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DISTRIBUTION AND ABUNDANCE OF BENTHIC DIPTERAN INSECTS IN HOOGHLY ESTUARY, SAGAR ISLAND, INDIA

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ONLY a fraction of the total insect population is marine and estuarine. Dipterans by their abundance and diversity constitute a major group of marine and estuarine insects; they spend part of their life in the littoral belt as benthic fauna[1]. The present note outlines the characteristics, composition distribution and variation of estuarine benthic dipterans in the littoral zone of the Hooghly estuary.

Larval and pupal populations were sampled from the soil every fortnight during July 1982 to June 1984 from a selected station situated in the south-eastern sector of the Sagar Island. They were recovered from the soil by standardized magnesium sulphate flotation technique[2], counted and expressed as no./25 cm^2. Simultaneously with sampling, various environmental parameters, viz., air temperature, soil temperature, soil moisture, rainfall, salinity, dissolved oxygen, pH of interstitial water, organic carbon, available phosphorus and texture of the soil were also recorded following standard methods[3]. Correlation coefficient analysis was made to understand the relationship with different environmental parameters and species populations.

The ecological parameters during different months are highly dynamic and present a cyclic pattern (figure 1a and b). In total, 13 species of dipterans have been recorded of which 7 species under the family Ceratopogonidae, 1 species each under the families Chironomidae and Psychodidae, 2 species both under the families Ephydridae and

