# Exploring the Systematics of Marine Biodiversity with Special Reference to Poriferans

Muthukumar .S*[1,2], R. Selva Meena[1], Smitha Ravi[1], Sharmila Anishetty[2], N.V. Vinithkumar[1], R. Venkatesan[1], R. Kirubagaran[1] and S. Kathiroli[1]

[1] National Institute of Ocean Technology, Velachery-Tambaram main road, Pallikaranai, Chennai 601302, India.
[2] Centre for Biotechnology, Anna University, Guindy, Chennai - 600025, India.

 Abstract-Oceans,   with   its   varying   environmental conditions, harbour the richest biodiversity on earth and remain as a treasure home for evolution of new species. Understanding   the   species   systematics   in   such   an environment is one of the challenging tasks of our future generation. The present work deals with the development of marine taxonomy tree – a database.  Tree view is a simple  way  of  representing  the  systematics,  which  is prepared with the support of 'open source technology' Pre processor hypertext (P.H.P.) for scripting and 'Mysql' for database.  The collection and compilation of data are done to  form  a  database  on  porifera  using  mysql.  Phylum Porifera,  being  one  of  the  major  groups  in  the  marine habitats, is reported to contain more than 8000 species. Data for about 1700 species of this phylum have been listed to form a taxonomic tree in the present study. It also includes all the marine phyla classified up to order level.

 Index Terms— Marine Taxonomy, Proifera, Database and Open source

## I. INTRODUCTION

Marine environment, which covers about 70% of our planet's surface remains relatively unexplored and provides space for marine living resources. The coastlines of the world measure about 312,000 km and a volume of $137 \times 10^6$ km$^3$ and it is the major ecosystem in earth to be used by man for a variety of purposes [1]. Naturally, a marine ecosystem comprises of species with rare composition of compounds with prominent pharmaceutical values. Taxonomic knowledge plays a key role in the identification of such species. The significance of the variability of the life and its variety, conservation paradigm should consider a seamlessly integrating information base for holistic action [2]. Multidisciplinary perception to explore the existing marine ecosystem will facilitate to understand and appreciate their diversity. The majority opinion among conservation biologists today is that they still understand too little about ecosystem functions to say for sure which species are the 'load-bearing' ones, whose presence keeps a complex, multi-tiered ecosystem from collapsing into some worst case dull scenario of rats, roaches and invasive  grass [3].Carl Linnaeus set off

the Science of classification in his masterpiece the System Naturae. This invention guided the classification system to establish consensus on plant and animal names and to understand complex evolutionary relationships between organisms. It is the basis for any biological research and remains as one of the burgeoning field until now. The ever-growing evolution of new species and its discovery leads our taxonomic science with novel perspectives to encounter biodiversity. The conservation and utilization of biological diversity requires comprehensive knowledge about the species distribution so as to keep the ecological balance in an environment [2]. Marine Taxonomy Tree is one such approach, which aids in appreciating the science of systematic classification of species under marine environment.

The marine taxonomy tree is classified into five kingdoms with fifty-four phylum with hundred and nine classes, further classified into four hundred and thirty orders. Except Monera, taxonomic classifications carried out up to order level for the other four kingdoms. One thousand seven hundred marine important species under the phylum porifera were included to form the tree. Whole concept behind the marine taxonomy tree is to create easy way of discernment towards taxonomy hierarchy just by clicking on a web interface.

Open source is widely preferred for scientific solutions since it is robust towards futuristic outlook. Marine taxonomy tree is built-using PHP, Mysql and Apache that are the major open source technologies, highly preferred for web based  solutions.  Apart  from  it,  commercial  tools  like Microsoft Excel and Access are used for data collection and conversion. Interface is designed using technologies like Hyper Text Markup Language (HTML), Cascading Style Sheet (CSS), and Asynchronous JavaScript and XML (AJAX). In any event, this is one of the few fortunate instances that India's traditional strengths are in perfect harmony with the modern ones, and the openness of economy, openness  in  knowledge  availability  and  openness  of opportunities is sure to spur the open source software movement even faster [4]. Therefore, in this study, we attempt a comprehensive systematics of marine biodiversity with special reference to poriferans.

## II. MATERIALS AND METHODS

Data were collected from published resources and standard databases available on biodiversity information. The collected data were formatted for our needs using excel sheets. The excel data were further converted to database using Access and finally the data were pooled into the database using Open Database Connectivity (ODBC) driver for Mysql. Marine Taxonomy Tree database designed using eight tables. Database design was carried out using normalisation and their relationships are shown through the figure.

