting and viewing the information on fishes of the country of interest. In the context to India, most of the information on fishes of the country are old and lacking on some aspects. As our database also contains the data generated from field surveys and research projects of NBFGR, it is worthwhile database with validated recent information. However, comparison of our database with worldwide available global databases is not strong enough, with the information that it contains at present. The limitations in developing this database was that information about catfish species is too scattered. Extensive literature search and partnership with other fisheries agencies of the country is required to expand the database and in future its scope to collaborate with other partners may increase its strength and utility. Efforts in the study were to develop the cost effective and easy product for the users of all fisheries community, which have or do not have Internet connection.

A CD version of the database has also been created about catfishes of India describing taxonomy, common name, group name, vernacular name, synonyms, habitat, resident environment, distribution, morphological characters, economic importance, endangered status and fishery information in addition to fish photographs and references that can serve as a model for development on other groups of elsewhere. The system has 169 catfishes with photographs and references. The system took substantial time and effort in collecting and collating the data besides development. However, the effort has been worthwhile, as initial use of the system was high and user feedback very positive. We found that collection of data on catfishes from different ecosystems of our country is much difficult and time consuming than we expected. The database on CD-ROM may be obtained by writing to the Director, NBFGR, Canal Ring Road, Post – Dilkusha, Telibagh, Lucknow (Uttar Pradesh), India -226002. To implement and use this application on Intel x86 machine running Microsoft's Windows XP, MSACCESS and dot net framework are minimum prerequisite.

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