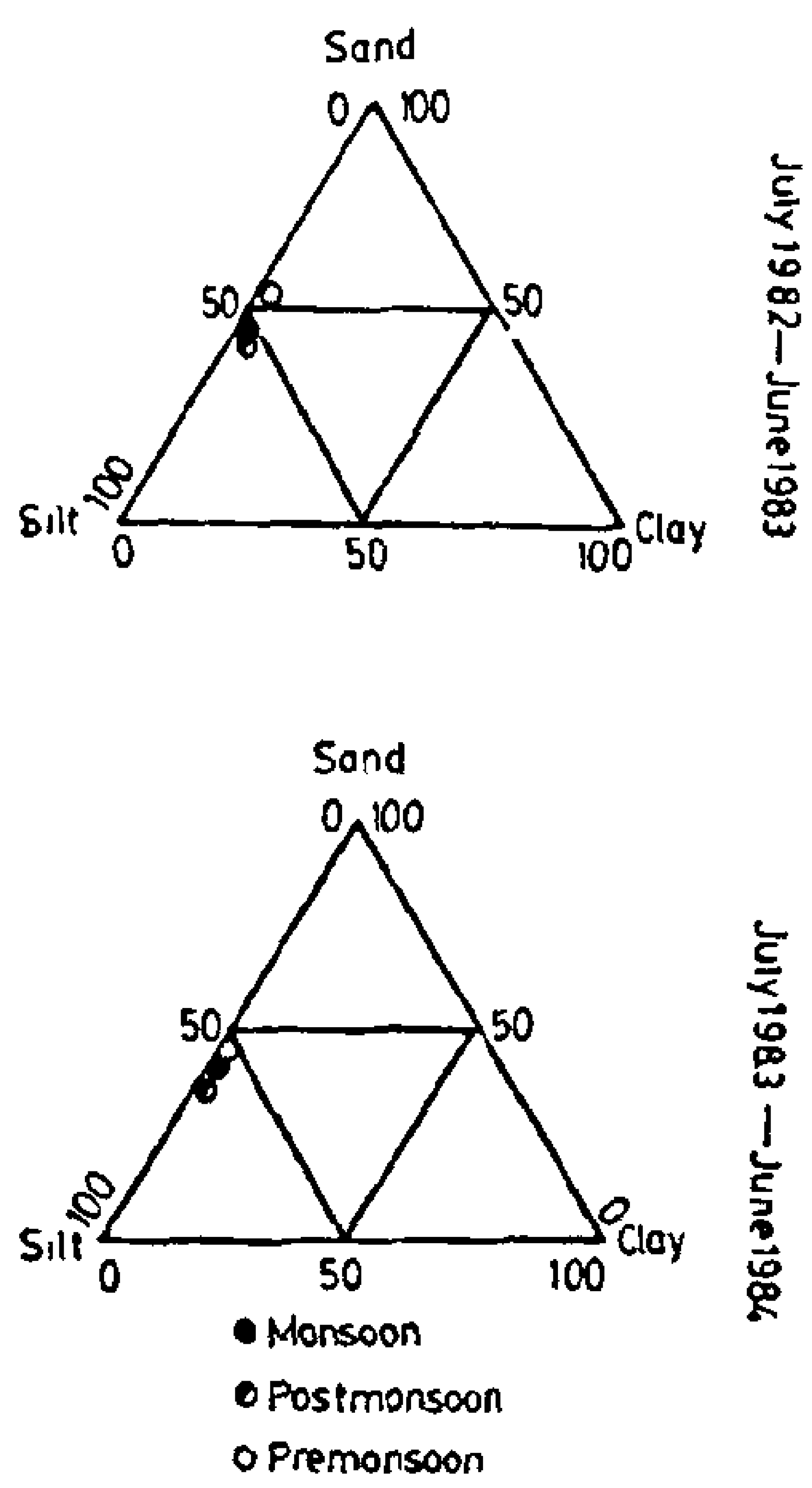

Figure 1b. Seasonal variation of the percentages of sand, silt and clay.

