CHAPTER 7

DISCUSSION
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The purpose of the present study conducted on Kashmir lakes has been the assessment of their present trophic status on the basis of physico-chemical and production parameters. Lake classification in regard to trophic status has been attempted by quite a few investigators especially by Naumann (1919) and Thiene-mann (1931). But the trophic concept, as originally established, was primarily based on nutrient content which limnologists subsequently found difficult to hold to, because of the complex relationships of factors involved in fresh water eco-systems. And this made
Yoehimura (1934) to feel that the classification of lakes by Haumann (1919) and Thienemann (1931), based primarily on their nutritional content, was not applicable to most of the lake systems.

According to Rawson (1955), the mean depth could be a good criterion to distinguish oligotrophic lakes from the eutrophic ones, as all the lakes with a mean depth of 20 meters or more, that he examined, were generally oligotrophic, against those with a mean depth of 10 or <10 m which were usually eutrophic.

Hayes (1957) tried to relate the variations in the bottom fauna and fish yield to the trophic level of some Canadian lakes. He further observed the productivity as being pronouncedly dependent on the mean depth which in turn would indicate the trophic status of the lake concerned. Margalef (1958), on the other hand, tackled the problem of lake typology on biotic rather than on trophic bases, considering the bottom fauna to be more indicative than the plankton flora because of larger life spawn of the benthos.

Larkin and Northcoate (1958), after a survey of British Columbia lakes found it difficult to classify them on morphometry or on other biological
characteristics, normally utilized in distinguishing the lake types. The only feature of any importance according to these investigators in this regard was the quantity of total dissolved solids. Further, the local features of each lake studied were thought to be more helpful in matters of lake classification than the broad generalized characteristics.

Rawson (1960) proposed eight different variables that could be profitably considered in problems of lake classification. Three of these were biological and revolved round (i) the quantity of plankton, (ii) the quantity of bottom fauna, and (iii) the weight of fish per standard net. The five physical variables measured (i) the mean summer temperatures, between surface and 10 m depth, (ii) transparency, as measured by the Secchi disc, (iii) the average bottom oxygen, in July and August, (iv) the total dissolved solids, and (v) the mean depth. The assessment of these eight variables, enabled the author to propose a fairly good classification of the Canadian lakes. Algae have also been used as indicators in lake classification. While Round and Brook (1959) used algae in assessing the trophic conditions of some Fish loughs, Patrick (1965) used them for the same purpose in regard to streams.
Rawson (1956), observed the phytoplankton quotients to be only of limited use to limnologists, as the use of algae as indicators could be deceptive for the fact that some 'indicators', were not true indicators at all. But Brook (1965) considered the quotient system of lake classification, using desmids as specific indicators quite useful.

Hutchinson (1938) used the oxygen deficit, which develops within the hypolimnion during summer stratification, as an indicator of lake typology. The other characteristics used from time to time to indicate the levels of trophic evolution in lakes include (i) water transparency (Berg et al., 1958); (ii) oxygen content (Fish, 1963); (iii) specific conductivity of water (Dunn, 1954); and (iv) Oscillatoria fubescens bloom (Zutshi and Chianzani, 1970).

Case histories of lakes supply a great deal of information regarding their trophic evolution. Such studies have especially been made on lakes in America, Europe and Australia by Hasler (1947), Flannery (1949), Deevey (1955), Ohle (1955), Edmondson et al. (1956), Davis (1964) and Carr and Hiltunen (1965) to mention a few.
In a relatively new approach to characterization of trophic levels and trends towards eutrophication, Findenegg (1964) employed the radioactive carbon method of estimating the plankton production types and was thus able to clearly differentiate the eutrophic from the oligotrophic lakes in Austria on the basis of carbon assimilation curves.

Morphometrically, the four basins of the Dal lake differ markedly (Table 1) in regard to their area, volume, volume-development, maximum depth, mean depth and the index of shore-development, etc. The largest is the Bod dal and the smallest is the Nagin basin. But the Nagin is the deepest and the Gagribal the shallowest. The lake basin walls are essentially convex towards the water as the volume development index figures are less than unity.

The three lakes viz., the Dal, the Anchar, and the Manasbal also differ in their morphometric characteristics to an appreciable extent (Table 2). The Dal has the maximum area while the Manasbal has the minimum. The Manasbal lake is the deepest and the Anchar the shallowest. The maximum volume is estimated for the Dal and the minimum for the Anchar. The shoreline index of the three lakes also differs; it being close to unity for the Anchar and greater than unity
for the other two lakes. The ratio of mean and maximum depth ranges between 0.20-0.25 indicating the gentle slope of the lake basin.

