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THE HYDROBIOLOGY AND FISH PRODUCTION POTENTIAL OF MAJOR FRESHWATER RESERVOIRS IN HAMBANTOTA DISTRICT SRI LANKA

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Hambantota district with an area of about 2563 km² is sparsely populated and is mostly occupied by a rural population. Because of the very unfavourable climate existing over most parts of the district, irrigation has played an important role since ancient times. Numerous ancient irrigation works dot the district, most of them now abandoned. In the recent times large reservoirs have been constructed for the development of agriculture in the intermediate zone such as Muruthawela reservoir and new irrigation schemes have commenced with the construction of Lunugamwehera reservoir to develop agriculture in the arid zone areas.

These irrigation schemes have now made available large (perennial) and small (mainly seasonal) expanses of water for agricultural development which could also be profitably used for production of fish to provide the much needed proteins for the rural population of the densely populated areas (Costa 1979). There are only a few studies available in Sri Lanka on Limnological studies associated with fish production. Hydrobiology and fish production potential in water bodies in Sri Lanka have been studied by Costa and Liyanage (1978), Wijeyaratne and Costa (1981) Wijeyaratne and Amarasinghe (1987) and Amarasinghe *et al.* (1983).

The present study was undertaken to get some detailed information about the hydrobiological conditions existing in the major reservoirs of the Hambantota district and to assess the fish production potential

Information about these are necessary for the proper management of fisheries in these reservoirs.

The present study was carried out over a period of one year. The reservoirs studied are; Udukiriwela wewa, Muruthawela wewa, Ridiyagama wewa, Badagiriya wewa, Wirawila wewa, Tissa wewa and Yodakandiya wewa.

The surface area and capacity of water at full supply level of the reservoirs are given in Table 1.

Table 1. Morphometric data of the reservoirs studied (From "Register of irrigation projects in Sri Lanka")

Tank	*Area at full supply level (ha)*	*Volume at full supply level* ($x\ 10^6\ m^3$)
Udukiriwela	261.00	3.92
Muruthawela	517.00	43.98
Ridiyagama	881.53	26.60
Badagiriya	477.90	11.07
Wirawila	615.72	14.36
Tissa	282.79	4.29
Yodakandiya	601.68	10.24

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MATERIALS AND METHODS:

Monthly surveys over a period of one year were carried out at Udukiriwela Muruthawela, Ridiyagama, Badagiriya Wirawila, Tissa and Yodakandiya reservoirs. Surface water from the reservoirs was collected in large bottles between 0900 - 1400 hours for chemicala nalysis. Temperature was measured with a thermometer while pH and conductivity were determine using a pH meter and a conductivity meter respectively.

Transparency of water was measured by observing the depth at which a 12 cm disc (secchi disc) was visible. Temporary hardness was determined by titrating the water sample with 0.01NHCl. Dissolved oxygen was determined by Winkler method. Primary productivity was measured by the light and dark bottle method.

For plankton determination, surface water was collected by dragging a plankton net for a distance of 15 metres The Concentrate was drained into a bottle and taken to the Laboratory for qualitative and quantitative analysis.

Morphoedaphic indices of the reservoirs were calculated using conductivity and, depth data (Henderson and Welcomme, 1974). Using these values in the equation described by Wijeyaratne and Amarasinghe (1987), maximum sustainable yield of each reservoirs was calculated.

Commercial fish catch was sampled four times a month on randomly selected days. The number of crafts and fishermen and the amount of time spent in fishing were recorded.

Asymptotic length (L_∞) and growth coefficient (K) of *Oreochromis mossambicus* were calculated by the model regression analysis method using the Gulland and Holt plot as described by Sparre (1988). These values were then used in the equation described by Pauly (1980) and instantaneous natural mortality rates were calculated.

The numbers of juveniles of *O. mossambicus* needed to be recruited to the fisheries of these reservoirs in addition to the present recruitment in order to increase the fish production to the estimated level of maximum sustainable yield was calculated using the following equation described by Wijeyaratne and Amarasinghe (1987),

$$S = \frac{MSY_{est} - MSY_{cal}}{\bar{W}} e^{z(t_i - t_o)}$$

where S = number of fingerlings needed to be recruited, MSY_{cal} = Present fish yield, MSY_{est} = Maximum sustainable yield calculated by the morphoedaph index relationship, $\bar{W}$ = mean weight of *O. mossambicus* at capture, t_o = age at recruitment, t^i = age at capture and z = mortality rate.

Since it appears that *O. mossambicus* generally enters the fishery in the third year of life (De Silva, 1985; Amarasinghe, 1987), t — t was taken as 2. Therefore, during the first two years of life only natural mortality is taking place in the populations of *O. mossambicus*. Thus the values for instantaneous natural mortality rates were used for z.

RESULTS

Physico-chemical parameters

1. Udukiriwela Wewa : (Fig. 1)

The air and water temperature : Rainfall for Hambantota district and air and water temperature for Udukiriwela reservoir are graphically presented in figure 1. Rainfall ranged from 28.63 mm to 342.88 mm. During the course of the investigation, the peak value was observed in November. A smaller peak of 180 mm was recorded in April. There is an inverse relationship between rainfall and temperature. Maximum temperature for both air and water (32.3°C) was observed in August and minimum temperature for air (27°C) was recorded in November and for water in October (29°C).

Secchi disc transparency : Secchi disc transparency varied from 0.25 to 0.75 cm during the period of the investigation.

pH : pH of the surface waters of Udukiriwela fluctuated between 6.9 and 9.2.

Temporary hardness ranged from 40 ppm. to 82.5 ppm.

Dissolved Oxygen : Dissolved oxygen in water showed a direct correlation with temperature. Peak values were observed in August and September when the temperatures were very high.

2. Muruthawela Reservoir : (Fig. 2)

Air and water temperature : The temperature of water varied from 27°C to 34°C during the period of investigation, attaining a maximum in January and a minimum in September. An inverse relationship betweeen rainfall and temperature was observed.

Secchi disc transparency : Generally water in Muruthawela tank was found to have a comparatively high transparency value indicating a high degree of light penetration. It ranged from 50 cm to 250 cm. Peak value of visibility was recorded in February.

pH : pH ranged from 6.8 to 8.3 as shown in Fig. 2. Water is rather alkaline for most part of the year.

Dissolved oxygen : Dissolved oxygen ranged between 7.0 ppm (in May) and 9.8 ppm (in November) for the surface and from 6.8 ppm to 8.4 ppm for the bottom.

