Final Technical Report.
May 1978 - May 1980

Study of Pollution and Aquatic Organisms Of the Leh Stream, Rawalpindi

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PAKISTAN SCIENCE FOUNDATION

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CONTENTS

Summary.

The purpose of the project was the study of physico-chemical nature of water, organisms(plants and animals) and the productivity of bottom fauna of the Leh stream, Rawalpindi. It was also intended to find out the pollution, its effects on water quality and the organisms and also to determine the water pollution indicators.

The collection of water samples and the organisms was done on monthly basis each year from June 1978 to May 1980. Due to shortage of staff and funds, the places of collection were reduced from 8 to 6 and instead of fortnightly, monthly collection was done The main object was the study of pollution and the organisms of the Leh stream, Rawalpindi. The Leh stream and its tributaries, arise from Margalla hills above Islamabad and drains through a great part of Islamabad, it is, therefore necessary that the study should also be done in Islamabad.

The water of the Leh stream before reaching the Sewerage Treatment Plant, a tributary, Tanewali Kas near 7-UP Beverage Factory and a tributary, Badarwali Kas coming from I/10 have nonpolluted water and the water quality is fit for drinking, domestic and irrigational purposes. These waters have typical stream flora and fauna. Among the flora there were a number of algae and a few angiospermic plants such as Potamogeton, Hydrilla, Typha and Lemna. There were a good number of macroinvertebrates which for the food of fishes. The productivity of bottom fauna was also high. Ten species of fishes were found in nonpolluted water, some of them were of suitable sizes. In sector I/9, after receiving the industri-al pollution the colour of water become milky and there was a drop in the organisms by number and weight. No fish was found. Tanewali Kas and Badarwali Kas discharge into the Leh near Sewerage Treatment Plant. The Leh after the confluence passes under the bridge near F-Block, Satellite Town. The bulk of water increases and the pollution is diluted. In our study of the fauna and flora, it was found that number and weight was increased. Before the construction of industries in Islamabad, the water was not much polluted, fishes were found up to Dhok Dallalan, Pir Vadhai. The Leh behind Holy Family Hospital was an ideal place for Anglers, but now no fish is found at this place. The water passes through Rawalpindi town and it gets household and sewage wastes; detergents and soaps from dhobighats and houses; faeces and urine of buffaloes; wastes from service stations and effluents from small industries, so the colour of water becomes brown and the bottom becomes black. The water is highly polluted when it comes near Mohanpura and Daryabad, the dissolved oxygen becomes very low, the flora and macrofauna are also reduced. When the Leh passes near Dhok Chiraghdin, it pollutes

the wells in the nearby areas.The water passes on the back of Ayub Park and the slope is sharp.Due to the detergents and soaps there are foams over the surface of water.During this course the water becomes aerated and solid impurities are settled down on the bott The water near the Soan Camp, becomes slow and is not badly pollu and a fish,Channa punctatus was found .In the spring 1979 a numbe of young Chela sp. were found in large number.Turtles were common the Leh near the Soan Camp.The total length of the Leh from its origin to the confluence of the Soan river is 22½ miles and it cov 12 miles in Rawalpindi.

