BFB-Bericht, 51, 61 65 1984

DATA TO THE WATER QUALITY OF THE RÁKOS BROOK

ÁBRAHÁM Margit and Miklós PANNONHALMI

North-Transdanubian District Water Authority Győr, Hungary

The water quality investigation of the lake Fertö has a long background, but the regular monitoring survey on the Hungarian part of the lake have been in the 60-s begin. Investigating the water quality both, the Hungarian and Austrian researche workers, and last, but not at least the experts of the Austro-Hungarian Water Council had established that the phosphorus discharge of the lake was in the 70-s slowly increased. The potential brutto phosphorus discharge from the catchment area has been estimated about 250 t/y, which after biological treatment and phosphorus removal can be reduce to 120 t/y. This value involves the 90 t/y diffuse phosphorus discharges as well. The brutto phosphorus discharge of the Hungarian sewage treatment works(STW) was estimated by the Austrian researchers for 14 t/y.

On the Hungarian part of the catchment area can be find two sewage treatment plants, one on the Rákos Brook drainage area, the STW of Sopronköhida, the second on the Balf sub-catchment area, treating the sewage waters of the medicinal bath. From both STWs the water is provided to the lake, after full biological treatment in case of Sopronköhida through the Rákos Brook. The Balf STW discharge is very small and it is not worth to deal with.

Morphology

On the Hungarian part of the Fertö lake catchment area the only one standing surface water runing to the lake is the Rákos Brook. The catchment area in West and North is bordered by Rust Hills, in South by the Hills round Sopron and East by the lake itself.

The catchment area is 11 km long in North-South and 5 km wide in East-West. The total surface is 50,9 km^2, from which 9,1 km^2 (17%) belong Austria. The Rákos Brook is about 10 km long. The average annually rainfall is 700 - 750 mm and 40 % falls in the winter period. The average annually air temperature is about 10^o C. The catchment area land use has an agricultural character, 48 % plough land, 38 % forest, 10 % vineyard and the rest are reeds and grounds.

On the area are two villages - Sopronköhida and Fertörakos - two farms and the Tömalom recreation area. The population is about 3.000.

Hydrological characteristics

The Rákos Brook flow is measured in Fertörákos gauging station. On the basis of 10 years records the characteristical flows are:

lowest flow	10	15 l/sec,
long term average		60 l/sec,

Flood waters in mouth stretch:

1 % highwater	28 m^3/sec,
10 % highwater	16 m^3/sec.

The Rákos Brook has one tributary, the Tömalom Brook, which water is totaly stored in reservoirs. The water volume of the Rákos Brook flowing into the lake in summer time is near to the lowest flow, because below the gauging station the water is used for irrigation as well. In 1978 the channel-like direct inflow of the Brook was stoped and the Brook joints the lake through 1,5 km wide reed belt.

Water supply and sewage treatment

The water supply of the two villages is secured by the Sopron Water Plants. Because of the lack of chanalization, the water supply is based on public wells.

Fertörâkos has no sewerage network, the sewage waters are treated in individual clarifiers and soakink pits. The lack of sewerage network is the limiting factor of the potable water distribution system.

Sopronköhida and Tömalom recreation area are partly chanalized and the sewage water after biological treatment conducts to Râkos Brook. The loading of the STW is gradually increased and recently reached the 1.000 m^3/d level. The STW structure:

- pumping station,
- screen,
- distribution well,
- 2 combined basin (aeration and final clarifiers),
- chlorination basin,
- sluge tank.

The biological treated sewage water joins to the recipient at 5+600 river km stretch.

The construction work of the STW was completed in two stages, according to the demands of the 50-s and 70-s, and this effect can be seen on the Râkos Brook water quality too.