3. Ridiyagama Wewa : (Fig. 3)

Air and water temperature : Water temperature ranged between 26°C and 32.9°C Maximum temperature recorded during the period of investigation was 32°C in April.

Secchi disc transparency : Secchi disc visibility was rather less ranging from 0.5 m. to 1.0 m.

pH : Range of pH observed in this tank varied between 7.6 and 8.6. Water was found to be alkaline on all occasions. Free C°2 was absent in water.

Dissolved oxygen : Dissolved oxygen of surface water registered its peak value (9.0 ppm) in February and the minimum (6.7 ppm) in December. Dissolved oxygen at the bottom of the tank ranged between 5.8 ppm and 8.4 ppm.

4. Badagiriya Wewa : (Fig. 4)

Air and water temperature : The temperature of water varied from 26°C to 34°C during the period of investigation attaining a maximum in October and a minimum in February. Air temperature ranged between 29.5°C and 33°C.

Secchi disc transparency : This increased during the dry season and decreased during rainy period. It ranged between 20 cm. to 75 cm.

pH : Varied between 7.9 and 8.8. Highest value was noted in October. Water was alkaline on all occasions.

Dissolved oxygen : Dissolved oxygen of surface water fluctuated between 6.4 ppm in December and 8.8 ppm in August. Dissolved oxygen at the bottom varied from 5.6 ppm to 8.4 ppm.

5. **Wirawila Wewa : (Fig. 5)**

Air and water temperature : Peak value of water temperature recorded for Wirawila was 34°C in April. The minimum value of 28°C was registered in February.

Secchi disc transpareucy : Fairly low visibility was recorded for this tank. It fluctuated between 25 cm. and 67 cm.

pH : This ranged between 7.6 in November and December and 9.5 in February.

Dissolved oxygen : Dissolved oxygen of surface waters registered its peak value (10.8 ppm) in January and the minimum value (6.4 ppm) was recorded in May. Dissolved oxygen at the bottom of the tank ranged between 5.4 ppm and 10.1 ppm.

6. **Tissa Wewa : (Fig. 6)**

Air and water temperature : Water temperature fluctuated between 26.5°C in February and 30.5°C in May while air temperature varied from 27°C to 31.5°C.

Secchi disc transparency : Values for secchi disc visibility was very high when the reservoir was full. These ranged between 1 m. and 3 m.

pH : It ranged from 7.6 in November to 9.2 in June. The water was markedly alkaline.

Dissolved oxygen : In surface waters this varied from 5.6 ppm to 12.15 ppm during the period of study, attaining a maximum in January and a minimum in May. Also in some months, the dissolved oxygen at the bottom of the tank varied from 5.2 ppm to 11.8 ppm. Of all the tanks studied, the highest values for dissolved oxygen were recorded for this tank.

7. **Yodakandiya Wewa : (Fig. 7)**

Air and water temperature : Water temperature ranged between 26°C in Janurary to 32.5°C in May. Air temperature varied from 29°C 30°C

Secchi disc transparency : Visibility, values are fairly low and fluctuated between 25 cm and 100 cm.

pH : Varied from 7.8 to 8.7 during the period of investigation attaining the maximum in September and the minimum in February. Water was alkaline on all occasions.

Dissolved oxygen of surface water registered its peak value (10.1 ppm) in September and the minimum (7.1 ppm) was recorded in December. Oxygen values at the bottom varied from 5.2 ppm to 9.0 ppm.

Plankton

Table 2 and 3 gives the synopsis of the various plankton forms for each lake.

Udukiriwela Wewa :

An abundance of blue-green algae was observed in May and June. During many months *Nostoc* blooms were recorded while in June *Oscillatoria* was common. The temperature of the water in this reservoir was generally high during May and June which may possibly be the reason for the abundance of blue-green algae at this time. The density of green-algae showed fluctuations throughout the year. The dominant form was *Pediastrum*. Diatoms were abundant except in November. The dominant diatom was *Navicula*.

The most dominant types of zooplankton in order of abundance were the copepods, rotifers and cladocerans. Nauplii larvae were. Also abundant but ostracods were abundant. Among copepods, *Cyclops* predominated while *Diaptomus* was less abundant. The seasonal fluctuations of plankton is shown in Fig. 1.

Muruthawela Reservoir :

Blue-green algae were abundant from May to August and specially in the months which had high temperatures. *Microcystis* species contributed mainly to the blooms while *Coelasphaerium* and *Oscillatoria* were also common. Among the chlorophyceae, *Pediastrum* and *Selenastrum* were abundant while *Spirogyra* was also commonly found. Diatoms formed the most significant group of algal plankton in this tank. Except in November, they were found throughout the year. Diatoms attained peak values during August which is the driest month. During November they disappeared altogether. *Melosira* was the dominant diatom species. However, *Navicula*, *Cyclotella* and *Synedra* were also common in this reservoir.

Of the Zooplankton, copepods were abundant while cladocerans, rotifers and nauplii occurred in lesser number. *Cyclops* was the dominant copepod. The seasonal fluctuation of plankton is shown in Fig. 2.

Ridiyagama Wewa :

Blue-greens occurred abundantly from April to August. There was a peak in June dominated by *Anabaenna*. *Nostoc* and *Microcystis* were also common in this reservoir. Among the Chlorophyceae, *Pediastrum* and *Closterium* were the most abundant pecies while *Ulothrix* and *Crucigenia* were less in numbers. Diatoms formed the most significant group of algal plankton in this tank. The dominant form in the diatom community was *Melosira*. They were found in all months during the period of investigation. *Synedra* and *Navicula* were also abundant although not to the same extent as *Melosira*.

Among the Zooplankton, copepods formed the commonest group. Ostracods were also collected. In April, rotifers (*Filina*), copepods and nauplii were equally abundant while in other months the numbers of rotifers and nauplii appearing in the samples declined (Fig. 3).

Badagiriya Wewa :

In May and June, blue-green blooms, were noticed. The dominant form being *Microcystis*. In April, an *Anabaena* bloom was recorded. Among other blue-greens, commonly encountered species were *Coelasphaerium* and *Oscillatoria*. Diatoms were present throughout the priod of study. The dominant form was *Melosira*. *Pleurosigma* was the next abundant form.

Rotifers, cladocerans, copepods and nauplii were abundant from April to June. (Fig. 4) In other months, they were less abundant. Of the copepods, *Cyclops* and *Diaptomus* were the dominant forms. Of the cladocerans, *Ceriodaphina* was the commonest. The commonest rotifers in the collections were *Brachionus* spp.

