law fit to the age data obtained by counting of annual layers and by tagging the prominent stratigraphic transition to 10,750 yrs In such a scheme, the age error on deeper (and hence older) parts of the profiles increases progressively. Therefore, an age error of 2–4 kyr at 22-18 kyr interval is not unlikely. Similarly, different radiocarbon ages on different fractions of soil organic matter from the same sample have also been reported[15,16]. We, however, believe that the contemporaneity of inferred warming at 22–18 kyr from a large number of different locations spread over a wide geographical area in the Indo-Tibetan region may not be a fortuitous coincidence, but may represent a definite event at this time. At this lower end, the time bracket of 22–18 kyr also encompasses the period of LGM and it may, therefore, be tempting to correlate it with the LGM. Until more reliable independent dating evidence becomes available, the contemporaneity of events as indicated above may be accepted but with the possible sources of error kept in mind. In the above discussion we have ignored the problem associated with divergence of radiocarbon and calendar years, because most of palaeoclimatic data in this note as also in the literature, including the assignment of LGM to 18 kyr, are based on radiocarbon years.

Gupta *et al.*[17] have modelled the mixed layer of the Bay of Bengal as a well-mixed box and have estimated the degree of change required in the quantum of river discharge and/or its isotopic composition to cause the observed negative $\delta^{18}O$ spike in core SK-20-185. The model calculations show that if the increased run off from the east flowing peninsular Indian rivers had been responsible for the observed spike, the rainfall during NE winter monsoon at the time of the LGM should have increased by a factor of 5–10 depending on its $\delta^{18}O$ value. On the other hand, a melting of $< 10\,\mathrm{cm\,yr^{-1}}$ of the accumulated snow during the 22–18 kyr would easily cause the lowering of $\delta^{18}O$ of the mixed layer of the Bay of Bengal and account for the observed magnitude of the spike.

We have no direct observational evidence yet for the melt-water spike in the Bay of Bengal. There is, however, strong observational evidence for a warming event during the 22–18 kyr period through several independent proxy climate indicators from widely separated areas in the Indo-Tibetan region as discussed above[8,11,12,14,17]. This warming event could have provided the melt-water needed to explain the observed spike. Evidence for melt-water of the Indo-Tibetan origin can be obtained by a high resolution investigation of sediment cores from suitably selected locations in the Bay of Bengal which would have been directly influenced by such an influx of melt-water at LGM. A correct identification of the source of the spike is important for palaeoclimatic reconstruction of this region and may have profound implications for future modelling studies.

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Metal levels in zooplankton from Hooghly estuary, India

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We have measured the levels of Fe, Cd, Ni, Pb and Co in zooplankton collected from Chemagari creek of Sagar Island of Hooghly estuary. Among the metals studied Fe showed maximum concentration. The concentration of Pb and Co was below the level of detection limit throughout the season. The concentration of Fe, Cd and Ni in zooplankton varied from 1470 to 12051 ppm, 6 to 96 ppm and 4 to 29 ppm respectively. Negative

correlation of Fe and Cd with salinity and pH of the habitat water is indicative of their source from upstream of the river.

RECENTLY much attention has been paid on trace metal research for the protection of environments and their impact on biotic life. Zooplankton are of much importance in the cycling process of elements in the estuary. Though concentrations of the metals in zooplankton vary due to many reasons they do indicate the possible environmental characteristics of a particular region. Moreover, being a major source of food for larger animals, their role in transfer of metals to higher trophic levels is of much importance[1]. However, no information is available on the concentration of metals in zooplankton from Hooghly estuary. Hence, the present study can be considered as a base line study for the region.

The zooplankton samples were collected from the Chemagari creek of Sagar Island for one year from January to December 1989 by standard bolting silk no. 10. The samples were first dried in the oven at 100–105°C to a constant weight, homogenized and 1 g of the sample was digested with mixture of nitric acid and perchloric acid[2] till a clear solution obtained, cooled at room temperature and filtered. The filtrate was then diluted with HCl and made to 50 ml with distilled water. The solutions were examined for Fe, Ni, Cd, Pb and Co using atomic absorption spectrophotometer (Perkin-Elmer type 2380) and expressed in ppm dry weight. Blanks were also maintained along with the samples.

