

## PRELIMINARY STUDIES ON THE SURFACE PHYSICO-CHEMICAL FACTORS OF CHILAW LAGOON, SRI LANKA.

by

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**ABSTRACT;** Chilaw lagoon is one of the least studied lagoons in Sri Lanka. Due to low fishing activities taking place in this lagoon, when compared with Negombo or Puttalam Lagoons it is regarded as one of the less productive lagoons in Sri Lanka. This study therefore, was directed towards verifying this belief. Physico-chemical parameters at seven selected stations in the lagoon were monitored monthly from November 1982 for two years. The air and water temperature ranged between 26°C and 36°C and 24°C and 34°C respectively. Highest temperatures were recorded in the months

of August to October. The greatest recorded depth was 3.1 m. The highest secchi depth was observed in January 1983, at 1.3m. The dissolved Oxygen values varied widely due to differences in time of sampling and variation in water temperature. Inorganic phosphate values varied from 0 to 270g per liter, highest value recorded in June 1983, is likely to be due to discharge from coir fibre mill in the vicinity, while the lowest value was recorded elsewhere in April 1983. The salinity ranged between 0.21 ppt and 36.55 ppt, the lowest recorded in November 82, while the highest was observed in August 83.

### INTRODUCTION

The existence of a lucrative shrimp fishery in the Chilaw sea for a century or more indicates that there is a regular supply of substantial number of recruits to this shrimp ground for a long time period. As it is well known among the penaeid shrimps, which are the major components of this fishery, the post larvae are drifted to either shallow areas of the sea or estuaries or lagoon for further development and growth. Therefore it is useful to study the important parameters in these habitats which may control the recruitment of shrimp to sea fishery. It is also well known that the nursery grounds for most of the penaeid species are lagoons. Hence the study of hydrography of the Chilaw lagoon was undertaken as a first step towards understanding the productivity of this lagoon. The Chilaw lagoon is considered to be less productive. This is evident from lesser fishing activities taking place in this lagoon when compared with Negombo or Puttalam Lagoon fisheries. Moreover, there is hardly any study undertaken in this lagoon either on hydrography or on fisheries. These again warrant initiating such studies.

### Study Area

Fig. 1 shows the map of Chilaw Lagoon. It has an approximate surface area of 1800 ha (Jayakody, 1984) and is approximately 10 km. long and 1.5 km wide at its widest point. The greatest recorded depth is 3.9m. and less than 30 percent of the lagoon has depths 1 m and less. Two third of the lagoon has mangroves on either side while the rest is surrounded by coconut palms. There are two openings to the sea from the lagoon. One is at the Deduru Oya estuary and is partially blocked by sand bars during certain months of the year. The other is at Thoduwawa which is totally blocked by a sand bar during most of the time. There are two fresh water inlets to this lagoon. One is the Lunu Oya emptying at Thoduwawa and the other is Deduru Oya meeting at the estuary near Chilaw market. There are two coir fibre mills close to the lagoon.

Salinity and D.O. were measured using standard methods described by Strickland and Parsons (1986). Inorganic phosphate was determined by the ascorbic acid-potassium antimony tartarated method of Murphy and Riley (1962). Surface water temperature was measured by a mercury thermometer. In this study only the surface water samples were taken for analysis assuming that there is ready mixing of water, because most part of the lagoon is shallow.

## RESULTS AND DISCUSSION

### Temperature

On the overall during 1982/83 period the air temperature ranged between 25°C and 32°C, while the corresponding range for 1983/84 period was 26°C to 35°C. The air temperatures during 1983/84 were comparatively higher than those of 1982/83. The water temperature during 1982/83 ranged between 23.5°C and 34°C and the corresponding range for 1983/84 was 24°C to 32°C. The air and water temperatures were lowest during December and January.

### Total depth

The annual mean values of depth at different stations are given below :

Station	Depth in meters	
	82/83	83/84
I	1.6	1.7
II	2.1	2.2
III	3.0	2.8
IV	0.9	1.3
V	0.9	1.2
VI	1.6	1.6
VII	1.6	2.1

Since the depths have been measured ignoring the tidal fluctuations these values should be compared in relative terms.