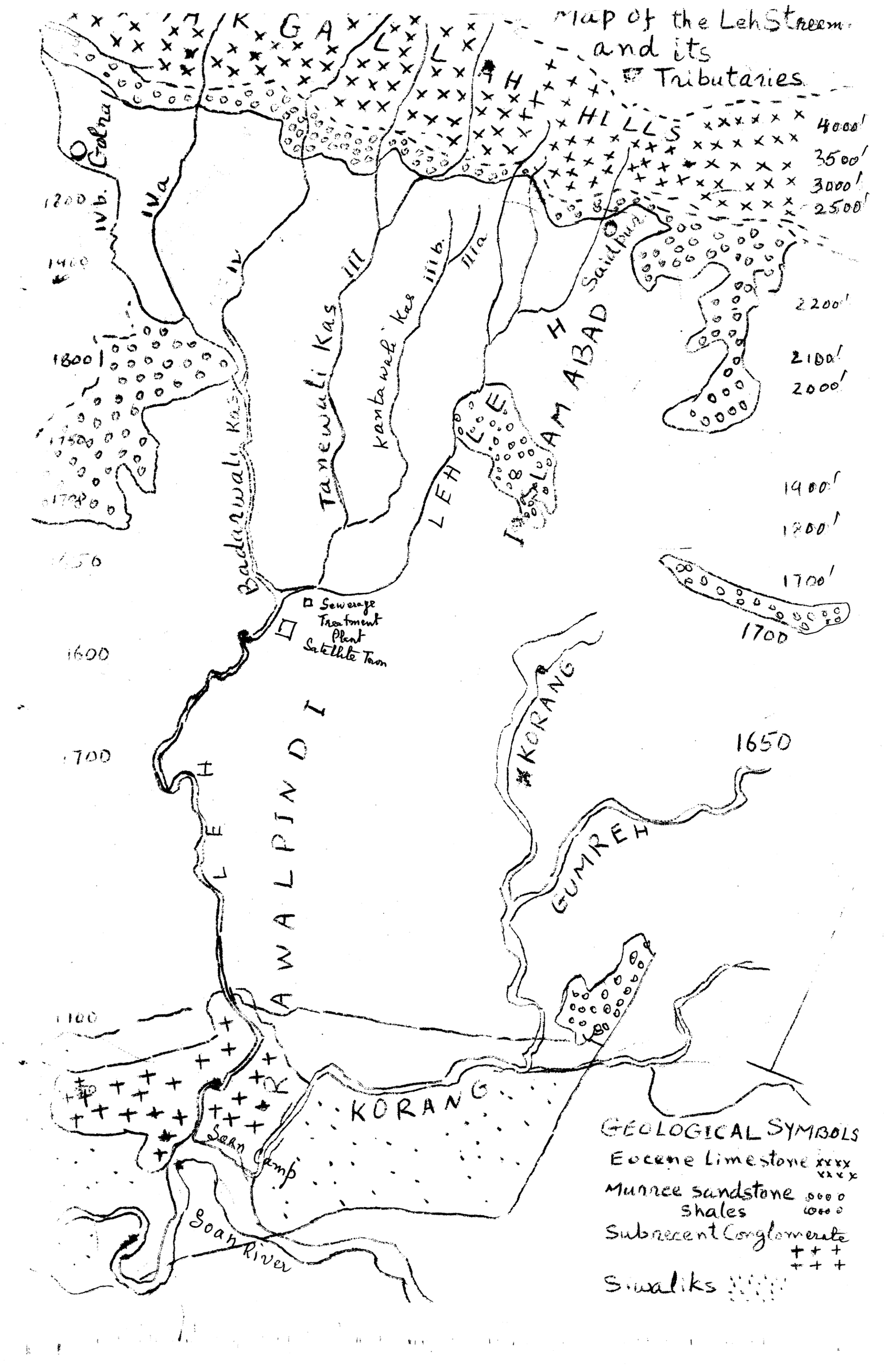
It is concluded that the water is nonpolluted in the upper reaches of the Leh and its tributaries in Islamabad.The total hardness is higher as compared to the International Standard of Drinking Water.After receiving the pollution there is increase in total alkalinity,total hardness.There is gradual increase in magnesium, sodium,and potassium.Certain plants and animals can not tolerate pollution.After pollution there was decrease in algae and macrofauna but increase in microfauna.The gradual increase in the quantities of sodium and potassium indicated domestic pollution.A few algae, micro and macrofauna indicate the pollution.

Detailed Report.

(1). Introduction.

Water is the basic necessity of life.Pakistan is deficient in rains and other water resources.At some places underground water is unfit for irrigational and domestic purposes.Wherever underground water is suitable,the lift system is expensive.All possible measures may be taken to conserve water and protect from pollution and steps may be taken to reuse the wastewaters. Among natural water resources,streams are usually present at the foothill

The knowledge of hydrobiology of Pakistan is very poor.Our water resources are very limited but the demand for the water is increasing with the development of the country.Due to growth of human population, the problem of food is getting acute, so water resources may be tapped for food production.Fish,prawn and crab are good protein food.Smaller fish can be used for poultry food and fi fertilizer.Algae form the food of many fishes.An alga , Chlorella which can be easily cultured can be used as human food.Angiosperm plants such as water spinach(Ipomoea), watercress (Nasturtium), wild rice and cattails(Typha sp.) are used as food in some part of the world.It is also desireable to find the pollution,its effects as well as reuse of waste water by cheap biological methods.


Map of the Leh Stream and its Tributaries
KARAKORAM HILLS
4000'
3500'
3000'
2500'
2200'
2100'
2000'
1900'
1800'
1700'
1650
1600
1700
1100
Golra
IVb.
IVa
IV
Badanwali Kas
III
Tanewali Kas
kantawali Kas IIIb.
IIIa
LEH
ISLAMABAD
Saidpur
Sewerage Treatment Plant Satellite Town
RAWALPINDI
KORANG
GUMREH
Soan Camp
Soan River
GEOLOGICAL SYMBOLS
Eocene Limestone
Murree sandstone
Shales
Subrecent Conglomerate
Siwaliks

Moreover, the environmental studies of the water courses essential for health point of view. The study of water quality for the domestic use. Presence of certain insects larvae and pupae which are vector of diseases in man and domestic animals. The purpose of this investigation was to find out the physico-chemical nature of water and organisms (Plants and animals) and productivity of bottom fauna of the Leh stream, as well as pollution and its effect on water quality and the organisms. After the study of the hydrobio -logy of the Leh stream, it is possible to proceed such investigat -ions at other places in Pakistan such as Kohat, Bannu where the water channel pass through the residential areas. It is also possible to develop methods of reusing the waste water by cheap biological methods.