Wirawila Wewa :

A striking feature in this reservoir is the low population of blue-green algae (Fig. 5) Diatoms were found throughout the period of study of which the dominant forms were *Melosira*, *Navicula* and *Synedra*.

Zooplankton showed distinct seasonal fluctuations. From April to June, rotifers, cladocerans, copepods and nauplii occurred in large numbers. Seasonal, fluctuation of plankton is shown in Fig. 5.

Tissa Wewa :

Like in Wirawila tank, here too the phytoplankton populations were comparatively low (Fig. 6), Diatoms were the dominant phytoplankters. *Melosira* and *Navicula* were more abundantly found than other diatoms.

Among the blue-greens, *Anabaena* and *Microcystis* were the forms that were commonly encountered. Of the green algae, the commonest was *Pediastrum*. During dry months, especially in August and September when the diatoms predominated, blue green were encountered only in very low numbers. Among Zooplankton, ostracods (*Cypris*) and rotifers were more abundant than cladocerans and copepods. Of the copepods, *Cyclops* was the commonest form.

Yodakandiya Wewa :

The dominant members of the Chlorophyceae were *Pediastrum* and *Scenedesmus*. Diatoms were found in all months of study. *Melosira* being the most abundant form. Of the zooplankters, rotifers, copepods, ostracods and nauplii were notably present. Seasonal fluctuation of plankton is shown in Fig. 7.

Primary Productivity :

Monthly values of primary productivity for the 7 reservoirs are shown in Figs. 1 to 7 The productivity varied with the reservoirs. The most productive of the reservoirs appears to be Udukiriwela and Badagiriya reservoirs while the least productive apears to be Muruthawela reservoir.

Fish and Fisheris :

Percentage abundance of fish in commercial catches

Nine species of fish were commonly present in the commercial catches of Badagiriya and Udukiriwela reservoirs while only four species were present in the commercial catches taken from Yodakandiya reservoir. *Oreochromis mossambicus* and *Puntius* spp. were caught from all the reservoirs while *Hyporhamphus gaimardi* and *Wallago attu* in commercial amounts were taken only from Ridiyagama and Tissa reservoirs. *Oreochromis mossambicus* formed the major part of the catch from all the reservoirs except Udukiriwela where *Etroplus suratensis* formed the major portion of the catch. The percentage abundance of all species in fish catches for all reservoirs is shown in Table 4.

Mean size at Capture :

Mean length and mean weight of the fish in commercial catches are shown in Table 5. The mean size recorded for *Oreochromis mossambicus* was the highest in the catches from Muruthawela reservoir. In Weerawila and Yodakandiya reservoirs, *Labeo* spp. formed the largest fish in the catches while in Tissa and Badagiriya reservoirs, it was *Cyprinus carpio*. In Udukiriwela reservoir, the biggest was *Ophicephalus striatus*. In Ridiyagama reservoir, the biggest was, *Puntius sarana*.

Catch and effort statistics, recruitment rates and stocking densities

The total catch, fishing effort, estimated values of maximum sustainable yields, survival and recruitment rates of *Oreochromis mossambicus* and the amount of *Oreochromis* fingerlings needed to be stocked in order to obtain the estimated maximum sustainable yields are shown in Table 6. The morphoedaphic indices, mean depths, mean conductivity values for the period of study and growth paraters and mortality rates of *Oreochromis ssambicus* are also given in this table.

DISCUSSION

'he present work was carried out to ain some information on the biological racteristics of the man made reservoirs the Hambantota district in relation to production.

n all the reservoirs studied, the waters re on the alkaline side with most ervoirs having pH values over 7.5. In drier months, the waters become rkedly alkaline with pH values reaching r 9.0. In one of the reservoirs studied pH went down below 6.8. The propor- n of carbondioxide, bicarbonate and bonate present in the water is correlated h pH. Free CO_2 is present only when pH is below 5. On the other hand arbonates become significant when the [is between 7 and 9. When pH is above more carbonates will be found in the ter. In the reservoirs under consideration phytoplankton appears to be obtaining $)_2$ from the bicarbonate and dissolved bonates.

The electrical conductivity values reflect measure of ionic content of the water. ese values recorded for the different ervoirs showed that they were less for lukiriwela and Muruthawela reservoirs ;h for Ridiyagama, Weerawila, Tissa, Yoda- ndiya and Badagiriya reservoirs. The hest conductivity values were recorded Badagiriya reservoir while the lowest re recorded for Muruthawela reservoir. e lower conductivity values may indicate horter residence time of the water in the ervoirs and consequently lower biological duction.

As in the reservoirs in the Anuradhapura trict (Amarasinghe *et al.*, 1983, Myxo- yceae was the dominant algal group. Chu and Tiffany (1951) correlated the dominance of blue green algae with hot summer months. Gonzalves and Joshi (1946) were also of the same view that an increase in temperature leads to an abundance of Myxophyceae in tropical reservoirs. The temperatures in these reservoirs are generally high and specially so in May and June which may possibly be the reason for the high abundance of blue-green algae in these reservoirs.

The gross primary production in Muruthawela reservoir ranged from 0.4 to 3.2 g O_2/m^2 per day while net primary production ranged from 0.2 to 3.0 g O_2/m^2 per day. Compared to Muruthawela, Udukiriwela reservoir showed a moderately higher gross primary production ranging from 1.7 to 9.8 g O_2/m^2 per day and net primary production between 0.2 and 3.4 O_2/m^2/day. The gross primary production values for Ridiyagama, Weerawila, Tissa, Yodakandiya and Badagiriya reservoirs are respectively 1.0 - 3.3, 0.4 - 3.2, 0.6- 3.8, 1.6 - 8.4 and 1.0 - 7.6 g O_2/m^2 per day. From these, it could be concluded that Yodakandiya and Badagiriya reservoirs are biologically highly productive.

Hubbert *et al.* (1966) have observed that the production in tropical waters is moderately high throughout the year with little seaonal variation. In the temperate regions the gross primary productivity shows a gradual increase in Spring and Summer with maximum rates during July and August and a gradual decline in fall months (Odum and Wilson, 1962). Costa and De Silva (1978) observed that in Colombo (Beira) lake slight fluctua- tions in productivity occur as a result of cloudiness, slight changes in temperature and changes in community structure. In the reservoirs under study, water levels markedly decreased during the drier months accompanying high rates of producion. In India too the highest production rates have been observed in the hot months, ie. in June for Ayyanakulam and in April for Amarawathy reservoir (Sreenivasan, 1964).

