Effects of Ganesh-idol immersion on some water quality parameters of Hussainsagar Lake

Immersion of idols of Lord Ganesh is carried out every year on the Ananta Chaturdasi day in the month of Bhadrapada (Chandramana calendar), i.e. either in August or September, after ten days of worship. Thousands of these idols are immersed in different water bodies such as lakes, reservoirs, ponds, rivers and canals in and around different towns and cities in Maharashtra, Karnataka and Andhra Pradesh. These idols are made up of plaster of paris, clay, and cloth supported by small iron rods, and are coloured with different types of paint such as varnish and watercolours. When immersed, these coloured chemicals dissolve slowly leading to significant alteration in the water quality. Thousands of Ganesh idols of various sizes reaching heights up to 45 to 50 feet are immersed in the Hussainsagar Lake in the twin cities of Hyderabad and Secunderbad in Andhra Pradesh. (The lake is constructed across Kalvaleru stream, one of the tributaries of Musi River passing through Hyderabad city. It is 3.2 km long and 2.8 km wide; its depth ranging from 2.5 to 12.5 m, with a surface area of 446 hectares.) Similarly, after Durga pooja, which occurs in the month of October, idols of Goddess Durga are also immersed in the lake.

Last year, we carried out an investigation to find out the effects of immersion of Ganesh idols on water quality of the lake, by collecting and analysing the water samples from the immersion sites of the lake before and after ten days of the event, following the standard methods[1].

We found that the concentration of calcium had increased significantly in the lake water after the idol immersion; however, it was below the limits of permissible standards. The average concentration of calcium in the lake water was much less compared to that at the immersion sites. Magnesium, molybdenum and silicon concentrations had also increased significantly in the lake water after the idol immersion. Though magnesium is non-poisonous, it increases the hardness of water. Over the years, the average concentration of heavy metals, especially arsenic, lead and mercury has also increased considerably in the lake water compared to the specifications of highest desirable limits as set by BIS and ICMR standards (see Table 1). Our measurements have shown that subsequent to Ganesh-idol immersion, the concentration of these metals increased perceptibly. The concentration of arsenic, a noxious trace element, has increased nine-fold in the lake water after the idol immersion, compared to its BIS and ICMR standards (Table 1). Excess of this element causes skin diseases. Though the concentration of iron in the lake water did not change much and was below the limits of standards, that of lead and mercury, the potentially obnoxious heavy metals, had increased many-fold in the water due to the idol immersion. Compared to the specifications of highest desirable limits of BIS and ICMR standards, the concentration of lead in the lake water increased more than three-fold, though its average concentration in the lake water is less than that at the idol-immersion sites. However, its concentration increased four-fold after the idol immersion. Further, we observed that the concentration of mercury, the causative chemical of the famous 'Minamata' disease of Japan, is high among that of the other trace elements in the lake water. It increased to more than five to six hundred times in the lake water, including that at the immersion sites compared to the specifications of highest desirable limits as set by BIS and ICMR standards. After the immersion of the idols, its concentration increased further, to more than seven-hundred fifty times in the water (Table 1).

Table 1. Changes in concentration (mg/l) of some chemical pollutants in Hussainsagar Lake water before and after the immersion of Ganesh idols

Chemical pollutant	X (mean) conc. in the water	Before immersion of idols	After immersion of idols	BIS and ICMR standards for highest desirable limits
Calcium	25.14	43.77	68.4*	75
Magnesium	7.785	6.590	10.02*	30
Molybdenum	0.090	0.149	0.354*	Not available
Silicon	3.537	2.954	3.826**	Not available
Arsenic	0.124	0.121	0.497	0.05
Iron	0.212	0.125	0.22**	0.3
Lead	0.289	0.351	0.45**	0.1
Mercury	0.689	0.5525	0.778**	0.001

Level of significance: *$P < 0.01$ and **$P < 0.05$.
‡Source: Goel, P. K. and Sharma, K. P., *Environmental Guidelines and Standards in India*, Technoscience Publ., Jaipur, 318 pp.

The heavy metals are known to be persistent in the aquatic environment, and gradually accumulate and magnify through the process known as bioaccumulation and biomagnification, while they move up in the food chain. Thus, lead and mercury may magnify in their concentrations at different trophic levels, including in fishes and birds inhabiting the lake, which finally reach the humans through food. Organic compounds of mercury, for example methyl mercury when it enters the human body, concentrates in the brain and destroys the brain cells, damaging the central nervous system, and also causes corrosion and ulceration of the digestive tract. Thus, people consuming contaminated fish caught from the lake over a period of time may get afflicted with mercury poisoning.

Therefore, it is suggested that the authorities looking into the environmental protection of the lake need to take necessary steps. Along with other measures, including strict implementation of central and state level legislation, they should conduct environmental awareness programmes, may be through different media, particularly before the 'Vinayakachauti' day, to educate the public of the city and make them aware of the harmful environmental effects of immersion of Ganesh idols in the lake and persuade them not to use this lake for immersion of Ganesh idols. This may to some extent reduce the pollution of water of this languishing urban lake.