Naumann (1919) and Thieman (1925) distinguished two types of lake basins, (i) deep and steep basins for oligotrophic lakes and (ii) shallow basins with gentle slope for eutrophic lakes. The lakes under investigation show the volume development index ranging between 0.601 to 0.785 indicating the highly gentle slope, which coupled with the shallow depth of the basins, puts them in the eutrophio series of Naumann and Thieman (E.C.). The same conclusions are drawn on applying the system of classification proposed by Rawson (1955) on the mean depth basis.

Viewing a lake strictly through the angle of transparency changes may not always help in assessing the change in its trophic status but this factor can, nevertheless, be used as one more aid for such an evaluation. In the Dal lake, the light penetration values differed from month to month and also from basin to basin. There is a seasonal correlation of transparency values; the values in all the basins being highest during the winter and early spring and the lowest during the summer (Figs. 7-8). The
transparency values in the Manasbal lake are the highest ranging from the minimum of 2.50 m to the maximum of 5.50 m. The transparency values show a definite seasonal trend, higher values being obtained during April-May and lower in the summer and the autumn (Fig.9). In the Anchar lake, due to a heavy proportion of silt brought in by the River Sind, the transparency values are the lowest of all the range between 0.70 m (during July-August) to 0.30 m in May.

Since there is no previous long term record of light penetration values for these lakes it is difficult to make any comparisons of their present trophic status with what existed in the past. However, following Yoshimura (1933) who while working on some Japanese lakes opined that lakes showing transparency values of 1.50 m or less show a tendency towards higher trophic level, these lakes could also be said to be getting eutrophied rapidly.

The thermal structure of any lake is opined to depend primarily on its geographical position and depth by Hutchinson (1951).

The thermal structure in the different basins of the Dal lake differs markedly. This may be due to varying depths of the various basins and also on account of the feeding channel coming into the
Fig. 38  Comparison of oxygen and temperature for the Anchar and three basins of Dal lake.
Hazratbal basin of the lake. Considering the annual changes in the surface temperature of the basins, the temperature did not fall appreciably during the winter and ranged between 5-6°C in all the basins without showing any inverse type of thermal gradient. The basins depicted isothermy during this period, which became disturbed with the increase in the atmospheric temperatures from March onwards; when as a result of warming up of the surface layers, a thermal gradient developed in the Nagin and the Hazratbal basins, while the Gagribal basin remained isothermal. Thus in the Hazratbal basin the maximum thermal amplitude of 5°C was recorded in March-April while in the succeeding months till August, it ranged between 1°C-2°C. In the Nagin basin, on the other hand, the maximum amplitude of 4-5.5°C obtained from April to July and the lowest of 2°C during early spring (March) and autumn (September). In contrast to these two basins the Gagribal basin remained isothermal throughout the year. Both the Hazratbal and the Nagin basins returned to an isothermal condition in September and October respectively. The temperature gradient developing in the Nagin basin can be attributed to the greater depth while in the Hazratbal basin, which is almost of the same depth as the Gagribal, it is due to incoming cold water through the feeding channel on the Telbal side.
The summer temperature gradient in the Nagin and the Hazratbal basins, without a detectable thermocline, is in no way near the true thermal stratification. However, Wedderburn (1910), while working on Loch Garry, recognised the fall of 0.28°C per m in the 'discontinuity layer' as sufficient to cause a definite discontinuity in the circulation of the water within the lake. Working on that analogy the term 'epilimnion' could, in the wider sense be rightly used to cover the warm upper layers of the two basins of the Dal lake throughout the stratification period, as has been done by Jenkin (1942) for Windermere.

In the Anchar lake two isothermal periods, one in winter and the other during the late autumn are detected. The summer temperature gradient was developed with the thermal amplitude ranging between 2°C in September and 4-6°C in June and July. The low water temperature in the lower layers is due to the cold water brought in by the feeding channel.

The thermal stratification in the Manasbal lake is different from that of the other two lakes in-as-much as, three distinct layers of epilimnion, thermocline and hypolimnion are discernible in this lake. The stratification sets in by early March and lasts throughout the succeeding summer and autumn.
Fig. 39 Some typical oxygen and temperature curves for Manasbal lake.
The stagnation period is of eight months duration while isothermy prevails from the last week of November to February. The lake depicts the multiple thermoclines in early spring as has been reported for Linsley Pond by Hutchinson (1957). The lake may show inverse type of stratification in severe winters though this was not observed during the course of the present investigation on account of mild winters. The lake is holomictic. The thickness of the thermocline varies from months to month, the maximum thickness of 5.50 m being observed in August which dropped to 2 m in October.