Analysis of the data on fish catches indicates that the highest catch per unit area is obtained from Badagiriya wewa and the lowest from Muruthawela reservoir (Table 6). Presently, the overall fish productvity from these 7 reservoirs is 0.66 x 10^6 kg/yr. It appears from the results that this catch can be increased upto 2.2x10^6 kg/yr by suitable management procedures. fish production. The potential catches of fish from each reservoir is shown in Table 6. The catch per unit effort is low in Muruthawela, Ridiyagama, Wirawila and Yodakandiya reservoirs. It is possible that the present low catches could be due to less abundance of fish.

The amount of *O. mossambicus* fingerlings which have to be recruited to the fisheries of these reservoirs to obtain maximum potential catch is around 45 x 10^6. Once stocking is done fishing effort could be increased in Udukiriwela, Tissa, Wirawila, and Yodakandiya reservoirs.

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Table 2. Phytoplankton species present in the reservoirs of Hambantota District.

	Uduki riwela	*Muruth-awela*	*Ridiy-agama*	*Badag-iriya*	*Weera wila*	*Tissa*	*Yoda-kandiya*
CHLOROPHYCEAE :							
Ankistrodesmus	+	−	−	−	−	−	−
Chaetophora	+	−	−	−	−	−	−
Chlorella	−	−	−	+	+	−	−
Closterium	+	−	+	−	+	−	+
Crucigenia	−	−	+	−	−	−	−
Gonatozygon	+	−	−	−	−	−	−
Microspora	−	−	−	−	−	−	−
Mougeotia	+	−	−	+	+	+	−
Oedogonium	−	−	−	+	+	+	−
Pediastrum	+	+	+	+	−	+	+
Richterella	−	−	−	−	+	−	−
Scenedesmus	−	−	−	+	−	−	+
Selenestrum	−	+	−	+	−	−	+
Spirogyra	+	+	+	−	+	−	+
Staurastrum	−	+	−	−	−	−	+
Tribonema	−	−	−	−	−	+	+
Ulothrix	−	−	+	+	+	+	+
Zygnema	−	+	+	−	−	+	+
BACILLARIOPHYCEAE							
Amphora	+	+	+	+	+	+	+
Cyclotella	−	+	+	−	−	+	+
Cymbella	−	+	+	+	+	+	−
Diatoma	+	+	−	+	+	+	+
Frustulla	−	+	−	−	−	+	−
Gomphonema	−	−	−	−	+	+	−
Melosira	+	+	+	+	+	+	+
Navicula	+	+	+	+	+	−	+
Nitzschia	−	−	+	−	−	−	−
Pinnularia	−	−	+	−	+	−	−
Pleurosigma	−	−	+	+	+	−	+
Surirella	−	−	−	−	+	−	+
Synedra	−	+	+	−	+	+	+
Tabellaria	−	−	−	−	−	−	−
CYANOPHYCEAE							
Anabaena	−	−	+	+	−	+	−
Coelosphaerium	−	+	−	+	+	−	−
Merismopedia	−	+	−	−	−	−	+
Nostoc	+	−	+	+	−	+	−
Oscillatoria	+	+	+	+	−	−	−
Microcystis	+	+	+	+	+	+	−

Table 3. Zooplanktons species present in the reservoirs of Hambantota District

	Udukiriwela	*Muruthawela*	*Ridiyagama*	*Badagiriya*	*Weera wila*	*Tissa*	*Yodakandiya*
ROTIFERS							
Asplanchna	+	+	−	−	−	−	−
Brachionus	+	−	−	+	+	−	+
Cephalodella	+	−	−	−	−	−	−
Dicranophorus	−	+	−	−	−	−	−
Filina	+	−	+	+	+	−	+
Keratella	+	+	+	+	−	+	+
Lepadella	−	−	−	−	−	+	−
Notholca	−	−	+	−	−	−	+
Platyias	−	−	−	−	+	+	+
Trichocera	−	−	−	−	+	−	−
CLADOCERANS							
Alonella	−	+	−	−	+	−	−
Ceriodaphnia	−	+	−	+	+	−	−
Diaphanosoma							
Guernella	−	+	−	−	−	−	−
Macrothrix	−	−	−	+	−	−	−
Moina	−	−	−	−	+	−	−
Moinodaphnia	−	−	−	+	+	−	−
Pleuropus	+	−	+	−	−	−	−
COPEPODS							
Canthocamptus	−	−	+	−	−	−	−
Cyclops	+	+	+	+	+	+	+
Diaptomus	+	−	−	+	+	−	−
OSTRACODS							
Cypris	+	+	+	+	+	+	+
Nauplii larvae	+	+	+	+	+	+	+

Table 4. The percentage abundance of fish species in the commercial catches.

	Bada-giriya	*Udukiri-wela*	*Murut-hawela*	*Ridiya gama*	*Tissa*	*Weera-wila*	*Yoda-kandiya*
Cyprinus carpio	0.42	—	—	1.65	0.13	0.03	0.09
Etroplus suratensis	0.92	40.33	14.48	12.89	—	—	—
Glossogobuis giuris	0.07	2.94	3.91	0.48	—	0.03	—
Hyporhamphus gaimardi	—	—	—	0.24	—	—	—
Labeo spp.	0.37	—	—	—	0.74	4.42	0.87
Macrones vittatus	0.04	2.24	—	—	—	—	—
Ophiocephalus punctatus	0.01	1.02	—	0.03	—	—	—
Ophiocephalus striatus	—	0.25	—	—	0.10	—	—
Oreochromis mossambicus	96.45	33.37	64.39	81.58	96.61	87.05	96.27
Osphronemus goramy	0.40	—	—	0.99	0.16	—	—
Puntius dorsalis	—	7.42	9.23	—	—	—	—
Puntius sarana	1.34	12.44	8.00	2.13	2.19	8.15	2.77
Wallago attu	—	—	—	—	0.07	—	—

Table 5: The mean length and mean weight at capture of the fish species present in commercial catches

	Badagiriya		Udukiriwela		Muruthawela		Ridiyagama		Tissa		Weerawila		Yodakandiya	
	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Length (cm)
Cyprinus carpio	716	30							900	40			678	28
Etroplus suratensis	62	15	86	18	162	25	81	15						
Glossogobuis guiris	151	25	80	18	121	20	160	25			538	28		
Hyporhamphus gaimardi							40	12						
Labeo spp.									734	34	842	38	850	38
Macrones vittatus	109	23	82	17										
Ophiocephelus punctatus	156	23	104	17			155	120						
Ophiocephalus striatus			451	35										
Oreochromis mossambicus	162	23	198	25	169	23	185	23	193	24	188	23	190	18
Osphronemus gorami									375	25				
Puntius dorsalis			195	30	512	33								
Puntius sarana	167	20	61	15	118	20	195	23	201 336	27 30	194	20	186	17
Wallago attu														

