

Status of Bioprospecting of Marine Molluscs in India

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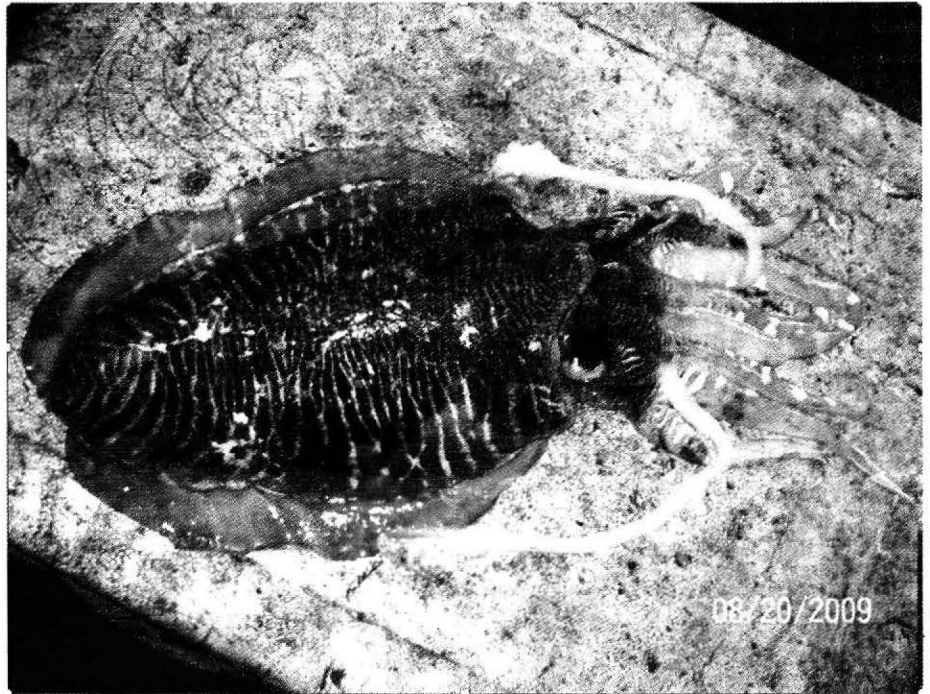
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Continuous pressure on the environment arising inevitably or otherwise out of technological progress and human population growth has made it necessary to place a commodity value on biodiversity (Randall, 1991). The provision of unprecedented biologically active compounds is one aspect of biodiversity that has been widely recognised (Eisner, 1990; Wilson, 1994; Beattie, 1994). There has been a lot of interest in the discovery of natural products as a source of new pharmaceutical agents (Beattie, 1994; Cragg *et al.*, 1997). This has been sparked by growing problems such as, the evolution of resistance to antibiotics, the increased occurrence of some diseases (e.g. cancer, tumor) and the evolution of new diseases (e.g. HIV). Coupled with this is the rapid rate of species extinction and the continuing threat to biodiversity. These factors created an International Society called as the International Society of Chemical Ecology (as a follow-up of Goteborg Resolution), which called for an increased effort to expand the search for new natural products (Eisner and Meinwald, 1990).

'Bioprospecting' is a word that has been recently coined to describe the centuries-old practice of collecting and screening plant and other biological material for commercial purposes, such as the development of new drugs, seeds and cosmetics. Bioprospecting is also defined as the systematic search, classification and research on new sources of chemical compounds, genes, proteins, and micro-organisms, for commercial purposes with real or potential economic value, which are found in biodiversity.

Bioprospecting is the collection of biological material and the analysis of its material properties, or its molecular, biochemical or genetic content, for the purpose of developing a commercial product. It is otherwise called as Biodiscovery. Biological material for bioprospecting activities can come from two main sources: directly from its natural environment, or from a collection. If biological material is collected from its



Cuttle Fish, *Sepia pharonis*

natural environment, it could be taken from a number of ecosystems, namely terrestrial, freshwater or marine. If the biological material has already been taken from its natural environment and placed in a collection, for example, in a zoo, an aquarium or a culture collection, this can be an alternative source of interesting material for bioprospecting activities.

History of Bioprospecting

Humans have always looked for plants and animals they could use to make life easier. However, they discovered that certain foods and beasts of burden could be used for more than basic subsistence. Archeologists are finding that some biotechnologies, such as the use of herbs for medicine and the use of fermentation and yeast in food products, date back 5,000 to 10,000 years (De Miranda, 2004). Many of the historical uses of enzymes, proteins, and other biological materials have been understood by scientists, physicians, and nutritionists for quite some time, while

others are still being discovered.

