Editorial

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Presentation of interdisciplinary research on Environmental Biology in each issue: JEB shows the way

After touching the mile stone of 40th year of service to society in general and scientific community in particular (see RC Dalela in *doi.org./10.22438/jeb/40/1/Editorial*), *Journal of Environmental Biology*(*JEB*) has introduced further productive steps, one of them being the **Editorial,** highlighting the importance of articles featuring in each issue.

The present issue (JEB vol. **40**, issue **2**, 2019) contains 19 articles, covering both basic and applied aspects of Environmental Biology. Since Rachel Carson's seminal work *Silent Spring* in 1962 on the organochlorine pesticides, a great attention has been paid to the indiscriminate use of persistent organic compounds in agriculture sector. Kaur *et al*. (in this issue) presented some valuable information about the presence of persistent organic pollutants such as PCB-28, from tissues of fish species *Cirrhinus mrigala, Heteropneustes fossilis* and *Catla catla* obtained from river Sutlej. In another ecotoxicological study using organophoshates, Samal *et al*. have observed reduced soil microbial growth and lowered exoenzyme activity due to pesticides.

Accidents during oil transport release oil spills and cause large scale ocean pollution, often with devastating effects on marine life. Although different oil dispersants have been developed to remove the spilled oils from sea surface, they probably do not reduce toxic effects to plankton and may even enhance the toxicity (see *doi.org/10.1016/j.envpol.2012.09.024*). Karam et al. (this issue) have quantified the toxic effects of crude oil, both dispersed and undispersed, to the fish (*Epinephelus coioides*) developmental stages. Cadmium is one of the highly toxic heavy metals to organisms and has no useful role in the metabolism of any species. Two works in this issue (Raychaudhuri *et al.* and Fadzil *et al.*) address the adverse effects of this heavy metal to biota. The results of these studies show that Cadmium toxicity was dependent on soil pH, higher toxicity at acidic range. When *Clarias gariepinus* was exposed to cadmium, cholinesterage activity was inhibited, in addition to histopathalogical alterations in the brain tissues. Whether accidental leakage of radioactive isotopes or the large scale nuclear disasters, organisms in the vicinity suffer from various adverse effects.Except a few taxa such as bdelloids rotifers and tardigrades(*doi:10.1073/pnas.0800966105*), most organisms can not resist gamma radiation doses>100 Gy. Using different doses of 250 - 450 Gy, Saha and Paul (this issue) found that the root system of Sesame (*Sesamum indicum*) was more sensitive than the shoot to gamma radiation. Evaluation of groundwater quality is a pre-requisite for governmental agencies and drinking water suppliers before using it as a non-hazardous resource. Ravindra *et al.* (this issue) analysed the groundwater quality from different locations in the Haryana State, India.

While most ecotoxicology workers are busy and quick in documenting the toxic effects of different substances to aquatic biota, only a few investigators actually attempt to offer adequate remedial measures to detoxify contaminated waterbodies. Triclosan is an antimicrobial agent widely used in personal care products. Yet, it is toxic to aquatic organisms including rotifers (*DOI:10.1016/j.ecoenv.2017.08.049*). Hur *et al.* showed that triclosan induce DNA damage in rat lymphocytes can be ameliorated by phytochemicals. The second contribution (Joseph *et al*.) aimed at improving fungal strains *Cladosporium uredinicola* and *Bipolaris maydis*) to detoxify tannery effluents. It is long known that sunken ships act as artificial substratum for colonizing a great variety of marine organisms including fish. Sreekanth *et al*. in this issue showed that a sunken ship during 1950s in the islands of Goa (India) harboured 50% higher number of fish species as compared to natural reefs. Arya *at al*., related the ontogenic development (from hatching up to 54 days) of lymphoid organs in *Catla catla* to the programming of fish vaccination.