The highest mean depth was recorded in station III while the lowest was recorded in station V during both periods.

### Secchi depth

Secchi disc visibility gives an idea of productivity of the water under certain circumstances. The visibility of secchi disc decreases due to increase in density of suspended particles which prevent penetration of light into water. These particles may either be plankton or silt. The depth at which the secchi disc disappears was measured. Lower values of secchi depth were recorded during November 82, October 83, and January 84 respectively in most of the stations. Except for October 83, the other low values were associated with low salinity and substantially high rainfall values (Fig. 7). The low secchi depth values may be due to intrusion of silt laden freshwater after rainfall.

### Oxygen

The dissolved oxygen values depend on the temperature, the time of sampling and secchi depth visibility. As the temperature increases, the solubility of oxygen decreases, and on the contrary, the concentration of oxygen increases with the increase in intensity of sunlight to a limited extent provided the secchi depth visibility is high. This is because, as sun rises, phytoplanktons come to the surface and release oxygen due to photosynthetic activities. The highest oxygen value 18.6 mg/l was recorded during November 82 at station II. On the overall, oxygen values were high during December 82, September 83, July 84, September 84 and October 84 in most of the stations. The low oxygen values in November 82, October 83 and January 84 in all stations were associated with low secchi depth readings indicating low productivity possible due to intrusion of turbid waters. The high oxygen values were generally associated with high secchi depth readings indicating high photosynthetic activity (Figs. 3 and 5).

### Salinity

Fig. 7 depict the salinities in different stations associated with the seasonal variations in rainfall. Station I near Thoduwawa mouth and station VII near Chilaw estuary have higher salinity values due to frequent intrusion of sea water, while station II near the Lunu Oya has low salinity values. There is no salinity gradient along the lagoon (Fig. 7). The salinity values ranged between 0.21 ppt in November 82 at station II and 36.55 ppt in August 83 at station IV.

During the 82/83 period, the salinity values at all stations were low in November 82 and thereafter gradually increased. The salinity values were maintained at higher level, near and above 30 ppt, at all stations from April 83 to October 83. This was partly due to less rainfall experienced in the catchment area during 83. However, the pattern of changes of salinity values during 84 was quite different from 83, because of substantial rainfall experienced during this year. The salinity values at all stations were low from November 83 to June 84 during which period the rainfall values were comparatively high (Fig. 7h). The months July to September 84 recorded high salinities associated with low rainfall. At Thoduwawa, the sea mouth is normally closed with a sand bar. But during March to September 1984 this was open. Fig. 8 shows that the maximum salinity was observed in August 84 when the mouth was open to sea.

### Inorganic Phosphate

Inorganic phosphate concentrations varied from 0 g/l in April 83 at Station V (Fig.4) to 270 g/l in June 83 at station VI (Fig.5). During April to June 83, the rainfall has been relatively high (Fig. 7h) and perhaps the rain water would have washed off phosphate manure from the adjoining agrarian lands into the lagoon, thus producing higher phosphate concentrations during this period. This phenomenon was also observed in the Puttalam lagoon (Indrasena, personal communication). The salinity in the Puttalam lagoon is fairly high, sometime reaching 580/00 or more near Palavi during dry season and drop to zero near the fresh water inlet during rainy season. It was observed that as there were rains in the

catchment area, the inorganic phosphate concentration in the lagoon increases due to intrusion of fresh water carrying washed off phosphate manure from the vegetation areas.

Singbal et.al (1976) observed Phosphate value above 800 g/l near a fertilizer factory and an average of less than 30 g/l elsewhere in Velsand Bay (Goa). The 83/84 values of inorganic phosphates are comparable with their average values. During 82/83 period fairly high values of inorganic phosphate were recorded near stations VI (Fig.5) which may be due to discharge of effluent from coir fibre mill in the vicinity.