Molluscan Resources of India

In India, till now, 5,070 species of Molluscs have been recorded of which, 3,370 species are from marine habitats. From the available data, it is possible to identify certain areas having rich molluscan diversity. Andaman and Nicobar Islands have a rich molluscan diversity, which includes over 1,000 species from the marine region. Gulf of Mannar and Lakshadweep have 428 and 424 species respectively. Eight species of oysters, two species of mussels, 17 species of clams, six species of pearl oysters, four species of giant clams, one species of window-pane oyster, and other gastropods such as Sacred Chank, *Trochus*, *Turbo* as well as 15 species of cephalopods are exploited from the Indian marine region (K. Venkataraman and Mohideen Wafar, 2005).

Bioactive molluscan resources: The natural products isolated from marine



molluscs have been tested for a broad range of biological activities. Molluscan metabolites have been most commonly tested for neuromuscular blocking action, anti-predator, antimicrobial, anti-neoplastic and cytotoxic activity. Perhaps the most promising metabolite isolated from a marine mollusc is Dolastatin 10, an anti-neoplastic peptide isolated from the sea hare *Dolabella auricularia* (Pettit *et al.*, 1987). The medical properties of this sea hare were known to the ancient Greeks and Romans, with the extracts being recommended for the treatment of some diseases as early as 200 BC (refer to Pettit *et al.*, 1987). Dolastatin 10 has recently reached clinical trials in the United States and is reported to be one of the most potent anticancer agents known (Carté, 1996). Toxic peptides produced by predatory snails in the genus *Conus* also provide a valuable resource. These toxins are being used as tools for neurological research (Carté 1996) and are being traded as strong pain killers and potential drugs against epilepsy, depression and schizophrenia (Concar 1996). These two examples demonstrate the potential for isolating commercially viable metabolites from marine molluscs.

Ziconotide is a 25-30 amino acid linear peptide exhibiting three disulphide bonds; it occurs along with other peptides in the venom of the predatory Indo-Pacific marine molluscs, *Conus magus* (Olivera, 2000). *Conus magus* and other *Conus* species are fish-hunting molluscs that use their venom to paralyse their prey (Kohn, 1956). Again the deadly nerve toxins, i.e., conotoxins, block channels regulating the flow of potassium or sodium across the membranes of nerve or muscle cells. Others bind to N-methyl-D aspartate receptors to allow calcium ions into nerve cells and some are specific antagonists of acetylcholine receptors responsible for muscle contraction. Thus conotoxins are valuable probes in physiological and pharmacological studies (Myers *et al.*; 1993). The remarkable analgesic activity of Ziconotide (the compound proved to be 1,000 times more active than morphine in animal models of nociceptive pain) is due to the blockage of calcium channels (Mc Cleskey *et al.*; 1987 and Olivera, 2000).

Antimicrobial, cytotoxic, antitumour, tumour-promoting, anti-inflammatory and antiviral agents have all been isolated from sessile, soft-bodied marine organisms (Carté, 1996). The chemicals that have evolved to protect these benthic organisms are intrinsically bioactive and are often highly active in too many pharmacological

assays to be used directly as drugs (Faulkner, 1995a). Sea hare, *Aplysia* spp. which is a shelled organism, produces a substance that has undergone clinical trials for the treatment of cancerous tumours. It produces a compound that shows good potential for curing bladder cancer in human beings.

The Conservation Status of Marine Molluscs

The present state of knowledge on the conservation status of marine molluscs is poor. The criteria for assessing the conservation status of marine species are largely based on terrestrial situations and are generally not considered appropriate for marine taxa (Allison *et al.*, 1998; Ponder, 1998; Chapman, 1998). There is currently little understanding of the rarity of marine invertebrates or threats to marine habitats. Therefore, it is essential that an understanding of these factors is developed, in order to conserve marine biological diversity. Research aimed at improving the baseline data through systematic assessment of marine biota is necessary (Endangered Species Advisory Committee (ESAC), 1996; Dept. Environment Sport and Territories (DEST), 1997).

Habitat Protection : The identification and protection of important habitats and representative ecosystems is essential for conservation. Given the general shortage of time and funding, rapid recognition of threatened habitats containing large numbers of endangered and endemic species (the hot spots) could be essential for conservation. Wilson (1994, pg 320) has suggested "the primary tactic in conservation must be to locate the world's hot spots and to protect the entire environment they contain". This will require habitat mapping, community descriptions and inventories to provide an adequate assessment of conservation status (ESAC, 1996).

