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Evaluation of Progress in Marine Biology: A Review

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Review Article

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ABSTRACT

Background: The aim of this review to evaluate the recent progress in marine science especially in biology. With doubling in human population and galloping demand for food and shelter our all needs may be accomplished by Ocean. Now, we are more focused on exploitation of natural product from ocean. For this our knowledge in marine flora and fauna play important role.

Conclusions: This systematic review evaluated the studies, investigation and recent development in marine biology and their future prospects. A lots of worked have done in this field which shows the importance of this field. Thus, further research play an important role in our understanding about marine flora and fauna.

INTRODUCTION

The study of marine organisms, their behaviours, and their interactions with the environment is considered one of the most interesting fields. A marine biology is concern with plant and animals of marine origin. Both of these areas have direct applications and implications for our society [1]. Besides this it also includes wildlife preservation and protection of marine organisms. Other popular areas within the field of marine biology are environmental biology and toxicology.

Currently marine biology faces many problems with promising future. Marine ecosystems make a huge biome where every living organism interlinks to each other with a single medium i.e. water. So the biogeography of these living organisms is essentially needs time and hard work [2]. In last few decades our population almost doubled so for food security marine biota play an important role. All over the world thousands of scientists working in this field till date. More than two third earth surface is occupied by water. Primarily our major area of research is fish and fisheries so there is gap of knowledge in other marine organism.

Marine Flora

According to Karthik et al Diatoms made larger contribution to the total abundance (68%) of phytoplankton followed by Cyanophyceae (24%) and Dinoflagellates (8%). Silicoflagellates were numerically less (0.4%) [3]. The Hooghly estuary was chosen as the study site since it is the largest estuary of the River Ganges and should reflect the scenario better being a tropical well mixed estuary. The study revealed higher proportion of diatoms, dinoflagellates and Cyanophyceae than before [4]. Garcia et al, explained a relationships between the epiphytic meio-fauna and their host macro-algal

species [5]. They find that there is no relationship between structural complexities of the epiphyte with their host macro algae.

Coastal ecosystem

Although anthropogenic activities play a major role in coastal ecosystem sustainability but natural phenomena also affect this [6]. Stephen et al. observed that diversity and seasonal variations of species have a relation to environmental conditions [7]. The study contemplates on the modification of a diverse community of copepods of the creek salt works into a simplified ecosystem of low complexity based on the influence of environmental factors on the copepods density. Similar experiment was conducted by Hernández-Trujillo et al. with adult calanoid copepodsv [8]. The seasonal influence on fecundity, embryonic development and parental care of Amphiprion melanopus reared in aquaria was studied by Uthayasiva et al. [9].

The coral reef forms the habitat for many unique organisms like sponges, anemone, fishes and octopus. But anthropogenic activities causing threat to coral ecosystem. It's our duty to protect the coral reef and needs programme for sustainable development [10]. Vimal et al. studies the spatial variability of zooplankton during spring transition association with ACE (Anticyclone Eddies) and CE (Cyclone Eddies) in Bay of Bengal [11]. Udaya et al. were studied that anthropogenic factors affected the nutrient dynamics and phytoplankton biomass in the coastal waters [12,13].

Marine toxicology

The economic development within the coastal zone may result in the discharge of chemical contaminants into coastal ecosystems from sewage treatment plants, industrial point sources and urban and agricultural nonpoint source runoff for example DDT and PCBs [14,15]. However a group of scientist reported heavy metal toxicity in marine fishes like Cu, Zn, Mg, and Fe in muscle tissue (Fe > Zn > Cu > Mn) [16]. But the bioaccumulation of heavy metal in lower than the values recommended before. Similar experiment was done by KÜLCÜ et al. [17] and others [18,19] in some marine species.

Whereas Salahshur et al. developed a relationship between concentration of metal in shell tissue and the surface sediments for Cd, Pb and [20]. Similar test was conducted by Oyebisi et al. in two species of crab i.e. Cardiosoma armatum and Callinectes amnicola [21]. But the concentrations of metals observed in the crab samples were lower than the WHO permissible level of 2.00 µg/g for Lead (Pb) and Cadmium (Cd) in foods.

Not only heavy metal but also increase in CO2 concentration damages the marine ecosystem. In recent years scientific community are more focussed on ability of ocean to absorb excess CO2 [22,23]. A study was done by Amjed et al. at six stations around Port Sudan Harbour to correlate total macro zooplankton with the physical and chemical parameters in samples from the Sudanese Red Sea [24]. Oxygen, transparency and NO3 showed positive correlation with total numbers of zooplankton. It was observed that Shellfishes namely Ocypoda africanus, Penaeus notialis and Procambarus clarkii have the capability to concentrate in their tissues pesticide residues from sediments and water [25].

Arakawa et al. conducted a study on the marine environment to clarify the cause and the persistence of the seaweed forest depletion in the west coast of central Japan [26]. The studies of fouling of pioneer artificial substrates were conducted by Gabaev et al. in the vicinity of Primorsky Territory (Sea of Japan) and had concluded an asynchronism in reproduction of invertebrates [27]. The first record of association between the juvenile carangid fishes Caranx crysos, the jellyfish, Aurelia sp. and a floating plastic bag is reported in tropical rocky shores, northeastern Brazil [28]. Similar experiment perform by a group of eminent scientist [29-31].