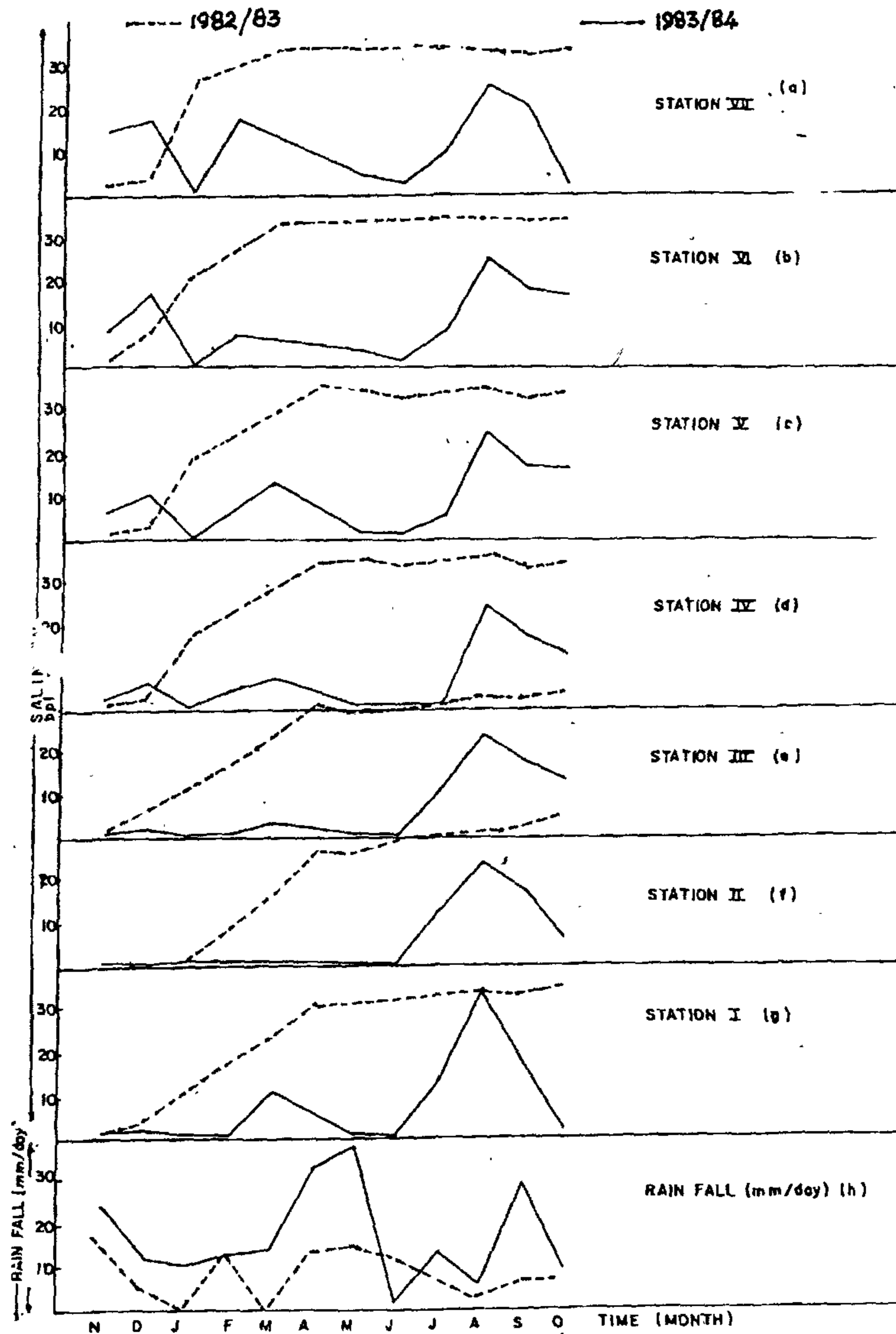


Fig. 1 - Seasonal variation of salinity at different stations and the rainfall for Chilaw during the period 1983 and 1984.