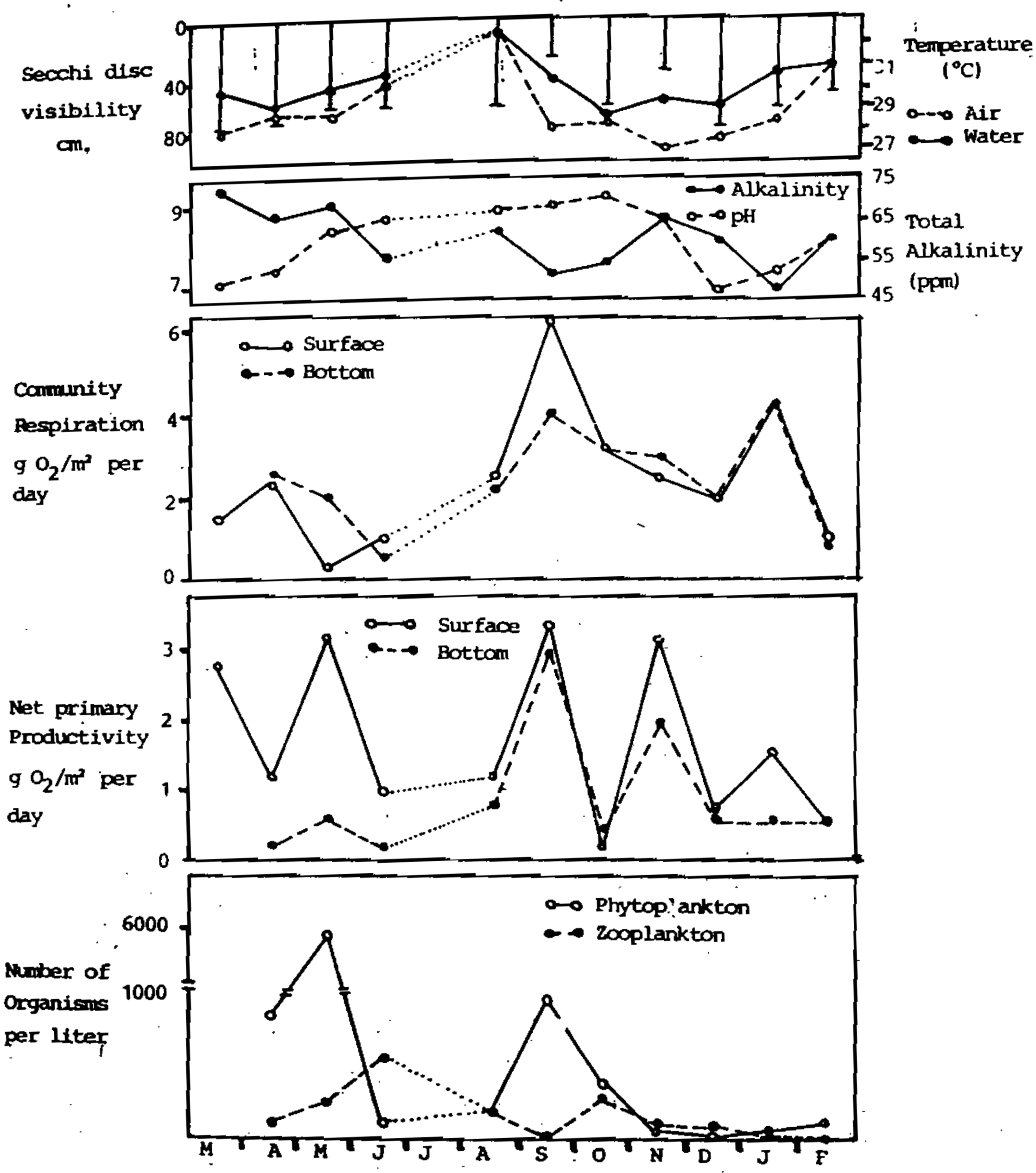

Fig. 1. Monthly variation of hydrobiological conditions in Udukiriwela reservoir.

