INTRODUCTION
It is widely believed that life originated first in sea, which subsequently migrated onto land. Whatever be the truth behind this, it is a fact that all ancient civilizations have sprung up alongside coastal areas or rivers. Faced with ever increasing population and depleting resources on land, man is, now once again forced to look into the potentialities of ocean to provide him with adequate food, energy, minerals and medicines. This is only natural, given the fact that ocean, our immediate neighbour, comprises of more than two-third of earths crust. It is believed that about 80% of earths animal life is in the ocean, numbering about 5-10 lakh species, distributed among 30 phyla.

Since time immemorial man was familiar with several classical drugs of marine origin. For example, carrageenan, isolated from red seaweeds was in use as a laxative since Roman times. Similarly, cod liver oil from the fish Gadus morrhhus is known as a good source of vitamin A and D for a long time. Also in use were spermacetti, from the head of sperm whale and protamine sulfate from the sperm of salmon.

Inspite of these early favourable leads, systematic studies in marine pharmacology / marine natural products could be started only about three decades ago. Many are the reasons for this rather late awakening. Perhaps the most important among them is the difficulty in collecting these samples from a relatively hostile environment and ensuring their repeat
collections as and when required. It is estimated that
greater than 10,000 terrestrial plants out of a total number
of 4,00,000 have been systematically studied chemically and
/ or pharmacologically. This figure might be even many times
more if we consider the large number of plants that might
have been less than thoroughly screened and prematurely
rejected. As compared to this, only less than 1% of marine
organisms have so far been similarly examined.

Recent advances in sample collection techniques including
SCUBA diving and use of submercibles as well as the modern
developments in extraction, isolation and purification of
compounds and the ability of chemists, aided by modern
spectroscopic aids such as IR, UV, NMR and MS to determine
the structures of compounds available in submilligram
quantities have lent a tremendous boost for research in this
area. This revival was pioneered by Bergmann and Nigrelli
during 1950's. The former isolated several cytotoxic
nucleosides' which eventually led to the development of anti-
leukemic drug Ara-C and antiviral drug Ara-A, while the
latter isolated several glycosides from various sea cucumbers
and studied their biological properties. Another important
compound is nereistoxin, a natural insecticide, isolated from
the worm Lumbriconereis heteropoda. It was first isolated in
1934 by Nitta, who also determined its elemental composition
as $\text{C}_9\text{H}_{17}\text{NS}_2$. It was subsequently reisolated by Hashimoto and
Okaichi in 1960, who proposed its correct structure. The
structure was finally confirmed by its synthesis by Konishi. Later a synthetic analog of this compound under the brand name "cartap" was marketed as an insecticide against rice stem borers by Takeda Chemical Industries Ltd. during 1970's. This insecticide is harmless to warm-blooded animals.

Besides, several compounds with useful biological properties have been isolated from various marine plants and animals during the past three decades. Many among them have since been accepted as useful drugs against various ailments. This includes compounds such as cephalosporin C, kainic acid, carrageenan, tetrodotoxin, saxitoxin, tedanolide, halitoxin, etc. Among these, cephalosporin C is an antibacterial compound active against a number of penicillin-resistant Staphylococci and several Gram negative bacteria. It is currently being marketed by Lilly Pharmaceutical Co. under the brand name Cephalothin. Similarly, kainic acid in combination with santonin is marketed under the name Digesan by Takeda Pharmaceutical Co. Ltd., Japan as a useful anthelmintic and vermifuge against tapeworm Taenia sp., the parasitic round worm Ascaris Lumbricoides and the whipworm Trichuris trichura. Carrageenan has been found to cause growth of connective tissues. Sodium alginate from the brown seaweeds is able to remove radio-strontium (Sr) from the body without affecting calcium metabolism. Tetrodotoxin and Saxitoxin are potent neurotoxins, toxic even at very low doses. Saxitoxin is 10⁴ times more potent than cocaine in
blocking action potentials. Its lethal dosage for man, based on studies of accidental death may be as low as 0.54 ng. The potent cytotoxin, tedanolide, isolated from a sponge *Tedania* sp. inhibits tumor cells at a concentration of $2.5 \times 10^{-4}$ (KB) and $1.6 \times 10^{-3}$ μg/ml (PS) arresting cell division and accumulating the cells in the S-phase\(^{4}\). Another interesting compound is halitoxin, isolated from the sponges *Haliclona rubens*, *H. viridis* and *H. erina*. It is a biopolymer of 1,3-dialkylated pyridine and exhibits potent cytolytic, hemolytic and toxic properties towards mice\(^{4}\).

The list is thus endless and is ever growing as vouched by the plethora of publications appearing on these topics lately. As part of our ongoing program on "Drugs from sea" we have screened a large number of marine organisms from Indian waters for various biological properties and also studied in detail the chemical constituents of a few active ones among them as described in TABLE 1 below.
TABLE 1: LIST OF ORGANISMS SELECTED FOR DETAILED CHEMICAL INVESTIGATIONS AS PART OF THIS STUDY AND THEIR PHARMACOLOGICAL PROPERTIES.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Pharmacological Activities</th>
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<tbody>
<tr>
<td>Padina tetrastromatica (algae)</td>
<td>Spasmogenic, antifertility, hypotensive &amp; antiamoebic</td>
</tr>
<tr>
<td>Ircinia ramosa KELLER (sponge)</td>
<td>Antiviral, CNS stimulant &amp; diuretic</td>
</tr>
<tr>
<td>Haliclona sp (sponge)</td>
<td>Antiviral &amp; antimicrobial</td>
</tr>
<tr>
<td>Lobophytmum strictum (soft coral)</td>
<td>Hypotensive &amp; antifertility</td>
</tr>
<tr>
<td>Actinopyga mauritiana (Sea cucumber)</td>
<td>Hypotensive, antimicrobial, hypoglycaemic &amp; antiamoebic</td>
</tr>
<tr>
<td>Tedania anhelans (sponge)</td>
<td>Spasmogenic &amp; Hypoglycaemic</td>
</tr>
</tbody>
</table>

During our systematic chemical investigations, several secondary metabolites, such as fatty acids, sterols, terpenoids, alkaloids, peptides and a reduced sugar have been isolated from these plants and animals by using modern chromatographic techniques (HPLC, Gel chromatography etc.) and their structures established from their spectral data (IR, UV-Vis, NMR & MS) and chemical transformations wherever necessary. As part of this study, we also developed a new method for quantitative analysis of fatty acid mixtures.
involving their facile derivatisation into the respective p-
nitrobenzyl esters followed by NCI mass spectral analysis. The results of these studies are described in detail in the following chapters.

LITERATURE CITED