1. APHA, AWWA, and WPCP, *Standard Methods for the Examination of Water and Waste Water*, American Public Health Association, Washington D.C., 1985, 16th edn, p. 1268.

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Predation of water bug *Sphaerodema rusticum* Fabricius on the snail *Pomacea bridgesi* (Reeve), introduced in India

Being a native of Peru, Bolivia, Brazil and Paraguay[1,2], the ampullariid snails *Pomacea bridgesi* are now thriving well in Florida[3], Hawaii[2] and in the countries of south-east Asia[4–6], including India[7]. They are a serious threat to taro[2] and paddy plants[8,9], and to gastropod fauna[4] of the introduced areas. Also, the fact that they may be involved with the spread of human diseases is of grave concern[10]. Therefore, attempts are being made to prevent their spread furthermore, and to keep the population density in check. Though voracity of *P. bridgesi* is on record[11,12], reports on the organisms devouring them are still wanting, with a view to develop the control strategy. Accordingly, we investigated the same by offering *P. bridgesi* to the water bug *Sphaerodema rusticum*, the most effective predator[13,14] of the endemic freshwater gastropod species experimentally, in the laboratory.

The required number of plastic containers (each 135 mm in diameter and 32 mm in depth), containing 250 ml pond water, laboratory-reared *P. bridgesi* belonging to the size-groups, 2.5–4.5 mm (the newly hatched snails range from 2.3 to 2.7 mm in shell length), 5.0–7.0 mm, 7.5–9.5 mm, 10.0–12.0 mm and 12.5–14.5 mm in shell length, and pond-collected adult *S. rusticum* were considered for the experiment. In all cases, 15 snails were exposed to a single water bug in a container, for a period of 24 h. Initially, experiments were performed with the snails with regard to their size-group, separately. Since the water bugs failed to capture the snails belonging to 10–12 mm and 12.5–14.5 mm size-groups, we finally supplied individuals belonging to the remaining 3 size-groups together in different combinations, taking at least 2 individuals of a size-group, to the predator to note the preference if any, for the specific sized prey individuals. Observations were continued for 6 consecutive days in the former and 39 days in the later experiments. *S. rusticum*, essentially a sucker of the visceral mass of *P. bridgesi*, sometimes consumed it completely (evident from dropping of empty shell from the rostrum) and sometimes, partially (evident from dropping of shell containing a portion of visceral mass). It is to be mentioned that, in cases of complete consumption a small amount of fibre-like material, following dropping of the shell, was seen hanging from the tip of the rostrum of *S. rusticum*. These fibres were, sometimes consumed or left in the water by the bug. Killing of the snails by such types of feeding was termed as ‘destruction’. Data were recorded accordingly, with respect to the feeding types, regularly, at the end of every 24 h. The snails were fed with lettuce and the water of the container was changed daily, adding fresh pond water. In all cases, mean and standard error (SE) were calculated to present the data. One-way analysis of variance (ANOVA)[15] was applied to ascertain whether the size of the prey individuals has significant impact on predation.

S. rusticum was seen to penetrate its rostrum into the visceral mass, suddenly when the snail opened its operculum. The snail tried to close the operculum, but failed to operate the same due to the strong barrier created by the predator by pushing its head into the shell cavity of the prey-snail trapped. The water bug required 25–186 min (average 81 ± 9.07 SE) (n = 18) to predate a single snail. A *S. rusticum* destroyed 3–9 snails, consuming 0–4 (completely) and 2–6 (partially); and 1–5 snails, consuming 0–3 (completely) and 0–3 (partially) daily, in single and mixed sized-group experiments, respectively. The average predation rates are shown in Figure 1 *a* and *b*. In mixed size-group experiments, irrespective of trials, the water bug destroyed 18.92, 36.03 and 45.05% *P. bridgesi* belonging to 2.5–4.5 mm 5.0–7.0 mm and 7.5–9.5 mm size-groups, respectively. ANOVA tests indicate that the rates of destruction as well as consumption of prey snails by *S. rusticum* differ significantly ($P < 0.05$) with the size of the snails offered. Also, it is evident that the rate of destruction of the prey by the predator differs significantly ($P < 0.05$), when offered different size-groups, groupwise or together.

Though some birds and reptiles are known to feed upon the golden snails in South America[16], no concerted attempt has ever been made to survey the invertebrates and microorganisms that attack them in their native habitats[6]. However, a pyrrochorid bug, *Dindymus pulcher* and the nymphs of firefly, *Luciola lateralis* are known to feed on *P. canaliculata* in the Philippines[6] and Japan[17], respectively. The results of the present investigation clearly indicate that the water bug, *S. rusticum*, is a voracious feeder of juvenile *P. bridgesi* and thereby, is effective in killing more number of individuals, daily. It is most likely that if the