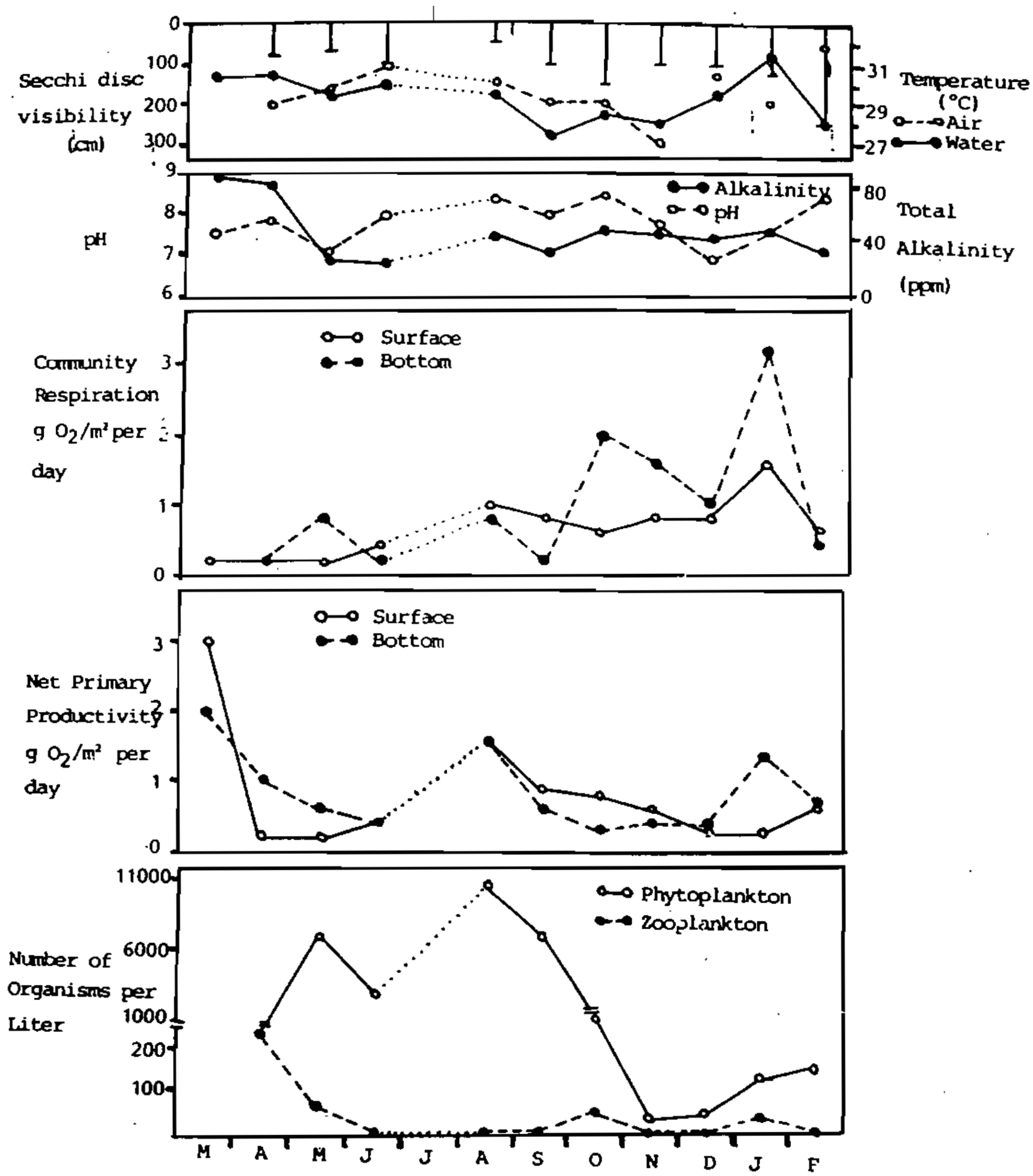

Fig. 2. Monthly variation of hydrobiological conditions in Muruthawela reservoir

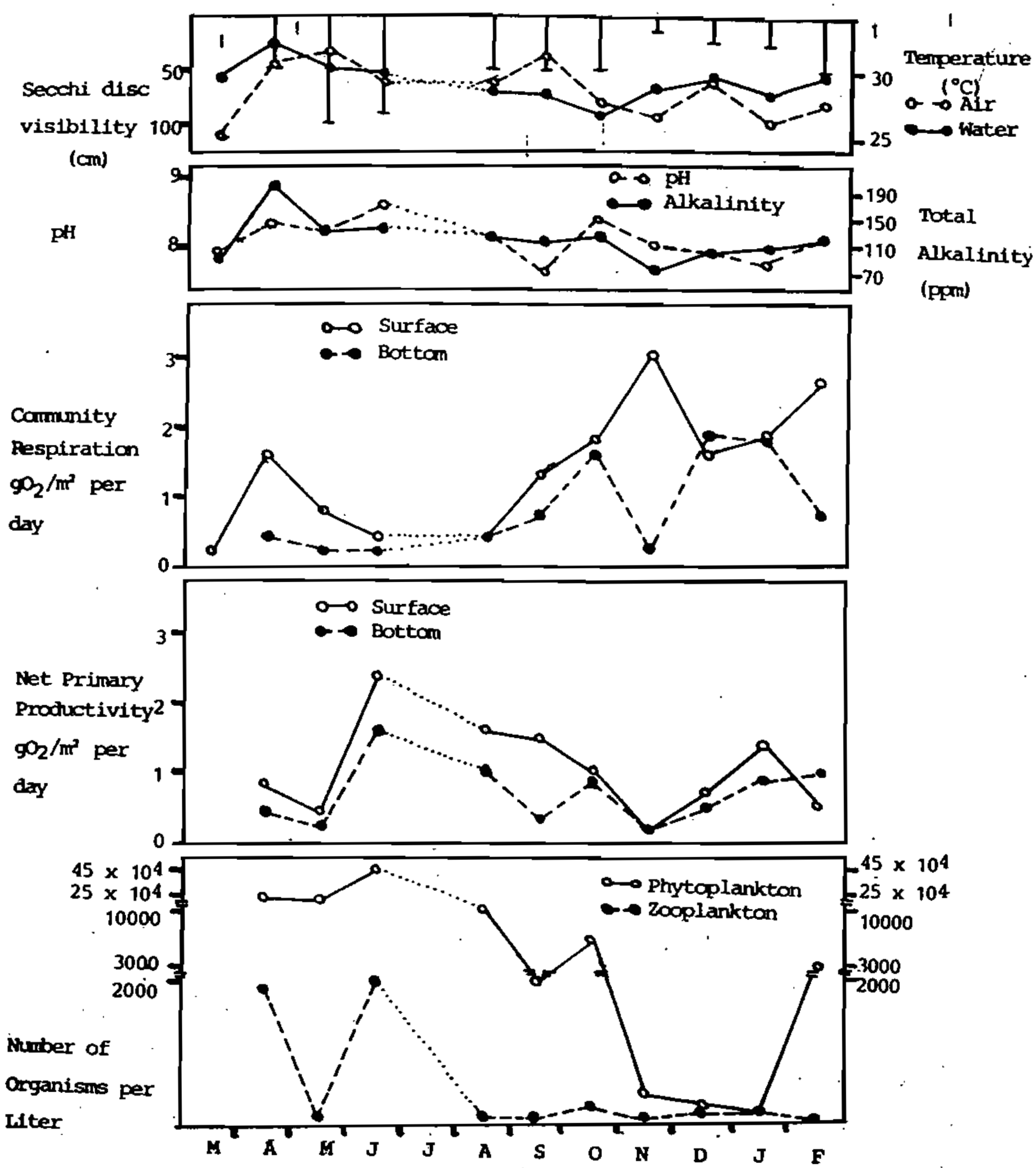

Fig. 3. Monthly variation of hydrobiological conditions in Ridiyagama wewa.