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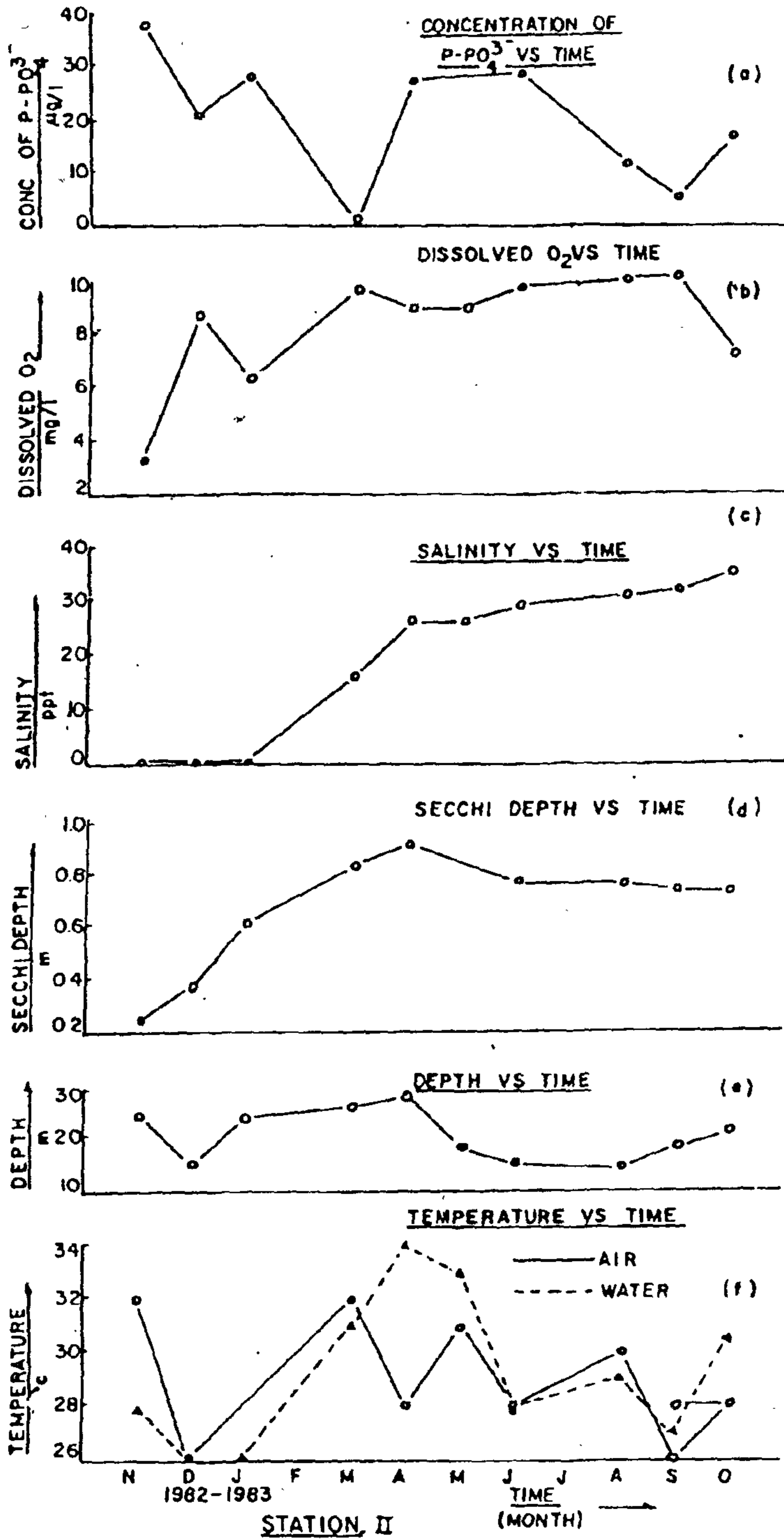


Fig.2 - Seasonal variation of (a) P - po<sub>4</sub><sup>3-</sup> (b) dissolved oxygen (c) salinity (d) Secchi depth (e) Total depth (f) air and water temperature.

