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Review Article

Indian Ascidians – Potential Candidate for Research – A Review

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Abstract

A review of research on Indian ascidians with possible areas for further research is focused. An extensive biological resources study on ascidians of Indian coast has revealed the occurrence of 359 species belonging to 38 genera and 10 families. The report of 183 species of ascidians belonging to the family Didemnidae which are producers of pharmacologically potent natural products ranks them the most potential candidates for research.
Key words: Ascidians, pharmacology, natural products, nutritional supplement

Introduction

Ascidians are marine sedentary organisms – commonly called "Sea Squirts" because of their habit of squirting a jet of water when disturbed. They are found distributed from the littoral zone to the deep sea. Ascidians settle on almost all marine under water structures like, hard rocks, stones, hull of ships, branches and roots of sea weeds, piers, pilings, test panels, buoys, floats, cables, harbour installations, and materials used for aqua culture operations. They occur as the major components of fouling community.

In systematic position they come under phylum Chordata, subphylum Urochoradata and Class Ascidiacea. From evolutionary point of view they occupy a place between the Invertebrates and the Chordates as they are members of the group Prochrodata.

The most important characteristic features of ascidians is the presence of a protective outer covering called test or tunic, tailed free swimming larva during development and the notochord in the tail region of the larva. They are broadly classified into two groups - the simple ascidians which are solitary living singly and the colonial ascidians in which many individuals called zooids live together to form a colony.

Tropical marine habitat provides favourable features of environment such as suitable substratum for attachment and temperature which promotes continuous breeding of ascidians. Though India is a tropical country with a vast stretch of coastline extending to several kilometres, there is a popular belief among the biologists that the ascidians are rare and extremely poor with respect to number of species and abundance. In spite of being conspicuous and macroscopic very little attention has been given to this group in India. India lags behind the rest of the world, not only in the taxonomical study of the ascidians but also on other aspects like biochemistry, microbiology, toxicology, breeding, aquaculture etc.

Status of Ascidian survey in India

Work on Indian ascidians started in 1915 and till 1992 – a long gap of 77 years only a meagre number of 44 species of ascidians belonging to 8 families and 21 genera have been reported (Oka, 1915; Gravely, 1927; Das, 1936; 1945; Sebastian 1952-1959; Sebastian and Kurian, 1981; Renganathan, 1981a-1986; Krishnan et al., 1989). A preliminary survey of the littoral zone along the Gulf of Mannar during the period 1994 to 1997 by the author yielded 2 more families, 5 more genera and 41 species as new records to Indian waters of which 9 species were new to science (Meenakshi, 1997-2005; Meenakshi and Renganathan, 1997-1999b; Meenakshi and Venugopal, 1999; Meenakshi and Senthamarai, 2004-2006c) bringing the total number of ascidians reported from India to 85.

An extensive biological resources study on the ascidians of the Indian coast – the first of its kind in India was carried out by the author by fixing 21 stations from Vishakhapatnam in the east coast to Mumbai in the west coast during the period 2000 – 2003. Based on the results of this initial survey, a sincere and deeper analysis of the coastal districts of Tamil Nadu was done by

fixing 520 stations. Nearly 2100 samples of ascidians were collected. The study revealed the occurrence of 359 species of ascidians belonging to 38 Genera and 10 families, among which 12 genera and 303 species are new. The most significant finding of that field survey was the report of as many as 183 species of ascidians belonging to the family Didemnidae which are producers of pharmacologically potent bioactive compounds.

Lack of taxonomists a concern

Indian subcontinent is blessed with a rich marine fauna, but it is pitiable that only 30% of them have been identified and the remaining is unexplored. Many animals in the ocean live and vanish even without being noticed by us. Hence they hardly find a place in the faunistic list of our natural resources. It is unfortunate that the study of biological taxonomy has not been given due recognition in the field of research. This attitude needs to be changed and utmost importance should be placed in this much neglected but very important field of activity to strengthen it considerably.