Along with the collection of zooplankton samples, simultaneously salinity of surface water was measured by standard methods[3]. pH of surface water was measured by using Lovibond Colour Comparator disc in the field.

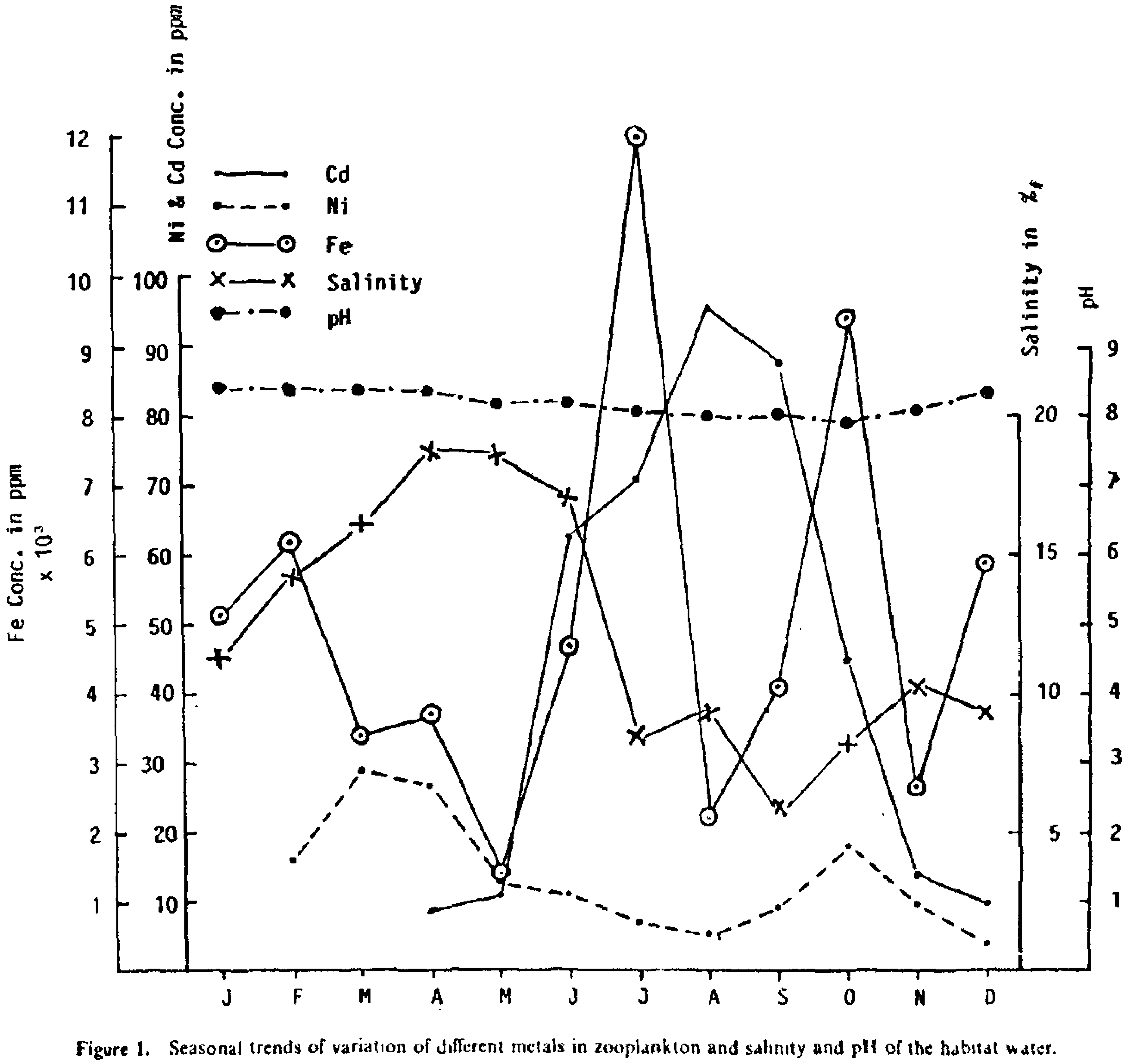

Figure 1. Seasonal trends of variation of different metals in zooplankton and salinity and pH of the habitat water.