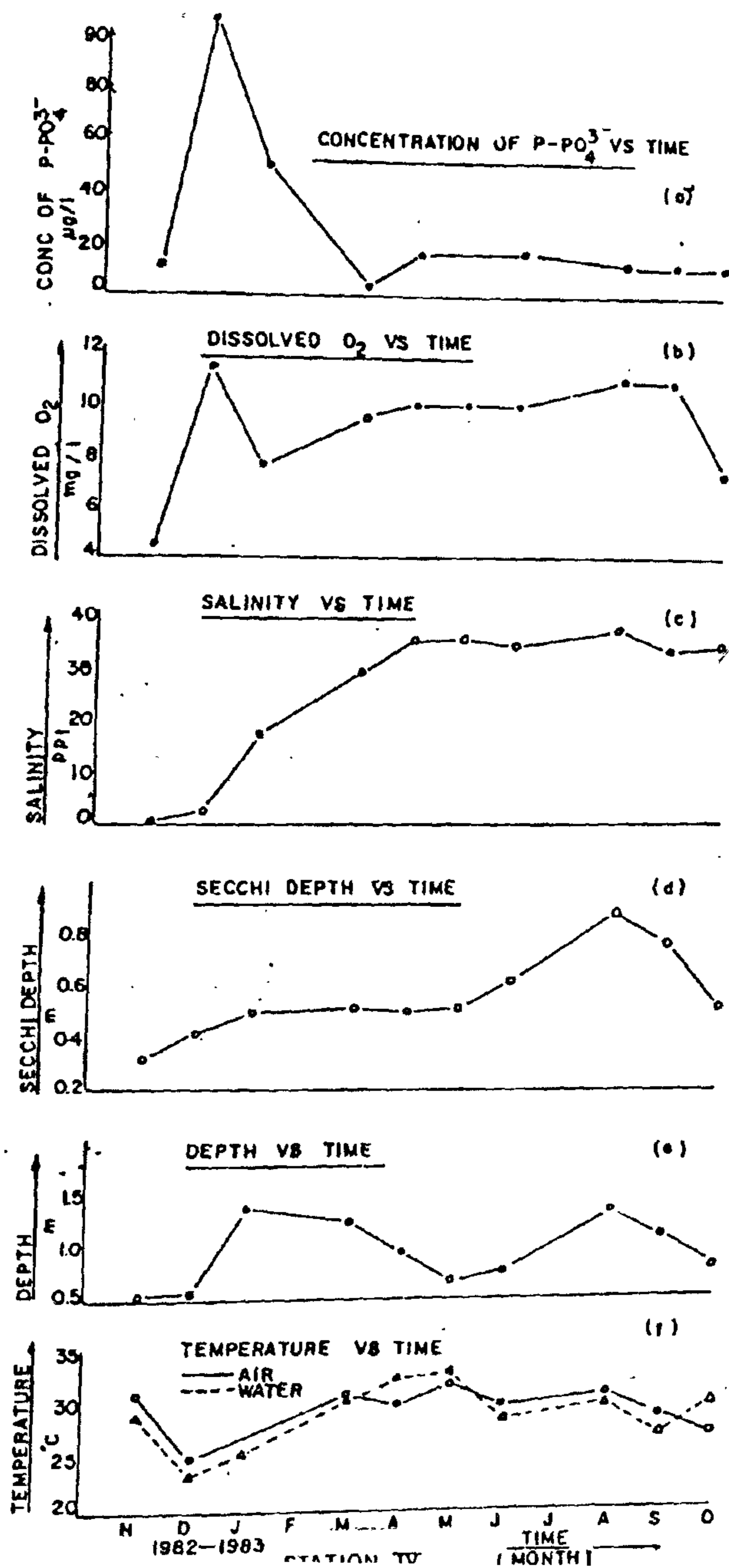


Fig.3 - Seasonal variation of (a) P - po<sub>4</sub><sup>3-</sup> (b) dissolved oxygen (c) salinity (d) Secchi depth (e) Total depth (f) air and water temperature.