The three basins of the Dal lake show varying heat budgets calculated at 2473 g. cal, 2083 g. cal and 1556 g. cal for the Hazratbal, the Gagribal and the Nagin basins, respectively. The maximum heat loss occurs during August-September against the maximum heat gain in February-March. The heat budget for the Anchar lake is the lowest i.e., 1408 g. cal in July; with the greatest heat loss of 9.5 g. cal in September-October. The Manasbal lake shows the highest heat budget as compared to the other lakes. Thus, the maximum of 3679 g. cal was recorded for July and the minimum of 929 g. cal for January. The heat storage in the two layers of the lake varies markedly with a good percentage of the total heat stored in the lower zone.
The overall heat budgets for the various lakes are low. The low heat budgets of small shallow lakes indicate the inefficient heating according to Hutchinson (1957). The low heat budget is attributed to the loss of heat on account of evaporation coupled with back radiation of the absorbed heat at high surface temperatures. In shallow lakes, however, the heating of the mud is proportionately more. The lake Beloye in Russia ($\bar{z} = 0.15$ m) is reported to have 2500 g. cal of heat in sediment alone, against an annual heat budget of 8000 g. cal for the whole lake (Rossolimo, 1932). Similarly in Lake Hula, Jordan Valley, ($\bar{z} = 1.7$ m) the heat taken up by the sediments was estimated at 1400 g. cal, while the annual heat budget worked out to 2240 g. cal (Naumann, 1953).

Seasonal changes in water temperature indicate the lakes conforming basically to the temperate type of Forel (1892) and Yoshimura (1936), though the occasional occurrence of spring circulation would point to their belonging to the tropical lake types as well. According to Whipple's (1927) scheme of classification, the Manasbal and the Nagin basin of the Dal lake could be put in the lakes of second order; while the Anchar lake in addition to the other basins of the Dal lake would come close to the lakes of the third order. According
to Hutchinson's (1957) system of classification the Manasbal lake and the Nagin basin of the Dal lake, can to some extent be placed in the 'warm-monomiotic', which at times can behave as 'dimictic type' due to severe winter conditions. In the schematic arrangement of the thermal lake types of Hutchinson and Löffler (1956) the Manasbal and Nagin can be placed in the transitional region between dimictic and warm-monomiotic, The Gagribal in the polymictic region, while the Anchar lake and other basins of the Dal lake in the region of mixed types.

Dissolved oxygen, because of its fundamental role in lake metabolism, has been the subject of limnological investigations for more than four decades past. The first thermo-dissolved oxygen classifications was proposed by Birge and Juday in 1911. These very authors later in 1914 while working on the Finger lakes in New York, were able to categorise these into three types on the basis of the oxygen reduction in hypolimnion during the late summer stratification period. Immediately after, Thienemann (1915) published a system of classification based primarily upon the summer stratification of oxygen followed by Tanaka's system of classification based upon the summer distribution of dissolved oxygen in the thermocline and the hypolimnion in 1928. Juday and Birge (1932) found it
possible to organize the seventy-six lakes in northern Wisconsin studied by them into four groups on the basis of depth coupled with the dissolved oxygen performance. Yoshimura (1938) proposed a system of classification based upon the mean amount of dissolved oxygen in the hypolimnion, the presence or absence of microstratification, and the oxygen stratification in the thermocline. In the improved method of handling oxygen data Hutchinson (1938) correlated oxygen deficit with the lake typology.

And, according to this author the oxygen deficit, developing within the hypolimnion, may be equated to the amount of trophogenesis which has occurred in the epilimnion, since the material produced in the epilimnion often falls into the hypolimnion.