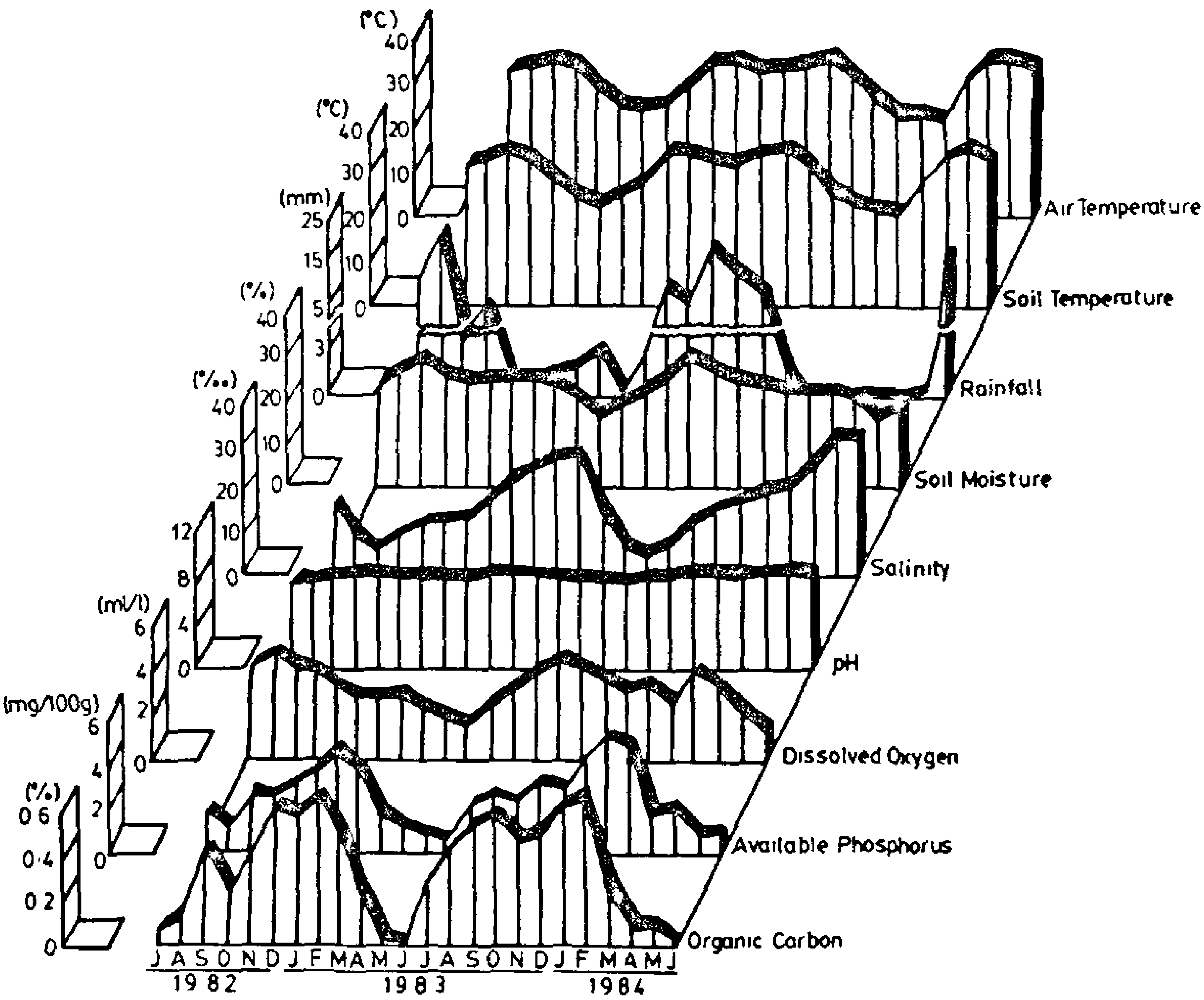

Figure 1a. Monthly fluctuation of different ecological parameters.