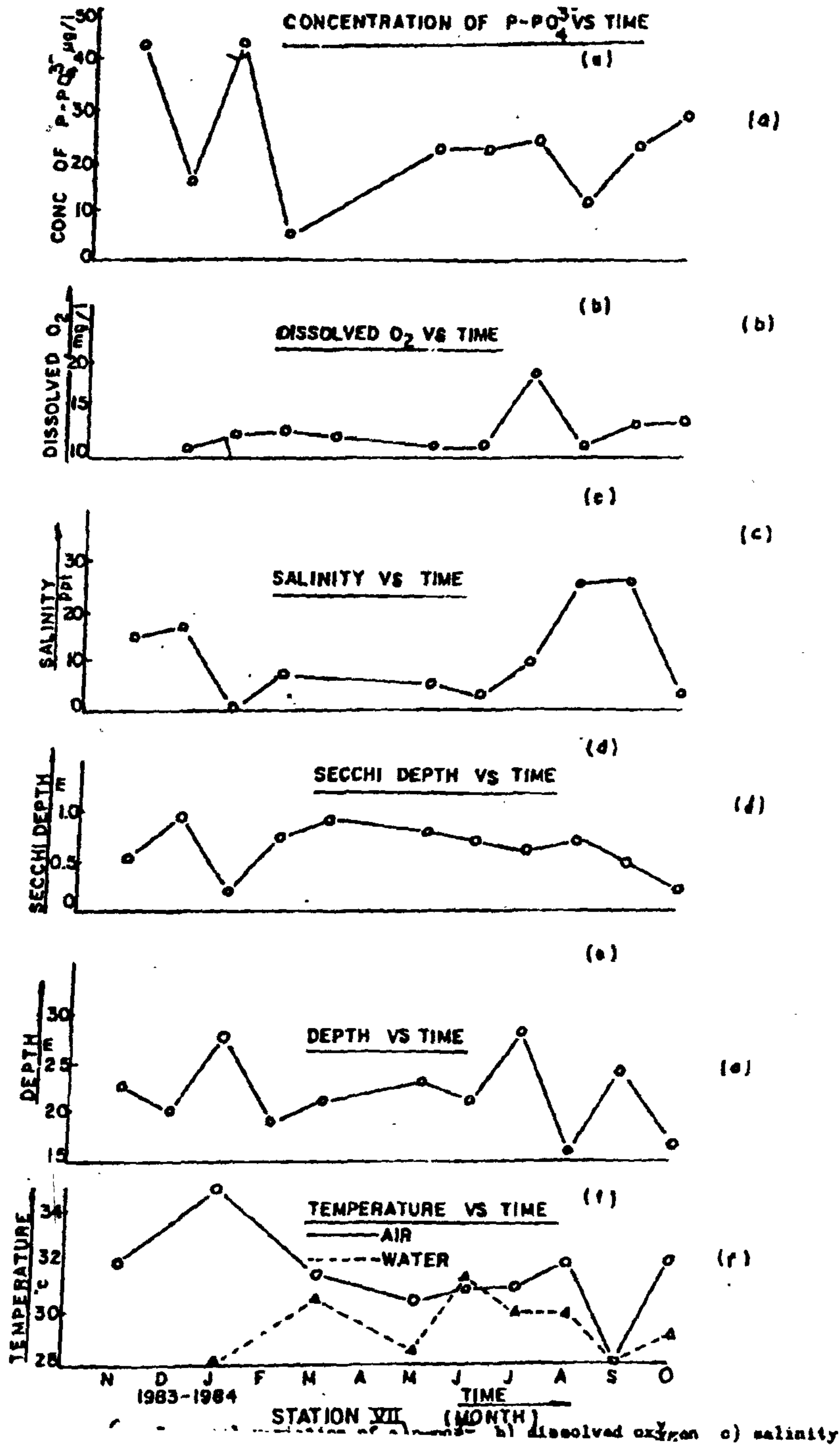


Fig.6 - Seasonal variation of (a) P - po<sub>4</sub><sup>3-</sup> (b) dissolved oxygen (c) salinity (d) Secchi depth (e) Total depth (f) air and water temperature.