The dissolved oxygen pattern in the lakes under study shows a marked variation. In the Gagribal basin of the Dal lake the water remains mixed throughout the year and oxygen content is consequently almost the same from surface to bottom all the year round. In the Hazratbal basin, on the other hand, the development of a thermal gradient results in the development of an oxygen gradient as well, the surface water containing more oxygen than the lower layer. In the Anchar lake the oxygen concentration from surface to bottom is the same until April, whereafter till October an oxygen gradient of the magnitude of 2-3 mg/l develops.
The oxygen profile in the Nagin and the Manasbal shows certain distinctive features, with a clinograde type of oxygen curve being markedly obtained for both the lakes. But while the Nagin also shows a positive heterograde along with clinograde type, no positive heterograde type of curve is obtained for the Manasbal lake. The positive heterograde oxygen curve in the Nagin could be biogenic. The increase of 2 mg/l or more in the oxygen concentration in the metalimnion layer in this basin can be said to be more due to photosynthetic activity of plankton than only due to physical causes. The lower layers of the Nagin and the Manasbal get depleted of oxygen during the Summer stagnation period, although the intensity of depletion in the two basins differs. So the summer depletion of oxygen in these lakes is characteristic and indicative of a tendency towards eutrophication. Ström (1951) has correlated the rate of oxygen depletion in the hypolimnion with the lake productivity. And similarly the higher trophic status of the lake Mergozzo in the northern Italy, was attributed to the consumption of the hypolimnion oxygen coupled with the higher content of carbon dioxide during the Summer stagnation by Baldi et al. (1953).

The real oxygen deficit for the Nagin was calculated at 0.0129 mg Cm⁻² day⁻¹ and for the Manasbal
at $0.068 \text{ mg Cm}^{-2}\text{day}^{-1}$. According to Hutchinson (1933), the lakes losing hypolimnetic oxygen at the rate of $0.017 \text{ mg Cm}^{-2}\text{day}^{-1}$ are oligotrophic in character while those losing $0.033 \text{ mg Cm}^{-2}\text{day}^{-1}$ are eutrophic. Mortimer (cf. Hutchinson, 1957) however, suggested $0.025 \text{ mg Cm}^{-2}\text{day}^{-1}$ hypolimnetic oxygen loss as the upper limit for oligotrophy, and $0.055 \text{ mg Cm}^{-2}\text{day}^{-1}$ as the lower limit for eutrophy. According to these two systems of classification, the Nagin falls in the oligotrophic series and the Manasbal in the eutrophic. The Manasbal lake is, therefore, observed to be at the higher trophic level, followed by the Nagin basin of the Dal lake.

Edmondson et al. (1956) while working on Lake Washington showed the hypolimnetic oxygen deficit had increased from $0.032 \text{ mg Cm}^{-2}\text{day}^{-1}$ in 1933 to $0.105 \text{ mg Cm}^{-2}\text{day}^{-1}$ in 1955 and suggested the lake to be showing a higher degree of trophication.

The nutrient status of the lake also gives an indication of its trophic level. The specific conductivity was utilized as one of the indices by Berg et al. (1958) for assessing the trophic level of Lake Pure S\textsuperscript{2}, Denmark. The conductivity values for the Hazratbal, the Gagribal and the Nagin basins of the Dal lake varied between 100-175 $\mu $S/25°C, 95-169$\mu $S and 148-240 $\mu $S respectively. The conductivity values evinced a definite seasonal trend, being higher in winter, spring and
autumn and lower in summer months. Stratification in terms of conductivity through different depths was recorded at the Nagin basin. The conductivity in the Anchar lake varied between 132-385 μS. The conductivity for the surface water in the Manasbal lake ranged from 170-340 μS, the values being higher during winter, spring and autumn and lower in summer. The stratification in regard to conductivity was well marked, the values for bottom water ranging from 275-393 μS with the same seasonal trend as marked for the surface waters. The conductivity increases in the bottom layer both in the Nagin and the Manasbal lakes during summer stratification period. Juday and Birge (1933) also recorded the higher conductivity in deeper zones as compared to that in the surface waters in some Wisconsin lakes. Similarly Vollenweider and Frei (1953) have also observed a marked increase in conductivity in the deeper zones of stratified lakes, coupled with a marked increase in bicarbonate (as measured by alkalinity) as is true for the lakes under study.

Applying the system of classification based on conductivity values as given by Cluen (1950), the lakes under investigation are grouped into:

a) Olgo-area type with conductivity $\geq 200$ μS
as for example the Gagribal and the Hasratbal basins of the Dal lake.
Fig. 40  Correlation diagram between average height and dry wt. per plant in *Typha*.
Dry wt. plant vs. average height in cm/plant graph.

Linear equation: $Y = 19X + 151$

Correlation coefficient: $r = 0.92$
b) β-meso-area with conductivity 200-500 μS as for example the Anchar lake, the Manasbal lake and the Nagin basin of the Dal lake. On the whole, the increased conductivity values can be said to indicate a tendency towards higher level of trophication as has been suggested by Berg et al. (L.C.) in regard to lake Pure Sø.