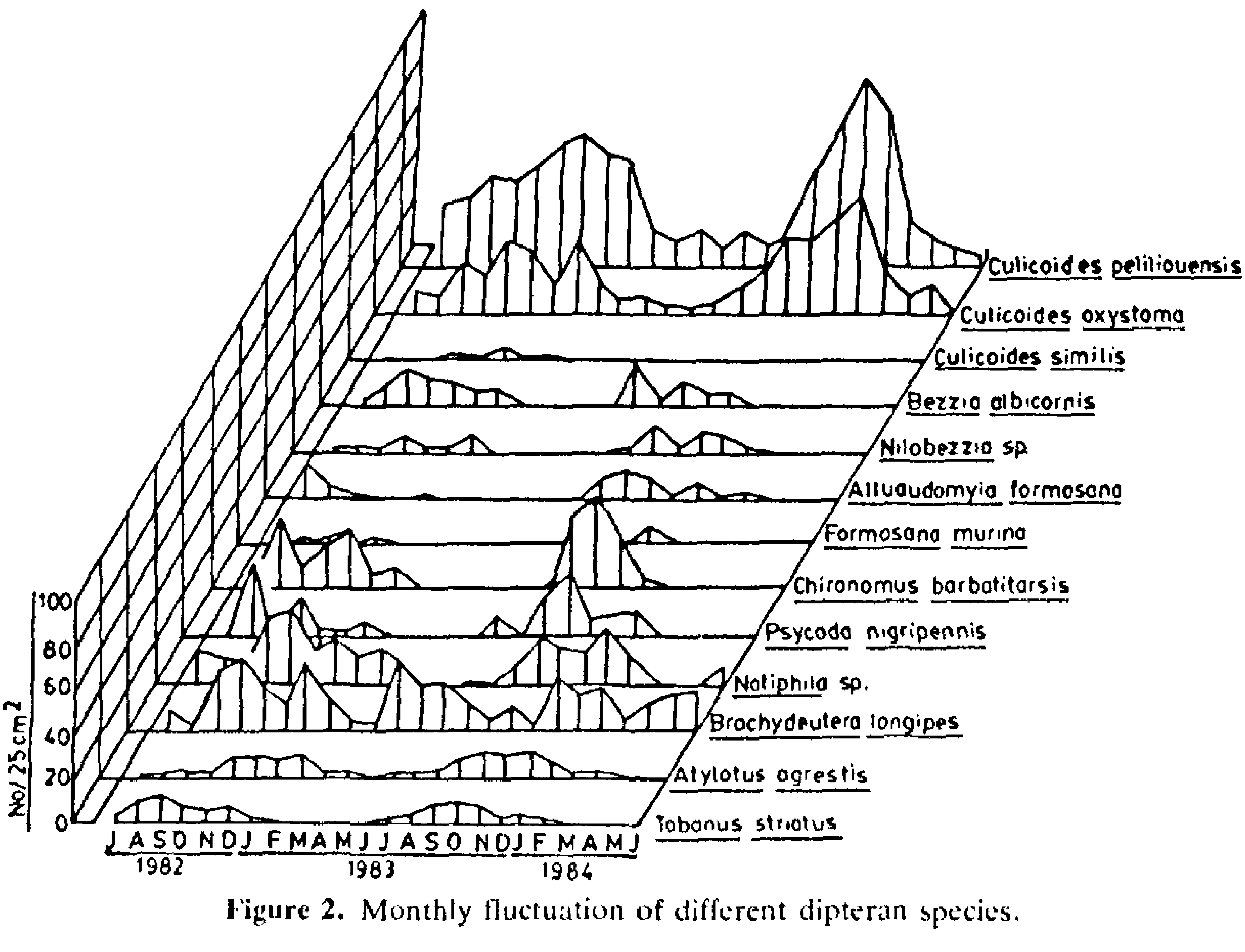

Figure 2. Monthly fluctuation of different dipteran species.

Tabanidae. The distribution and abundance of these species are shown in figure 2.

Animals of estuarine environment acquire a certain degree of euryhalinity as an insurance against fluctuating environmental conditions[4]. The presence of *Culicoides pelilouensis*, *C. oxystoma*, *Notiphila* sp. and *Brachydeutera longipes* in this changing environment throughout the year indicates that these species are typically euryhaline, but the remaining species were found to occur in these habitats only during less saline periods.

Temperature is also an important factor for animal distributions[5]. The distribution and abundance of *C. pelilouensis*, *C. oxystoma*, *Notiphila* sp. and *B. longipes* were inversely proportional to temperature.

The change in the population densities of some species documented mainly during the monsoon and postmonsoon seasons seems to be directly associated with soil moisture and dissolved oxygen and inversely associated with pH.

Soils of the littoral zone of mangrove ecosystem are rich in organic nutrients[6]. These nutrients help the growth directly of algae and indirectly of meofaunal (specially nematode) population which provide food source for insect intruders[7]. The distribution and abundance of dipteran species were directly associated with organic nutrients (organic carbon and available phosphorus).

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CONTRIBUTION OF EXOGENOUS FERTILIZER SOURCE TO PHOSPHORUS REQUIREMENT OF *CITRUS*

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PREVIOUS studies in *Citrus* using ^{15}N labelled fertilizer have shown that the exogenous fertilizer source accounted for 10–19% of total nitrogen in various new organs when applied in spring, whereas summer application accounted for 11% of total nitrogen in the new flush[1,2]. There is no such information with respect to phosphorus either in *Citrus* or in any other fruit crop. An attempt was, therefore, made to assess the same in *Citrus* species. *C. limon* Birm (Italian lemon) and *C. latifolia*, Tanaka (seedless lime) using ^{32}P labelled superphosphate in a rootstock experiment.

In this experiment, the two *Citrus* scion cultivars Italian lemon (*C. limon* Birm) and seedless lime (*C. latifolia*, Tanaka) had been budded on 7 rootstocks namely; (i) Rough lemon (*C. jambere*, Lush), (ii) Rangpur lime (*C. limonia*, Osbeck), (iii) Cleopatra mandarin (*C. reshni*, Tanaka), (iv) *Kodakithuli* mandarin (*C. reshni*, Tanaka), (v) *Trifoliate orange* (*Poncirus trifoliata*), (vi) Carrizo citrange (*P. trifoliata* × *C. sinensis*), and (vii) Citrumelo (*P. trifoliata* × *C. paradisi*). The study was carried out during July–August, when a major flush of new growth and flowering was occurring. The plants also had a sizable crop load of developing and developed fruits. Each plant received ^{32}P labelled single super phosphate at 350 g (with an activity of 3.12 mCi or 115.4 MBq) per plant which was applied to the soil in a circular band 75 cm away from the plant where the actively absorbing roots were located. Samples of newly developing organs such as shoot tips, flowers and immature fruits and old organs like mature leaves and developed fruits were collected 45 days after treatment, to determine the proportion of phosphorus derived from fertilizer in these organs. The samples were dried at 70°C, ground and wet digested in a diacid (nitric-perchloric) mixture. Total P in the digest was determined by the vanado molybdate method and ^{32}P activity was measured by