The water entering the affected pond also showed very high NH$_3$-N levels (0.459 mg l$^{-1}$) and PO$_4$-P (0.622 mg l$^{-1}$). It was observed that after mixing with the affected pond water, because of its high dissolved oxygen concentration, the effect of high NH$_3$-N got nullified (Fig. 6). Hence the total toxic forms of dissolved inorganic nitrogen (ammoniacal and nitrite nitrogen) did not exceed the permissible levels of 0.1 and 0.5 mg l$^{-1}$ respectively. After mixing with the water in affected ponds, PO$_4$-P remained as such retaining the PO$_4$-P in dissolved form in water, because of the high DO in water of the affected ponds and no further oxidation of PO$_4$-P was possible.

Fig. 6. Dissolved inorganic phosphorous (DIP), dissolved inorganic nitrogen (DIN) and primary productivity in water

The high dissolved inorganic phosphorus (DIP) and low inorganic nitrogen species has resulted in a highly imbalanced nutrient ratio of N/P. The very high phosphate levels in water might have resulted from the house hold waste water which entered the affected pond. The bubbles on the pond surface indicated presence of detergent in water. Detergents that contain phosphates are highly caustic, and surfactant detergents are very toxic. Surfactant detergents are used to enhance the wetting, foaming, dispersing and emulsifying properties of detergents. Phosphate detergents are used to soften hard water and help suspend dirt in water.

Detergents can have poisonous effects on all types of aquatic life. All detergents destroy the external mucus layers that protect the fish from bacteria and parasites; plus they can cause severe damage to the gills. Most fish will die when detergent concentrations approach 15 parts per million. Detergent concentrations as low as 5 ppm can kill fish eggs. Surfactant detergents are implicated in decreasing the breeding ability of aquatic organisms.

Detergents can also add another problem for aquatic life by lowering the surface tension of the water. Organic chemicals such as pesticides and phenols are much more easily absorbed by fish. A detergent concentration of only 2 ppm can cause fish to absorb double the amount of chemicals they would normally absorb, although that concentration itself is not high enough to affect fish directly. The main contributors to the toxicity of detergents were the sodium silicate solution and the surfactants with the remainder of the components contributing very little to detergent toxicity. However, untreated or primary treated effluents containing detergents can pose a problem.

Advisory for improving water quality

It is essential that house hold effluents are to be properly drained out, without getting them mixed with natural embanked aquatic systems like, ponds, wells etc. The PO$_4$-P accumulation in the present pond can be managed with application of lime as CaCO$_3$, or CaMgCO$_3$ or CaO, in the pond soil. The pond sediment showed acidic soil reaction on observation of sediment pH (Fig. 4). Hence the addition of lime will not lead to excess alkalinity. Addition of lime induces phosphorous fixation as insoluble calcium phosphate, which removes excess phosphate from water and precipitates it in sediment by soil fixation and the nutrient imbalance can thus be overcome.

**Harvesting in situ microalgal feed by enriching seawater**

P. Kaladharan and P. K. Asokan

Research Centre of CMFRI, Calicut

Mixed populations of marine natural microalgae were continuously cultured at high density through seawater enrichment with the Walne’s medium, at the marine hatchery complex of Calicut Research Centre of CMFRI. Freshly collected seawater from Konnad beach, decanted after an hour of sedimentation to remove sand and debris, was transferred to big transparent containers. Seawater...
Diet composition of *Johnieops sina* (Cuvier, 1830) from Cochin coast

N. Venugopal and N. G. K. Pillai
Central Marine Fisheries Research Institute, Kochi

*Johnieops sina* is one of the commonest species constituting the jew fish fishery of the Kerala coast. The food and feeding of fishes becomes difficult to observe in their natural environment and therefore accurate determination of prey choice by fish species is indeed difficult. Rearing of fish in artificial environment may not reflect the exact feeding habits of particular fish. However, analysis of gut content is proven to be the method for determining feeding habits of any fish species. Samples were collected from three major landing centres such as Munambam, Kalamukku and Cochin Fisheries Harbour. A total of 1141 individuals of *J. sina* in different size groups ranging from 99-209 mm were sampled for the present study. In order to understand the seasonal variation in feeding habits, samples were collected in different seasons during the study period. However, samples were not collected during the month of July because of the annual ban on fishing along Kerala coast. All the individuals were segregated sex-wise after examining the gonad maturity stages. The stomachs were preserved in 5%