This "ecosystem approach" is vital if we are to ensure the health of our oceans for future generations. An ecosystem approach promotes both conservation and the sustainable use of marine resources in an equitable way. It is a holistic approach that considers environmental protection and marine management together, rather than as two separate and mutually exclusive goals. Paramount to the application of this approach is the establishment of networks of fully protected marine reserves, in essence, "national parks/ sanctuaries/

biosphere reserves" of the sea (The Wandur National Park located in the Andaman and Nicobar Islands in the Indian Ocean, First marine national park of India, Gulf of Kutch, Gujarat, Gulf of Mannar Marine National Park, TN). These provide protection of whole ecosystems and enable biodiversity to both recovering and flourishing of marine resources in general and molluscan resources in particular.

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2000 Outstanding Intellectuals of the 21st Century – 2010

Maheswarudu Gidda has a place in the list



Dr. Maheswarudu Gidda, Scientist-in-Charge, Visakhapatnam Centre of CMFRI.

The Editorial Board of International Biographical Centre (IBC), Cambridge, England has unanimously agreed that the biography of Dr. Maheswarudu Gidda is worthy of inclusion within 2000 Outstanding Intellectuals of the 21st Century. His biography has now

been assigned to one of the International Biographical Centre's Senior editors who will be working to compile his entry into the Centre's standard biographical format.

The publication on 2000 Outstanding Intellectuals of the 21st Century being brought out by the IBC, Cambridge, accurately profiles the foremost illuminati in the world and it is anticipated that demand will be high for this title, with the various high-profile Research Institutes and Libraries across the globe showing great interest in acquiring this important biographical research work.

The prestigious inclusion of the biography of Dr. Maheswarudu Gidda, presently Scientist-in-Charge, Visakhapatnam Centre of CMFRI is a great honour not only to Dr. Maheswarudu but also for all the marine fisheries scientists of India.

Purse seine Nets Supply by Garware Wall Ropes Ltd., Pune to Faroe Islands in Southern Pacific

In the recent years, Garware Wall Ropes Ltd, Pune, India has emerged as a conspicuous supplier of polyethylene fishing nets to various foreign countries. One of the recent supplies made by company has been to a Faroe company, Vinnan. This company acquired a new purse seining vessel named as Tróndur í Gøtu, a 81.60 m long vessel with a main deck of 7.20 m, fitted with a main engine of 6,000 Kw.

Marine Products Exports from Indian cross \$2-b mark

Despite global recession and a stronger rupee, marine exports crossed the \$2 billion mark for the first time in the 2009-2010 fiscal, Ms Leena Nair, Chairperson of the Marine Products Export Development Authority (MPEDA) said. Indian seafood export volumes grew 10 per cent to 6,63,603 tonnes while realisation grew 15 per cent to Rs 9,921.46 crore during 2009-10. Foreign exchange earnings were up 10 per cent at \$2,105 billion.

Addressing a press conference in Kochi, Ms Nair said the industry had been impacted by a host of factors beyond its control but for which the realisations would have gone upto Rs. 200 crore and \$50 million during last year. Shrimp continued to dominate Indian seafood exports accounting for 42 per cent of dollar realisations. The strengthening of the rupee continued to daunt Indian exporters. As a result, the unit value realisation from shrimp export increased by a meagre 1.53 per cent.

Frozen fish repositioned itself as the principal item in terms of quantity and second largest in value. Dominating the volumes, it accounted for 38 per cent of the total quantum of marine exports realising 20 per cent of the total foreign exchange earnings.

Garware Wall Ropes Ltd., Pune participated in the supply of a full set of fishing gear that included a pair of brand new purse seines. Garware Wall Ropes Ltd., has the distinction of supplying fishing nets and webbings to several foreign fishing companies. The facilities at its net making plant at Pune are at par with facilities at reputed fishing net making plants in the west.

Although cuttlefish exports continued to grow in volume and value, the foreign exchange earnings were hampered and there was seven per cent decline in unit value realisation. While export of squid registered a nominal growth in volume, the realisation in rupee and foreign currency registered a fall.

While several countries in the EU continued to reel un-der the after effects of the global recession, the region continued to be the largest market accounting for 30 per cent of the foreign exchange realisation. Accelerating exports to China made it the second largest buyer, accounting for 18 per cent of value realisations.

Although a late entrant into the big league, rapid export of frozen fish made the South-East Asian countries the third biggest buyer, accounting for 15 per cent of Indian seafood exports in value. Japan accounted for 13 per cent and the US 10 per cent.

Mr Anwar Hashim, President of the Seafood Exporters Association of India, said it was high time that Indian industry is elevated from a pre dominantly frozen fish exporter to value added fish products exporter to the South East and West Asian countries.