The alkalinity values for the Gagribal, the Hazratbal and the Nagin basins of the Dal lake varied between 35-70 mg/l, 56-120 mg/l and 45-120 mg/l respectively. The seasonal trend was exactly the same as recorded for conductivity. Stratification with regard to alkalinity was obtained in the Nagin basin. In the Anchar lake the alkalinity ranged between 53-80 mg/l. The surface water alkalinity in the Manasbal lake ranged between 57-120 mg/l with a well marked stratification between surface and bottom waters. The bottom water showed higher alkalinity ranging between 82-160 mg/l.

Moyle (1945) designated the lakes with alkalinity values of 40 mg/l as 'soft', those with values of 40-90 mg/l as 'medium hard' and those with values over 90 mg/l as 'hard' types. Accordingly, the Anchar lake and the Gagribal basin of the Dal lake are 'medium hard' and the rest are all the 'hard' types.
Sørensen (1948) also classified lakes on the basis of alkalinity into (a) oligo-area (0.5 meq/l), (b) β-meso-area (0.5-2.0 meq/l), and (c) Poly-area (2.4-4.5 meq/l). Applying the above scheme of classification, the Anchar lake and the Gagribal fall into β-meso-area type while all the rest fall into the Poly-area type.

The pH of the lakes under study varies a great deal during the year though always falling on the alkaline side. Stratification with respect to pH was noticed in the Nagin and the Manasbal lakes.

The calcium content of the surface water in the three basins of the Dal lake shows only a little variation in a particular month. An increase is noticed during the late summer and the autumn against a decline during the spring. The calcium content of the Anchar lake is slightly higher. Calcium stratification was recorded for the Nagin basin of the Dal lake, the bottom layer containing more of the mineral. In the Manasbal lake, the hypolimnion is richer in calcium which drops considerably in the thermocline and the Epilimnion. Ohle (1934) designated lakes containing 10 mg/l of calcium as 'calcium poor', those with 10-25 mg/l as 'calcium medium' against those with 25 mg/l as 'calcium rich'. In view of this classification the waters of the Nagin and the Manasbal are 'calcium medium', while those of the Anchar, the Hazratbal and the Gagribal are 'calcium rich'.
Correlation between the shoot density and dry wt. in *Phragmites*.
Öhle (1955) described the changes that had occurred in some lakes of the Holstein area of Northern Germany and correlated the change over from oligotrophic to eutrophic condition with increased flow of phosphates into the lake systems particularly through the fertilization of fields. According to him the primary factors of enrichment were listed as phosphorus and nitrate nitrogen, which has since been corroborated by the views of numerous workers. For example, Klifflmuller (1962) attributed the change over of the lake constance, Switzerland, from an oligotrophic to an eutrophic condition between 1935 and 1962, to the increased \( \text{PO}_4^\text{2-} \) content of the lake water. Similarly, on the basis of analyses of water of 17 different Wisconsin lakes, Sawyer et al. (1945) have suggested 0.015 mg/l of inorganic phosphorus and 0.3 mg/l of inorganic nitrogen as critical levels, beyond which blooms indicative of enhanced trophic status can normally be expected.

Both the inorganic phosphorus and inorganic nitrogen are low in the surface waters of the lakes under study. The phosphate ranged between 5-10 \( \mu \text{g/l} \) while the nitrate nitrogen ranged from 20-25 \( \mu \text{g/l} \), the very fact that indicates the lakes to be of low trophic levels. But, being subject to a great cultural influence besides, being the receivers of sewage plus the other
effluents, the lakes should surely have shown higher values for these radicals, which of course is not so. The low content of phosphates and nitrates in these lakes can, however, be attributed to (i) the formation of insoluble calcium phosphate complex, due to their being basically marl lakes and hence rich in calcium, and the looking up of the phosphates and nitrates in the dense macrophytic vegetation that abounds in these lakes all the year round, offers a great competition for these radicals to plankton population. Similar conclusions have earlier been drawn by Goulder (1969) in regard to a gravel pit in England and by Boyd (1969) in regard to the production of Justicia americana and Alternanthera philoxeroides.

The lakes under study are rich in marl and are characterized by alkaline, hard water in addition to marked deposits of carbonates both in the sediments and other types of substrates. The conspicuous feature in these marl lakes is a generally low diversity of macrophytic vegetation; most of the production being due to a few species only that are adapted to the rather rigorous chemical milieu (Rich et al., 1971). The occurrence of some species in typically dense and relatively monospecific stands in the Dal and the Manasbal lakes could also be explained on this basis.
Fig. 42 Average daily production rate of different macrophytes.
The total biomass production in the Anchar lake is comparatively less than that in the Dal lake. The sparse growth of macrophytes in this lake is more due to higher silt conditions than to the unavailability of biogenic salts; as has also been opined by Edwards (1969) in case of some South African rivers.