HTML and CSS were mainly used to develop the interface. Apart from it PHP and AJAX were used to interact with the database and fetch out the results. PHP besides being a popular language on web works well against Mysql since both exist as an open source. Functions were configured using PHP so that on every click data to be pooled up from Mysql to generate the Tree. Apart from it AJAX were used to update the database using previously available data. The idea was to avoid redundancy as well as to avoid the spelling misinterpretation. Typing the first alphabet gives suggestion of names under the titel so that it can be typed out for adding new species.

## III. RESULTS AND DISCUSSION:

Systematic classification of species is a standard, which exists for about three centuries without much of alteration. There are many biodiversity information portals, which keeps up their database piled more than million records on species, like Global Biodiversity Information Facility (GBIF) and Ocean Biogeographic Information System (OBIS). Database can be further put to advanced niche modelling to derive species distribution and potential habitats as defined by its biophysical parameterization [2]. The systematics of marine biodiversity will facilitate us to realize the richness of marine ecosystem. This marine taxonomy tree is one such effort, which brings a flow chart for marine taxa in that way building better views to explore the systematics of marine biodiversity.

Ocean being the largest ecosystem with varieties of forms like deep ocean, estuaries, intertidal region, sea mounts, hot springs, glaciers, coral reefs, mangroves, and seagrass beds. Species and their particular bionetwork are essential component in such system to maintain their balance. Systematics of species plays a vital role in figuring out their radiance with every other biological science. Rapid changes in biodiversity are occurring globally, yet the ecological impacts of diversity loss are poorly understood [5]. The significance of this science in the marine arena is something, which is in need of high-quality survey since it is reported around 230,000 marine species are known although estimates of the total number in the world's oceans and seas are between 1.4 million to 1.6 million. Declining biodiversity thus facilitates invasion in this system, potentially accelerating the loss of biodiversity and the homogenization of the world's biota [6]. Awareness
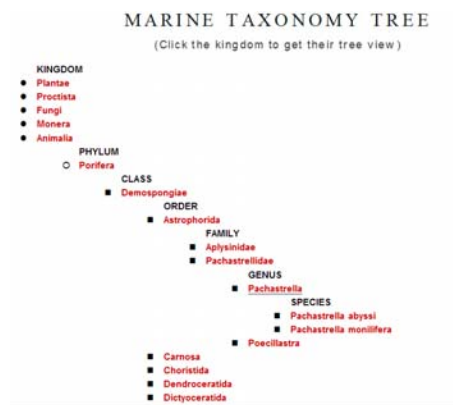
has to be initiated to recognize the importance of ecological data and their role in preserving the eco system.

Figure 1
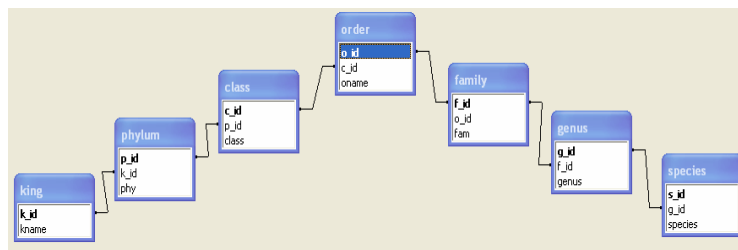


Relationship diagram shows the data flow of the database

Figure 2



Tree view from our website

### REFERENCES

[1] S. Das, P.S. Lyla and S.A. Khan. 2006. Marine microbial diversity and ecology : importance and future perspectives. Curr. Sci. 90:1325-1335

[2] M.S.R. Murthy, G.S. Pujar and A. Giriraj. 2006. Geoinformatics-based management of biodiversity from landscape to species scale – An Indian perspective. Curr. Sci. 91:1477-1485

[3] E. Marris 2007. What to let go? Nature 450: 152-155

[4] N.V. Joshi. 2005. Open source software: The silent revolution. Curr. Sci. 89: 1643-1644

[5] J.J. Stachowicz, R.B. Whitlatch and R.W. Osman. 1999. Species diversity and invasion resistance in a marine ecosystem. Science 286:1577-1579

[6] M. Solan, B.J. Cardinale, A.L. Dowining, K.A.M. Engelhardt, J.L. Ruesink, D.S. Srivastava. 2004. Extinction and ecosystem function in the marine benthos. Science 306: 1177-1180