Microbial applications in medicine, food industry, agriculture and environmental management have greatly improved the quality of human life. Vinoth *et al.* separated six isolates of plant growth promoting rhizobacteria which had potential as bio-fertilizer and bio-

fungicide. Chattopadhyay *et al*. compared the ability of bacterial (*Bacillus pumilus*) endospores with that of talc based formulation in obtaining better quality of jute fibre. Sowmiya and Ramalingam, attempted to obtain eco-friendly natural preservatives from *Lactobacillus plantarum* grown on the milk protein, whey. Saini *et al*. applied arbuscular mycorrhizal fungi together with *Trichoderma viride* and *Pseudomonas fluorescens* to delay flower senescence. Judicious application of fertilizers and evaluation of quality of the products are among the basic requirements of modern agriculture. *JEB*, while accepting contributions from authors, adheres to these principles. Sharma *et al*. tested the role of colemanite, a natural calcium borate mineral, in releasing boron to fertilize potato crops. Using histological and physiological tools, Vijaykumar *et al*. were able to distinguish between good and poor genotypes of soybean seeds. Similarly, using biochemical approach, Muralidhara *et al.* evaluated nutritional quality of fifty varieties of mango fruits.

Basically, research in environmental biology is an interdisciplinary approach that focuses on the relationships among microbes, plants and animals with environment. This holistic approach is fundamental in understanding how biological processes interact with their surroundings. Currently most research in the area of environmental biology is focused on the impact of pesticides, heavy metals, plastics and nanoparticles, oil spills, toxic cyanobacteria, pharmaceuticals and emerging contaminants on a great variety of organisms. Other associated aspects that also dominantly feature in environmental research are the wastewater treatment, habitat loss, climate change and invasive species, all of these suggest that the health of the environment eventually impacts human life. Although both field and laboratory-based methods for the assessment of soil, water and air available, there exists a distinct gap between what is available and what is needed to protect our environment. For example, for many ecosystems, baseline data are not available. Similarly, work related to the behavior of organisms in stressed ecosystems from an evolutionary perspective is inadequate. Data on the evaluation of fate of pollutants in ecosystems and development of safety standards for each category of pollutants are at best fragmentary. Because of these lacunae, models predicting long term trends are often inaccurate. Two areas that need to be more strongly integrated with the process of inter-relationships between organisms and environment are the application of molecular tools and environmental statistics.

Involvement of public in environmental awareness programmes including short term workshops and semi-scientific lectures is urgently needed. It is only with the participation and cooperation from public, further environmental degradation can be halted or already deteriorated ecosystems can be reversed. A notable example for this was shown by Edmondson who successfully communicated with local community to resolve environmental problems: recovery of Lake Washington from eutrophication during late 1960s (Edmondson WT 1991 The uses of ecology: Lake Washington and beyond. University of Washington Press, Seatle).

Simple laboratory experiments in toxicity evaluation can generate wealth of information which can be later used for formulating safety standards in water quality. For example, a three-week experiment on the demographic responses of the rotifer *Plationus patulus* exposed to DDT (doi.org/10.1007/BF00028292) provided basis for inclusion of this species as standard bioassay organism by both the American Society for Testing Materials (ASTM) and the American Public Health Association (APHA).

My interest in the area of Environmental Biology grew stronger with a publication on the haematological responses fish exposed to sublethal levels of cadmium (Current Science 51: 947-94, 1982). Soon, I got interested in working on taxonomy, ecology and ecotoxicology of freshwater zooplankton and more specifically on rotifers and cladocerans. In terms of *JCR* (*Clarivate Analytics, Web of Science*) or *Scopus* (*Elsevier*)-indexed works, together with my wife, S. Nandini, our laboratory (sites.google.com/site/profssssarma/) has generated the highest number of articles on the theme of Rotifera and Cladocera, 3rd highest output. Conservation of endangered species is an integral part of our research. For example, the Mexican axolotl, a salamander, is critically endangered in the wild. Experiments on its larval feeding behaviour on zooplanktonic prey indicated that compared to rotifers, cladocerans were consumed in greater numbers (*DOI:10.1163/156853811X610348*). Utilization of wastewaters to produce zooplankton biomass has also been attempted (*doi.org/10.1016/j.jenvman.2004.02.001*). This indicates that zooplankton species are capable of using the particulate organic matter present in the partially treated urban wastewaters. Similarly, utilization of toxic cyanobacteria as diet to zooplankton suggests that it is possible to culture rotifers, cladocerans and ostracods on a mixed diet consisting of toxic strains of *Microcystis aeruginosa* and green algae (*doi.org/10.1093/plankt/fbs040*).

In conclusion, in this editorial I attempted to summarize the research articles included in present issue of *JEB*. I also highlighted the current research needs of Environmental Sciences with particular reference to society.

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