The seasonal variation of different metals in zooplankton and salinity and pH of the habitat water are shown in Figure 1. Among the metals studied, the concentration of Fe was highest (av. 5102.5 ppm) in zooplankton, while a lowest (av. 12.41 ppm) value observed for Ni. Fe content varied from 1470 ppm to 12,051 ppm. The trend of variation of Fe and Cd through seasons showed higher values during monsoon (July–October), a period of low salinity (mean salinity 7.99‰) and pH. On the other hand, the metal content showed decreasing value during premonsoon (March–June), a period of high salinity (mean salinity 17.74‰) and pH (>8.0). Bryan and Uystal[4] suggested that salinity was an important factor governing the availability of metals to the organisms. The negative correlation (Table 1) between metals concentration in zooplankton and salinity and pH of the habitat water suggests that salinity and pH might play an important role on the availability of metals to the organisms. The annual average of Fe obtained was 5102.5 ppm. George and Kureishy[1] while studying with the metals in zooplankton from Bay of Bengal observed 1139 ppm of Fe. Generally, the river mouths contain large amounts of Fe both in dissolved and particulate states and the source of the metal is in flowing water. Dissolved and particulate iron at the river mouths is almost three times more than offshore stations[5]. The higher primary productivity[6] in this zone during pre- and postmonsoon may be one of the reasons for minimum value of Fe in zooplankton during that period. It has been reported[7] that phytoplankton utilizes considerable amount of iron during photosynthetic process and lowers the concentration of iron in the surface water.

Similar results were observed for Cd also which ranged from 6 ppm to 96 ppm. The annual average of Cd was found to be 33.92 ppm. Literature survey revealed that these values are comparable with those reported earlier[8,9] at different water masses. The absence of the metal in January to March may be due to the high salinity and pH values as evidenced from the high negative correlation (Table 1) between metal concentration in zooplankton and salinity and pH of the habitat water. The relatively higher value (75 ppm) of Cd during monsoon may be due to the considerable amount of industrial effluent carried by monsoonal run off.

Among the metals studied only Ni showed completely different trend of seasonal variation, showing a decreasing order from premonsoon to monsoon and to postmonsoon. Ni content ranged from 4 ppm to 29 ppm. The annual average of Ni found in the samples was 12.41 ppm. Levels of Ni observed in the present study are comparable in magnitude to the concentrations reported by Subrahmanyam[8] in zooplankton collected from Visakhapatnam.

Though other workers[1,9,10] in different regions observed Pb and Co in zooplankton but these two elements were not detected in any sample throughout the season.

Table 1. Correlation coefficient values between metal concentrations in zooplankton and salinity and pH of the habitat water.

	Fe	Cd	Ni
Salinity	−0.439	−0.532	0.561
pH	−0.153	−0.816*	0.265

*Significant at 1% level of probability.

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A method for the estimation of food consumption by chironomids

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Considering the gut clearance time (GCT) and gut content weight of *ad libitum*-fed larva, as well as the energy content of the nutrient provided in the medium at the beginning of the experiment and that left behind at the end of the experiment, a method has been developed to estimate food consumption of the chironomid larva, *Kiefferulus barbitarsis* (Kieffer). Validity of the proposed method was tested by the isotopic tracer method. Food energy ingested by the larva from hatching to pupation as estimated by the present method was 26.6 J compared with 28.4 J by the isotopic tracer method.

REVIEWS on feeding and transformation of food in insects[1–4] indicate selective predominance of studies on