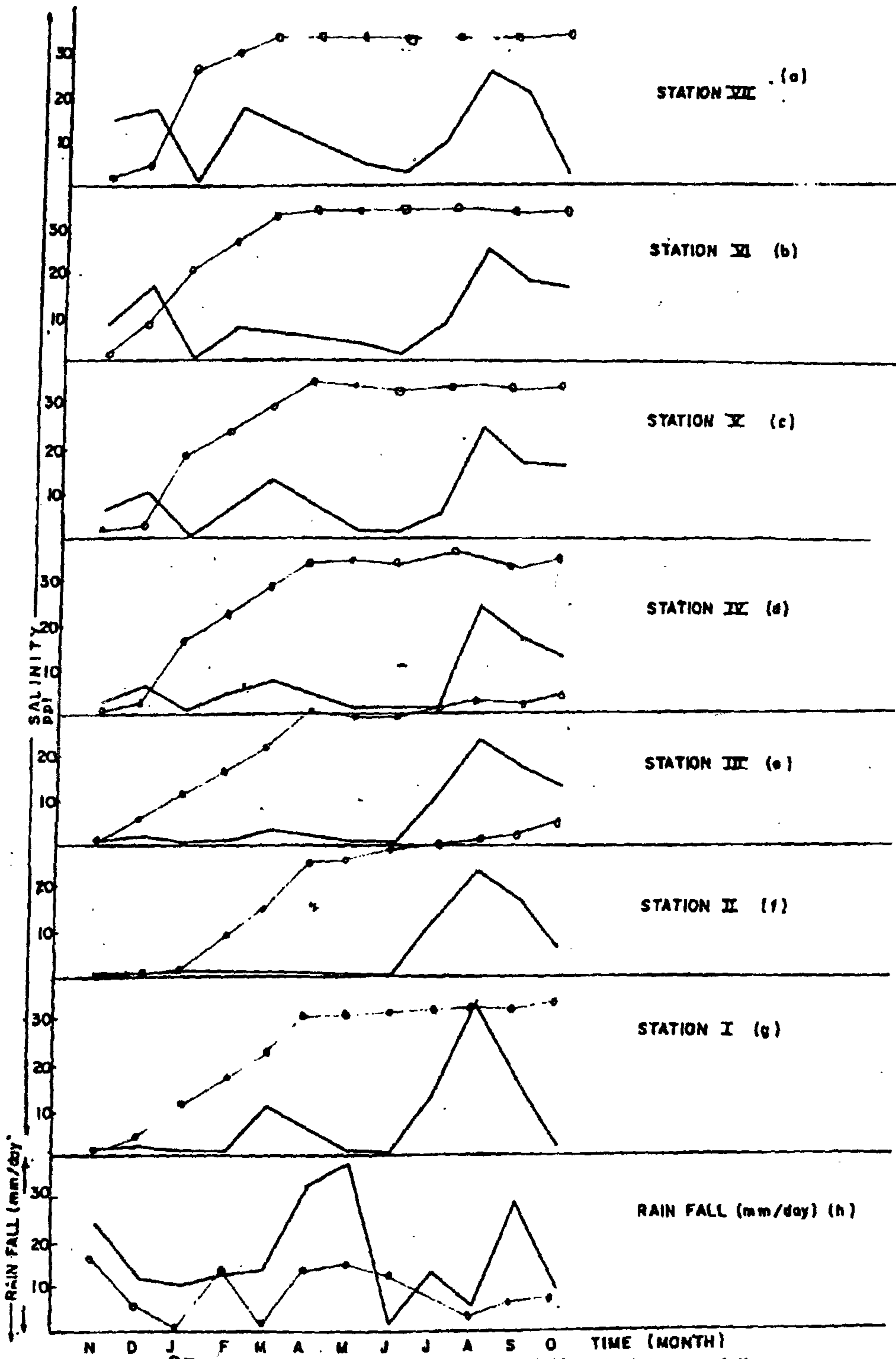


Fig. 7 - Seasonal variation of salinity at different stations and the rainfall for Chilaw during the period 1982 and 1984



## ACKNOWLEDGEMENTS

Our thanks are due to Director General of National Aquatic Resources Agency for enabling us to carryout this project. We wish to thank Mr. M.G.K. Gunawardena a Research Assistant of NARA who was much involved in collection of samples and analysis and also to Mr. D.S. Jayakody a Research Officer of NARA who also helped in collection of samples. Also our thanks are due to Mr. W.M. Indrasena a Research Officer of NARA with whom we had useful discussions in carrying out this project. Last, not least we wish to thank Mr. W.G. Sirisena and Mr. S.P. Wijesinghe, Lab Attendants of NARA who helped us in many ways.

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