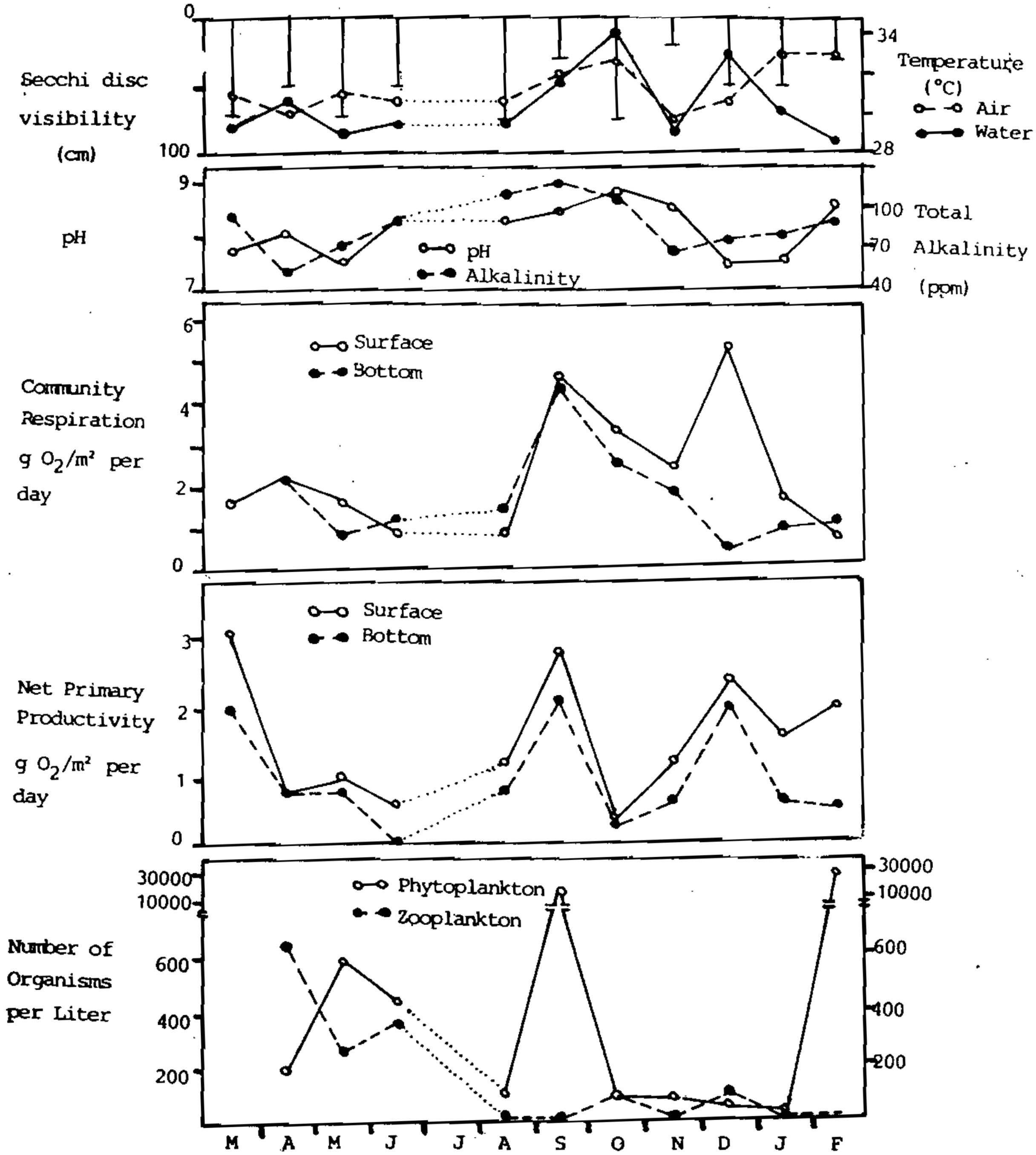

Fig. 4. Monthly variation in hydrobiological conditions in Badagiriya wewa

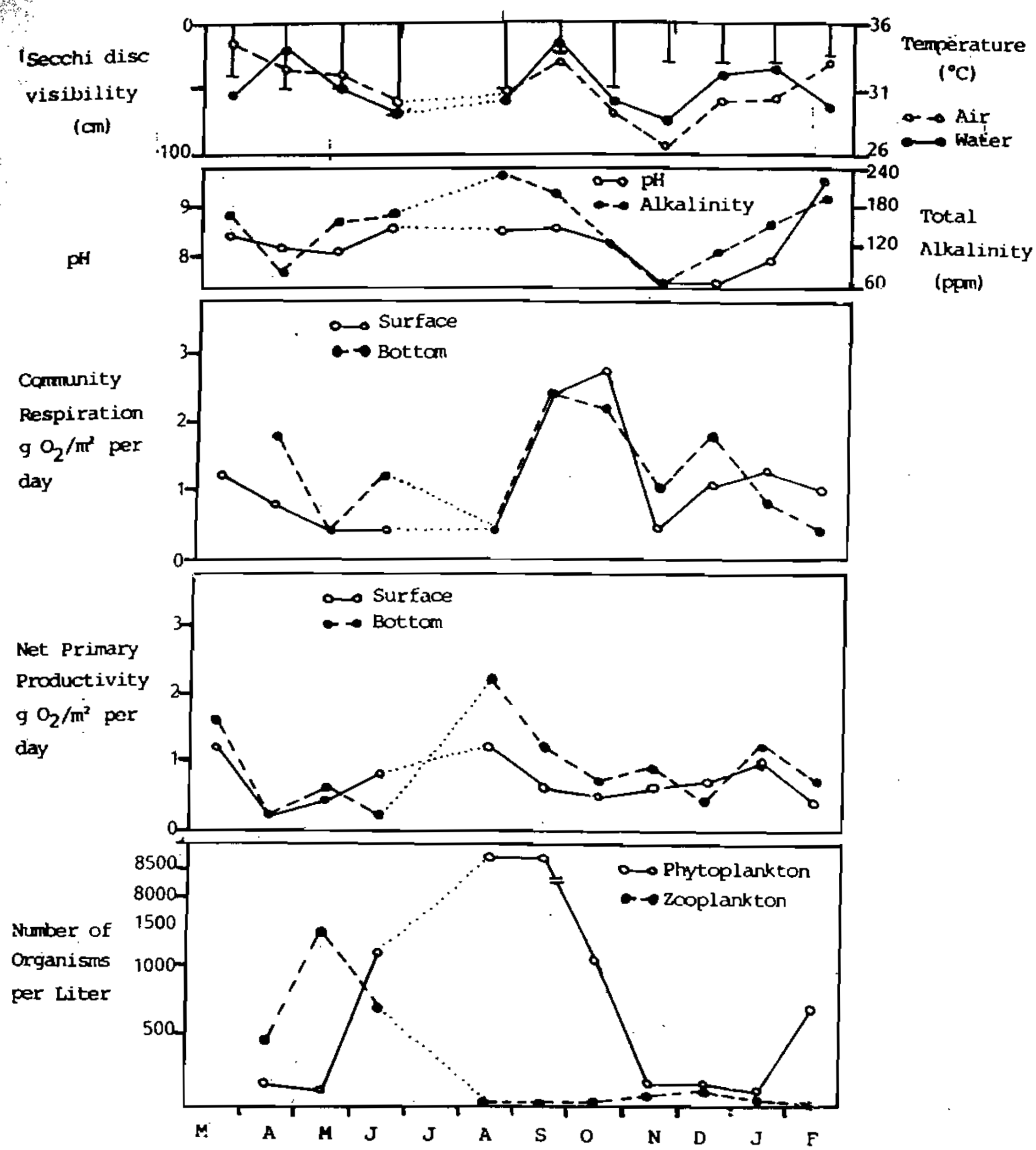

Fig. 5. **Monthly variation in hydrobiological conditions in Weerawila wewa.**

Table 6: Mean conductivity values, mean depths, morphoedaphic indices, catch and effort statistics, maximum sustainable yields and growth parameters, mortality rates and stocking densities of <u>O. mossambicus</u> for the reservoirs considered.