Marine drug

Drug demands and their continuous supply is an important matter for medical field which might be resolved by new innovation in pharmaceutical sciences based on marine organism [32]. Antibiotic properties of certain marine product give us an opportunity to exploit our vast marine biota for medicinal purpose [33]. Some marine flora produced antioxidant and antiradial activities (e.g. Spirulina platensis) as reported by Shalaby and Shanab [34,35]. Lakshmi et al. have selected C. hornemanni to evaluate its antileishmanial potential [36]. A study was designed to evaluate the lipid lowering potential of total extract as well as several fractions from Pseudobryopsis mucronata by Lakshmi and Puri [37].This alga has been selected for lipid lowering activity because it showed lipid lowering effect in our random screening programme of marine flora. Kappaphycus alvarezii is red seaweed rich in polysaccharides. Sakthivel et al. were attempted to isolate polysaccharide from K. alvarezii and also tested for immunostimulatory effects on Asian seabass (Lates calcarifer) using Vibrio parahaemolyticus as a test pathogen [38].

Discoveries in fisheries science

Overexploitation is a common problem in fishing industries that can be resolve with scientific analysis of species for proper management [39]. The work of Costa et al. (2013) given us basic data on the growth and mortality of Paralonchurus brasiliensis captured in the inner shelf of São Paulo Southeastern Brazil [40]. Growth performance of African catfish, Clarias gariepinus fed Unical Aqua feed was carried out by Ekanem et al. [41]. Growth performance indices showed that weight gain (kg), growth rate (GR), specific growth rate (SGR) and mean growth rate (MGR) of C. gariepinus fed Unical feed was significantly different (P 0.05) from fish fed Coppens feed. Oliveira et al. performed a unique experiment in which they estimated the sex ratio and length-weight relationships for five marine fish species Mugil curema, Chloroscombrus chrysurus, Opisthonema oglinum, Hemiramphus brasiliensis and Lutjanus synagris, from the Brazilian coastal waters [42]. The results indicated a negative allometric growth for the species O. oglinum and C. chrysurus, and an isometric growth for M. curema and H. brasiliensis. A synchronous reproductive life cycle was showed by P. lividus (Sea urchins) across sites and between males and females [43]. Similar work was shown by Bhaby [44]. Narayani et al. were observed that method of feeding and food had a connection with the morphological characters [45]. The basic knowledge of the hematology and biochemistry of the Red Sea seabream Diplodusnoct was explored by Mahmoud et al. Their investigation might be helpful as a tool to monitor the health status of Diplodusnoct and will grant early detection of clinical pathology [46].

Marine microorganism and pathology

White Spot Syndrome Virus (WSSV) caused diseased in cultured shrimps and enhanced the mortality rate which leading to economic loss. We have no controlling mechanism regarding this but advancement in molecular biology has made it possible to understand its mechanism of infection and replication [47].

Rajpara et al. modified the methods for isolation of indigenous microorganisms using both low molecular weight (LMW) and high molecular weight (HMW) PAHs [48]. His work sort out the difficulties for isolation of microorganisms that can be used in bioremediation. How we can use Mathematical models for study of allelopathic interactions? To find out its answer Jean-Jacques et al. were conducted a survey in aquatic environment [49].

Oceanography and biogeochemical studies

Ocean is the source of minerals and nutrients which are circulated in different forms because of biogeochemical cycles [50]. The recycling of minerals is carried out by microbes as studied by World Ocean Circulation Experiment, which is a Joint programme of Global Ocean Flux and GEOTRACES [51].

Today with the help of Satellite mapping several geographical studies are going on e.g. for the study of Moroccan Atlantic Coast satellite data was used [52].For proper conservation and exploitation of marine resources our knowledge in distribution pattern is benef icial for us [53]. Jayanthi et al. surveyed the occurrence of Lesson's thick lip Plectorhinchus lessonii (Cuvier 1830), for the first time from the Andaman and Nicobar Islands, India [54]. Similar survey was done by Kannathasan et al. to identify the distribution and diversity of salps in the Northern Arabian Sea [55]. Similarly finfish resources were analysed quantitatively and qualitatively in regards to their abundance in ocean waters in southeast coast of India [56]. Selar crumenophthalmus (bigeye scad) locally known as mushimas, is a widely distributed fish in Maldives [57].Echinoderm species diversity in the coastal waters of South Andaman was investigated by Vishwas et al. [58]. Species richness was generally greater, higher levels were noted in Pongibalu and Chidiyatapu followed by Marina Par, Wandoor and Barmanallah. Sami et al. describes the first record of the P. argenteus in the Tunisian waters (Mediterranean Sea) [59].

CONCLUSION

There is a fundamental tension between resilient ecosystem, shaped by extreme events, and humans need for sustainable resources in a changing world. This tension is best understood through marine science, but best resolved through multi- disciplinary efforts [60]. Our land resources have limited capacity to complete the human demands. Consequently policy makers are seeing a new opportunity in vast marine ecosystem that fulfils their requirement [61,62]. We can exploit the marine flora and fauna for Pharmaceutical industries [25,33,36-38,63,64]. Fish is commonly used as food substitute in our daily life [40-42,65]. Algae can be converted into various types of biofuel, depending on the technique and the part of the cells used [66]. According to Sarkar et al. [67] macro benthos could be used as bio-monitors to detect pollution in estuaries [65,68]. The removals of pollutants (nitrate, silicate, chromium and sulphide) from

tannery wastewater were studied by Adam et al. using marine microalgae. The bioremediation is an emerging science to resolve the marine pollution [69-71].

Our growing population could not survive on planet earth without exploitation of all natural resources. The approach and focus of scientist is based on our needs but we can't forget its limits. Finally we can say that new discoveries in marine biology play a vital role in human survival. There are many topics which required immediate attention like sustainability of man with environment. Overall all efforts and approaches made by researchers in this field are satisfactory.

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