The water quality of the Râkos Brook

The water quality control and the biological survey of the Râkos Brook started 15 years ago by the North-Transdanubian D.W.A. with mountly system at Fertörâkos in the 2+900 river km. stretch in the frame of our harmonizing monitoring network. We control regulary the STW of Sipronköhida, the effluent and the STW efficiency as well. For a successful water quality protection of the Râkos Brook and Fertörâkos Bay, we have been carring out many times long- and cross profile surveys on the lake and the Brook. Since 1981 near our harmonizing monitoring sampling point have been carried out the Austro-Hungarian common investigations too.

Hydrochemical investigations

The investigations involve the determination of the main components of salt-household, and nutrients and such as special components as oil residues, phenols, detergents.

Analysing the 11 years long water quality data, since 1970 till 1980 we have divided this period into two, because the improvement of the STW of Sopronköhida had been completed in 1976. These two periods are 1970 - 1976 and 1977 1980.

Salt-housenold (1. figure)

The salt concentration of the Râkos Brook water in term of conductivity during this 11 years shows a small increase which can be in connection with the slowly increase of the discharges of the STW. The total salt concentration since 1976 shows stagnation. The standard deviationsin both cases are rather small, 10-15 expressed in %. The sodium-ion concentration in the past 11 years did not show any important changes and the average concentration is lo times less comparing to the Fertö lake.

Oxygen-household (2.figure)

From the oxygen-household we analyse here the dichromat and permanganat COD. Generally can be established, that after completing the STW, the COD of the water did not increase and in case of permanganat COD the Râkos Brook showed some slight improvement. The load of the Râkos Brook has been equalized what shows the standard deviation of the permanganat COD, which decreased of 1/3. The average COD values show in the last 3 years a decreasing tendency.

Nutrients (3. und 4. figure)

Among plant nutrients have been done regulary the ammonium, nitrit, nitrat and phosphat-Ion analysis. The distribution of ammonium and nitrat- ion follow the improvement of the STW. In the 1970-1976 period the ammonium-ion concentration had a significant increase and after completting the STW in 1976 showed a decreasing tendency. According to this, but in opposite direction changed the nitrat-ion concentration.

After a quiete fast increase of the orthophosphat-ion during the 1970-1976 period, later on the increase was slower. On the STW is no phosphorus removal, so the increase of the phosphorus concentration can be connected with the increase of loading. Figure 4 shows the average distribution of anion active detergants. The figure shows, that after completing the STW improvement, in spite of increasing loads, the values are decreasing, and looking the standard deviation rates, the discharge of the recipient has been equalized.

Concerning total phosphorus loading of the Brook we carried out long-profile surveys as well and could established, that the total phosphorus concentration of the Brook changed between 0,25 - 1,22 mg/l P. The discharge was 0,036 g P/sec on the survey day, that means a 3,1 kg/d phosphorus load in mouth stretch. This value agree well with, the measured 5 kg/d phosphorus load in STW effluent.

Saprobiological surveys

To qualify rivers biological quality we used the saprobiological index lined out by Kolkwitz-Marson-Liebman. At our sampling point, a slowly decreasing tendency of the water quality till 1975, from alfa-mezosaprob to alfa-polimezosaprob and in some cases even polisaprob could be seen.

Since 1975 the quality improved and by now it has an alfa-mezosaprob character, in Spring and Summer periods by diatoms domination even an alfa-beta-mezosaprob character.