	Mean conductivity (μmhos/cm)	Mean depth (m)	Morphoedaphic Index	Present fish catch		fishing effort (Man hrs/day)	Present catch per unit effort (kg per ha /man hr per day)	estimated values for maximum sustainable yield (MSY)		MSY per unit effort kg per ha/man hrs per day	asymptotic length (L_∞) cm	growth coefficient (K)	natural mortality rate (M)	estimated values for stocking density	
				kg/ha/year	kg/year			kg/year	kg/ha/year					whole reservoir	per ha
Badagiriya wewa	523.75	2.318	225.9	651	311119	345	1.89	430253	900.30	2.61	39.3	0.34	0.85	4025514	8423
Udukiriwela wewa	143.75	1.501	95.8	113	29596	82	1.38	108537	415.85	5.07	41.3	0.32	0.80	1974729	7566
Muruthawela reservoir	150.80	8.506	17.7	28	14534	73	0.38	47036	90.89	1.25	40.5	0.33	0.81	971805	1880
Ridiyagama wewa	252.00	3.020	83.5	143	126489	392	0.37	323907	367.45	0.94	39.7	0.34	0.83	5612336	6367
Tissa wewa	371.30	1.517	224.7	195	55077	114	1.71	253403	896.05	7.86	39.5	0.34	0.84	5513624	19497
Wirawila wewa	402.90	2.333	172.3	98	54153	120	0.73	434370	705.49	5.87	38.7	0.35	0.87	11522484	18714
Yodakandiya wewa	394.30	1.702	231.7	114	68756	129	0.89	554256	921.15	7.14	35.3	0.36	0.91	15770722	26211

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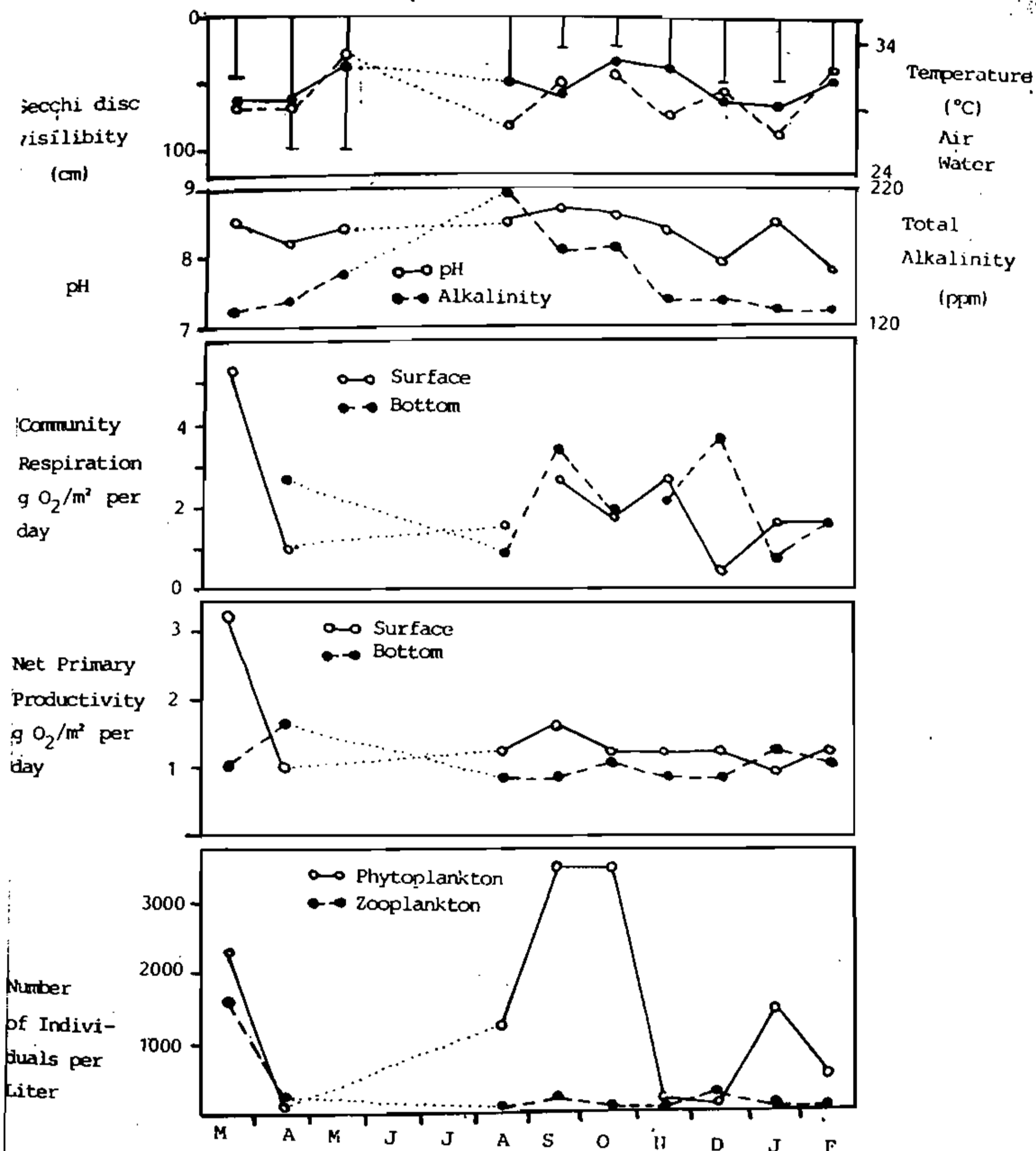

Fig. 7. Monthly variations of hydrobiological conditions in Yodakandiya wewa.