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Environment driven phytoplankton biomass to potentially alter food web interactions in northern hemisphere: study

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About 40% of the world's population live within 100 km of the coastline making it crucial to have a healthy marine ecosystems for livelihoods and food production. Anthropogenic stressors such as nutrient loading, light penetration and mixing within the water column can affect aquatic biodiversity and the function of seafood webs impacting the goods and services dependent on marine resources.

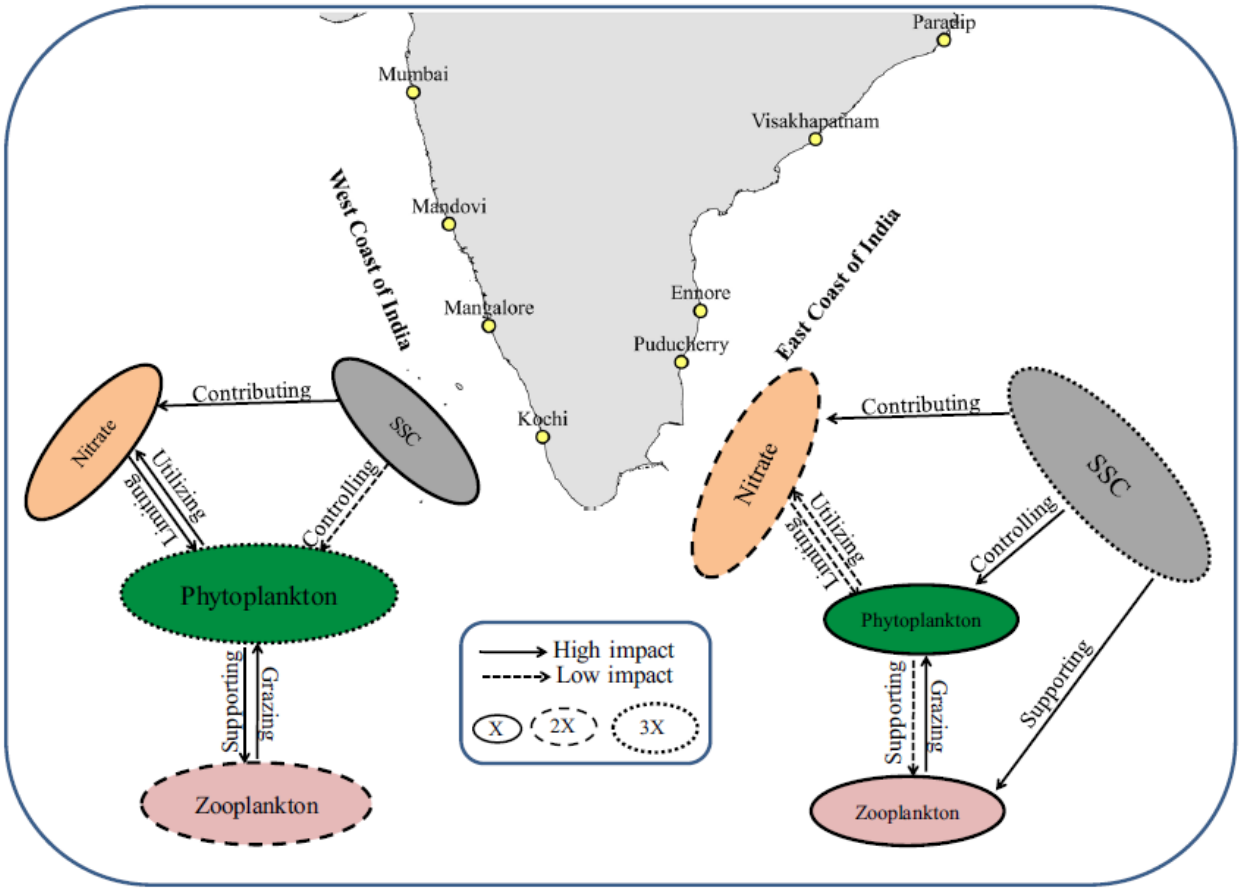

Figure: *Schematic diagram showing heterogeneous controlling factor phytoplankton biomass and various diet preferences of zooplankton with respective to regional influences along Indian coast.*

Primary production of Phytoplankton is often enhanced by nutrient loading from various sources like coastal freshwater runoff/rainfall, upwelling and cyclones/depressions including fertilizers, sewage, animal waste, atmospheric inputs and coastal aquaculture. But at the same time, it is often depressed by the high turbidity water produced via sediment discharge by the presence of suspended solid concentrations (SSC) which influences the transparency or light availability ultimately affecting the growth of phytoplankton in coastal waters.

Scientists at the National Center for Coastal Research (NCCR) have explored how changes in primary producers are affecting the secondary producers in the complex coastal system of the Northern Hemisphere between the Arabian Sea and the Bay of Bengal in the eastern part of the country. Phytoplankton is an indicator of marine primary productivity and an important component of the seafood web and regional fisheries, which has significantly altered the food web and ocean's ability to transform atmospheric carbon into living matter.

According to NCCR scientists, the current study as a baseline observation will help to understand the type of food web operating along the Indian coastline and accordingly the role of food preference of zooplankton on fishery yield.

Scientists found that the anthropogenic and regional influences have become the biggest driver of changes rather than monsoonal runoff in plankton biomass and plankton primary production along west coast of India (WCI) and east coast of India (ECI). Due to the seasonal discharge of sewage in WCI and ECI, the decay of the organic compounds present in the sewage releases large amount of ammonia with higher nitrate content. However, a threefold higher phytoplankton biomass has been observed along WCI than ECI due to low suspended solid concentrations (SSC) allowing strong utilization of these nutrients (nitrate) supporting secondary production of zooplankton thus considerably influencing the food web dynamics.

Nutrient such as nitrogen, phosphorous and silicate play a key role in phytoplankton abundance, growth and metabolism. However, higher concentrations of nitrate were found in ECI than in WCI due to huge quantities of fertilizers through the land runoff due to higher use of fertilizers in the east coast and potential consumption by autotrophs along west coast.

Author of the present study said, phytoplankton biomass growth is minimum along ECI due to higher load of SSC and removal of nitrate is also minimum. Moreover, zooplankton population was supported by phytoplankton biomass along WCI; on the

other hand, SSC is supporting as a food source for zooplankton population in absence of phytoplankton along ECI.

Scientists said that due to the ongoing climate change, world fisheries are economically suffering a lot. As per recent records on fisheries, the southwest coast provides 31% fishery yields and 26% from the southeast coast. Estimate suggests that global warming could cut the value of world catches from about 17 billion dollars a year to 41 billion dollars a year by 2050 with East Asia and the Pacific suffering the greatest losses.

Led by Manuri D. B., the research team comprised of Chandrasekaran M., Perumal M., and Mallavarapu R.M of NCCR, NIOT Campus, Chennai, Ministry of Earth Sciences. The study published in Environmental Science and Pollution Research.

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