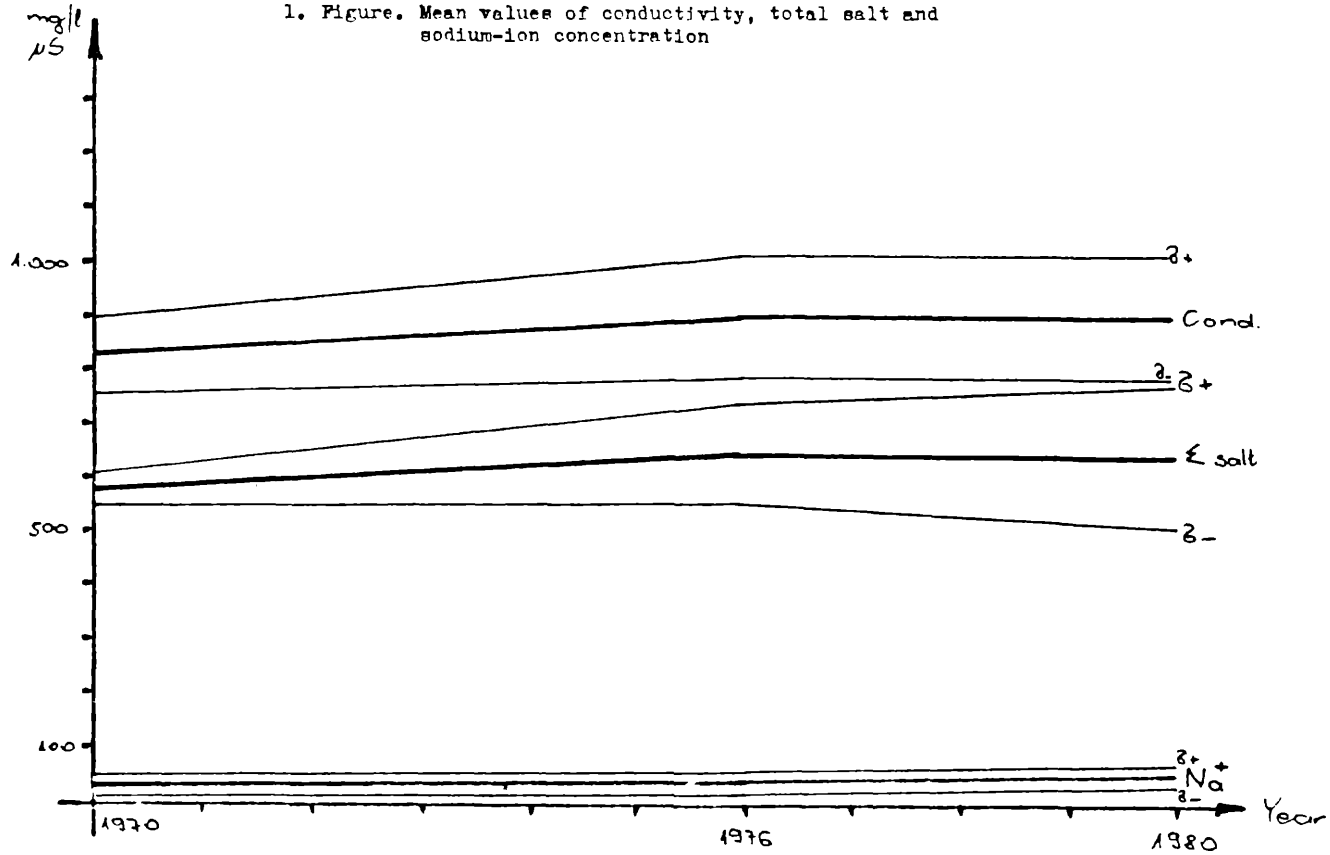
On the basis of our long-profile surveys it can be established that the water quality over the STW was in the II-III class and below the STW changed to III-IV class.

Conclusion

According to our surveys it can be established, that the Rakos Brook does not have any effect on the lake water quality. On the catchment of the Hungarian territory the STW-phosphorus load does not exceed the 2 t/y value. In spite of this, to improve the water quality of the Rákos Brook it seems to be necessary to introduce the chemical phosphorus removal, which gave exellent results in case of the Austrian STW-s.