Possible areas for further research:

Table-1: Families Reported From India

S. No	Family	S. No	Family
1	Polyclinidae Milne Edwards, 1841	6	Ascidiidae Adams and Adams, 1858
2	Holozoidae Berril, 1950	7	Corellidae Lahille, 1888
3	Polycitoridae Michaelsen, 1904	8	Styelidae Herdman, 1881
4	Didemnidae Giard, 1872	9	Pyuridae Hartmeyer, 1908
5	Perophoridae Giard, 1872	10	Molgulidae Lacaz-Duthiers, 1877

Table-2: Genera Reported From India

S. No	Genera	S. No	Genera
1	*Aplidium Savigny, 1816*	14	*Ascidiella Roule, 1984*
2	*Sidnyum* Savigny, 1816	15	*Rhodosoma* Ehrenberg, 1828
3	*Polyclinum* Savigny, 1816	16	*Styela* Fleming, 1822
4	*Distaplia* Della Valle, 1881	17	*Cnemidocarpa* Huntsman, 1912
5	*Eudistoma* Caullery, 1909	18	*Polycarpa* Heller, 1878
6	*Didemnum* Savigny, 1816	19	*Monobotryllus* Oka, 1915
7	*Tridemnum* Della Valle, 1881	20	*Polyandrocarpa* Michaelsen, 1904
8	*Diplosoma* Macdonald, 1859	21	*Eusynstyela* Michaelsen, 1904
9	*Lissoclinum* Verril, 1871	22	*Symplegma* Herdman, 1886
10	*Perophora* Wiegmann, 1835	23	*Botrylloides* Milne Edwards, 1841
11	*Ecteinascidia* Herdman, 1880	24	*Pyura* Molina, 1782
12	*Phallusia* Savigny, 1816	25	*Microcosmus* Heller, 1877
13	*Ascidia* Linnaeus, 1767	26	*Molgula* Forbes and Hanley, 1848

Table-3: Genera As New Records To India

S. No	Genera	S. No	Genera
1	*Synoicum* Phipps, 1774	7	*Polysyncratom* Nott, 1892
2	*Aplidiopsis* Lahille, 1890	8	*Atriolum* Kott, 1983
3	*Cystodytes* Drasche, 1884	9	*Echinoclinum* Sluiter, 1909
4	*Polycitor* Renier, 1804	10	*Botryllus* Gaertner, 1774
5	*Exostoma* Kott, 1990	11	*Boltenia* Van Name, 1945
6	*Leptoclinides* Bjerkan, 1905	12	*Ctenyura* Van Name, 1918

Lack of collecting efforts is one of the main reasons for the report of a very few number of ascidians from the Indian coast. Arranging expeditions, to collect deep ascidians from Indian waters is suggested.

Through CAT (Computer Aided Taxonomy) identification of specimen can be made easier. Bar coding of Indian ascidians and preparation of a catalogue of much help to biochemists, immunologists, microbiologists and other researchers to identify their ascidian collection.

Ascidians are excellent materials for several experimental studies like tissue regeneration, immunology, budding, colony organization, embryology, bioaccumulation of elements like vanadium, zinc etc.,

Investigations on population studies, diversity, food selection and utilization by this important group should be carried out.

Preliminary studies on the seasonal abundance, recruitment and succession of ascidians in the fouling community has led to the opening of new venues for research on bio-film, substrate preference, antifouling, defence mechanism etc.

Studies on alien ascidians are rare in India. Hence a constant monitoring of new entrants into the harbour areas can be attempted.

A thorough knowledge of the breeding season of ascidians common in the fouling community has to be acquired which is an essential prerequisite for evolving effective measures of overcoming their menace.

Ascidians are producers of amino acid derived secondary metabolites. Investigations of taxonomically diverse ascidians could reveal a variety of pharmacologically potent natural products.

Most of the microorganisms which cause infectious diseases in man are rapidly developing resistance towards traditional antibiotics. Screening of Indian ascidians for unprecedented novel natural products which can act as antibiotics could be carried out.

Ascidians elsewhere in the world have been proved to contain chemicals with unique antiviral, antitumour, anti-inflammatory, anti-leukaemic activity. Similar work on Indian ascidians could be taken up.

The magnitude of over and ever increasing need for food protein has made it necessary to explore other protein sources, to supplement part of this need ascidians can be exploited.

Ascidians are consumed as food in many parts of the world and are sufficiently important to merit an entry in FAO Year Book of Fishery Statistics. Indian ascidians have to be analysed for their nutritive value.

Like other marine food products ascidians are delicious, relatively easily digestible and offer minerals, iodine and vitamins.

Ascidians have a high breeding capacity and a faster growth rate facilitating their culture in open sea farms. Cultivation of ascidians thus has a great potential for the production of protein rich quality food.

Ascidians can replace other animal proteins which are expensive and serve to improve our nutritional status and help in preventing protein deficiency malnutrition in children.

Specialised products and dishes like soups, jellies, sausages, jams, pickles and similar ready to eat food materials can increase their market value and earn foreign exchange. When their novel uses are established steps can be taken to conserve and culture them.

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