The present study has revealed the macrophytes in Kashmir lakes as being the main contributors of photosynthetic carbon fixation. In the Dal lake alone, the submerged macrophytes cover as much as 40 per cent of the total area during the optimum growth period. Accordingly, the total dry weight production in this lake was calculated at 30 metric tonnes per hectare, against 10.1 m.t per ha in the Anchar and 9.7 m.t/ha in the Manasbal lakes. In the Dal and Anchar lakes the contribution by submerged vegetation amounts to 3.51 m.t/ha and 2.92 m.t/ha respectively. The main contribution in the Manasbal lake is due to the two most dominant submerged species viz., Myriophyllum spicatum and Ceratophyllum demersum. The former producing 5.3 m.t/ha and the latter 4.2 m.t/ha. The phytoplankton populations are quite low in the lakes under study; as indicated by their production figures. The total carbon fixed by the phytoplanktons in the Manasbal, the Dal and the Anchar lakes was calculated at 25.4 kg C/ha, 10.3 kg C/ha and 5.32 kg C/ha respectively.
The higher production of macrophytic communities on per unit basis as compared to phytoplankton communities under comparable conditions is thus apparent and in accordance with the findings of Westlake (1963). The lakes are perhaps not very fertile (cf. Westlake, 1963). Thus the conclusions drawn by Hasler and Jones (1949) and Moore (1952) in regard to the insignificant contribution of phytoplankton to primary production in shallow lakes with large littoral zones, do hold true for these lakes as well.

Findenegg (1964) suggested the shape of the assimilation curve as very important for diagnosing the degree of eutrophication, in fact, attached greater importance to it than to the amount of organic matter produced per surface unit. According to the author the lakes with a maximum peak of assimilation below the surface rather than right at the surface are more productive and further, eutrophication may not raise production but only lessen it due to decreased high transmission.

The productivity measurements carried out in the lakes under study by carbon - 14 method, have been used to construct assimilation curves for the Manasbal lake and the Nagin basin of the Dal lake. The assimilation curve of the Manasbal lake shows the typical
metalimnic maxima being characteristic of Findenegg's type III assimilation curve. The assimilation curve of the Nagin basin of the Dal lake also conforms to this type. This clearly points that these lakes are showing a definite tendency towards eutrophication.

Berg et al. (1958) reported eutrophication in the lake Pure on the basis of (i) visibility, (ii) an increase in conductivity coupled with lower values of oxygen in hypolimnion. Minder (1943) had also reported a change in trophic level of the lake Zurich on the basis of increased content of dissolved oxygen at the surface layer coupled with oxygen depletion in the bottom layer. Eutrophication, as a result of increased culturation has also been reported by Ohle (1955) for some lakes in Northern Germany and by Cowgill and Hutchinson (1964) for Lago di Monterosi in Central Italy. There have, however, been no studies on eutrophication in India except for Singh (1953) who reported the Maini Tal lakes as undergoing eutrophication due to dumping of cattle dung and other raw sewage into these water bodies.

Thus, on a consideration of the various parameters studied vis-a-vis the literature existent on the subject, the lakes in Kashmir are definitely marching ahead in regard to their trophic status, the parameters of positive significance being (1) morphometric features,
(ii) increased oxygen content in the surface layer, (iii) hypolimnic oxygen deficit, (iv) increased conductivity values, and (v) the pattern of assimilation curve. The (i) low concentration of phosphates and nitrates in lake waters, (ii) water transparency, (iii) lack of frequent planktonic blooms, and (iv) lower values of primary production, would, however, be of a negative significance in this regard. The chief causative factor for a change towards a higher trophic status in these lakes is the rapid cultural development of their catchment basins.

Unfortunately, with the exception of special fish ponds in which the enrichment in regard to nutrients is desirable, the effects of eutrophication are generally conceived to be rather drastic. This process of eutrophication is bound to result in the lowered aesthetic values, increase of algal mats and macrophytic vegetation, changes in fisheries and fish kills, problems of water treatment plants, undesirable tastes and odours in the water in addition to the development of anaerobic zones and toxic algae.

The old English saying, "An ounce of prevention is worth a pound of cure" is a valuable advice to conserve our lakes, which if left unchecked will deteriorate fast.