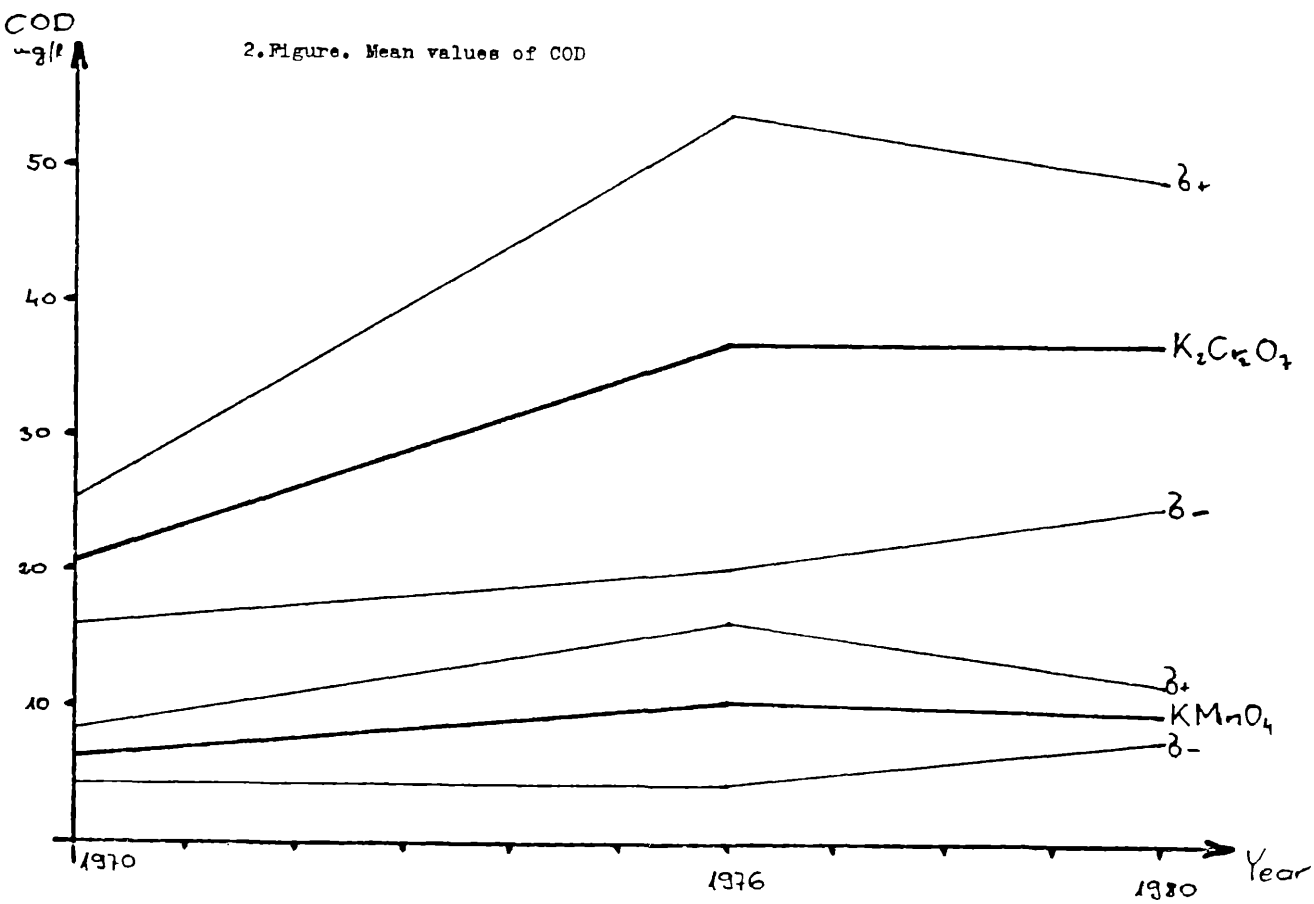
RÁKOS BROOK

1. Figure. Mean values of conductivity, total salt and sodium-ion concentration



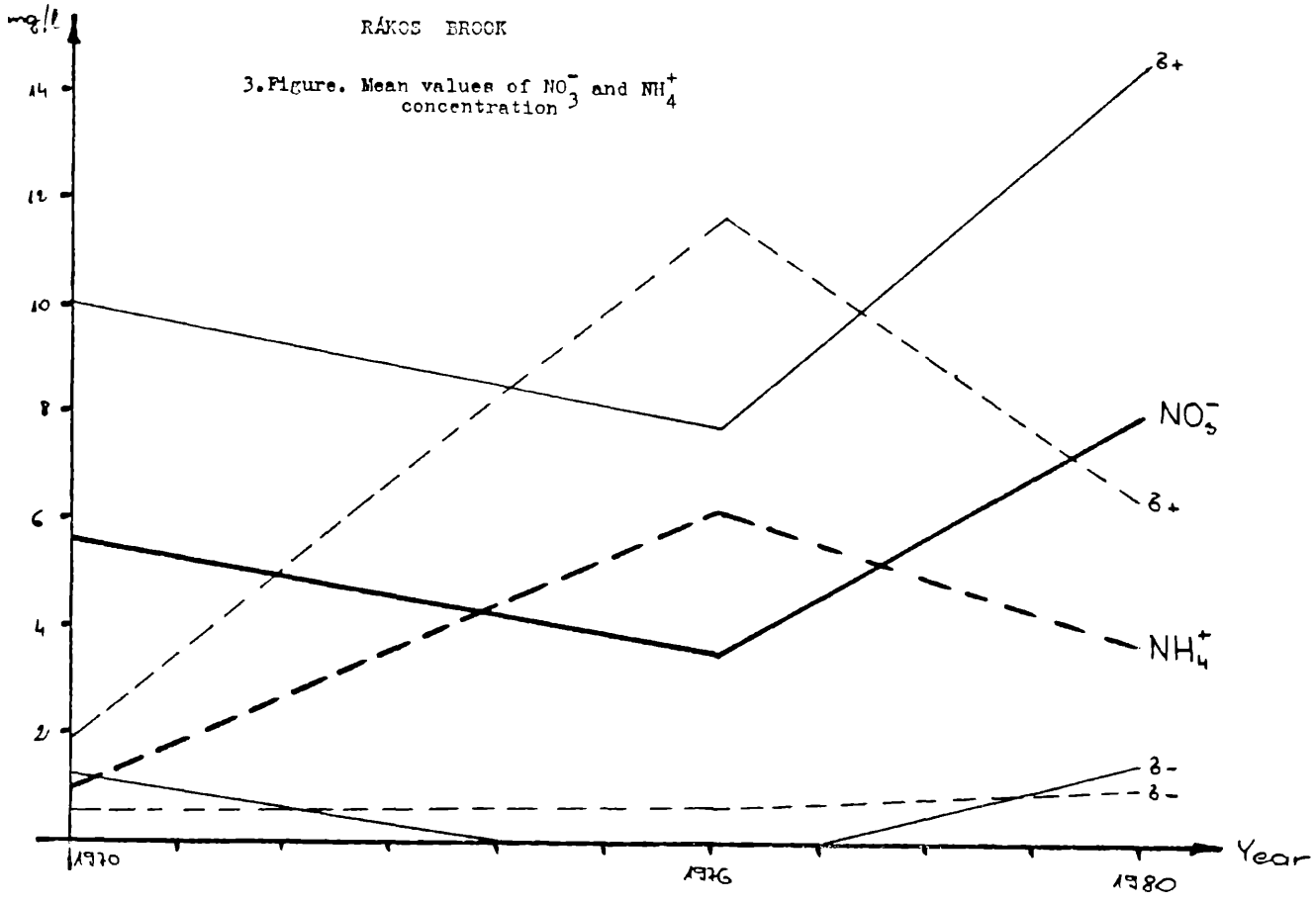
RÁKOS BROOK

2. Figure. Mean values of COD



RÁKOS BROOK

3.Figure. Mean values of NO_3^- and NH_4^+ concentration



RÁKOS BROOK

4.Figure. Mean values of PO_4^{3-} and ANA detergent concentration