(Map attached)

Islamabad and Rawalpindi are situated below the Margalla and Murree hills and are drained by streams and small rivers. The Leh is one among these water courses and is important as it passes through greater part of the residential areas of these towns. Islamabad has closed sewerage system, but the waste water of the industries is discharged into the Leh streams and its tributaries. In Rawalpindi the Leh stream is much polluted due to sewerage, waste of cattle yards, domestic, service wastes and effluents of small industries. The water is also contaminated by diseases causing bacteria and protozoa. The residential areas near Mareer have wells for water requirements. The residents of these areas complain for intestinal disorders. The water of the Leh comes in these wells by seepage. Due to the pollution, the Leh has an ugly outlook and produces bad smell during summer, sometimes during rainy season floods are high and may be dangerous to the life and properties of the low lying areas of Rawalpindi. Therefore, the study of water quality and organisms seems to be necessary for the improvement and for making the Leh stream as recreational spot.

The Leh and its tributaries arise from the Margalla hills It is desireable to give topography, geology and climate of Islamabad and Rawalpindi. Islamabad and Rawalpindi are located in Potwar Plateau. On the northern west of Islamabad are Margalla hills with other ranges. Hills play a significant role in diverting currents of rain clouds and lifting them up. Islamabad and Rawalpindi come under a large basin. There is great diversity in

precipitation that flows into channels.The land in Islamabad is undulating and slopes are sharp.The Margalla-Murrees ranges on th ran north of Islamabad have an average hight 3500' and a few peaks ar about 5000' .The plains below foothills sloping steeply southward ranging from 2000' to 1600' . Eocene limestone of the Margalla ra comprises thick massive, pinkgrey nummulite limestone,interlayere with shale containing nummulite fossils.There are series of sand -stones,siltstones,mudstones and shales.The sediment consist of boulders, gravel pebbles mostly of limestone and sandstone.The th mantle of fine sediments overlying the rock of the capital area consists of stream borne alluvium mixed with loess. A bore hole a Saidpur disclosed a thickness of alluvium of 700 ft. The loess deposits are exposed in the Leh bed near Shakarparian.In many cas loess deposits appear to reworked by streams and interbedded with alluvium.In Rawalpindi there is alluvium and loess which is 200' to 300' at some places and the loess is seriously affected by bo wind and water erosion.The southern part of Rawalpindi consists o conglomerate (pebbles cemented togethers) and Siwalik bed.

The main Leh stream arises from the Margalla hills at 36 elevation passes through Saidpur village,it enters Islamabad in sector F-6.It has two tributaries (I and II) who have their source in Margalla hills, join it in sector F-7 and G-7 respectiv It traverses through sectors H-8 and I-8 and join stream III in sector I-9 near Sewerage Treatment Plant near F-Block of Satellit Town.The length of the Leh stream from the source and the confluence with stream III is 10½ miles.Another stream Kantawali which is a tributary of stream III, arises from the foot of the Margalla hills at an elevation of 2000' ft, enters Islamabad in sector E-7 and then comes into sector E-8.Traversing ythrough sec G-8, and H-8, it joins stream No. III in the north corner of sect I-9.

Stream No. III, Tanewali Kas starts from an elevation of 3900' in the Margalla hills and drops down to an elevation of 200 ft. , about 2 miles in length.It enters Islamabad in sector E-8. A tributary of stream No. III has its origin in the Margalla hill joins on the northwestern corner of the sector I-9 then it disch

into the main Leh in the southeast corner, sector I-9. From the source to the confluence the length of stream III is 10 miles.

The stream No. IV, Badarwali Kas drains a vast area. Its drainage basin is larger than that of all the other streams combined. The source of the stream lies in the Margalla hills at elevation 3775, it emerges out of the Margalla hills at an elevation 1950 ft. after having traversed a distance of 2.6 miles It has two tributaries arising from the Margalla hills. It enters Islamabad in the north west corner of sector E-9, than taking southerly course it bisects sector F-10 and joins its two major tributaries IVa and IVb in sector G-10. Traversing through sector H-10 and I-10 joins the Leh stream at south western corner of I-9 near Satellite Town.

The drainage basin of Leh and its tributaries covers an area of 90 square miles. The total length of streams which drains the Leh Basin is about 195 miles.

The major tributaries of the Leh join at the north west extremity of Rawalpindi, near Satellite Town, then the Leh stream enters Rawalpindi town and passes on the back of Holy Family Hospital, reaches Dhok Dallalan, where it becomes deep and looks like a small river and it contains domestic and sewage pollution as well as soaps from Dhobighats. After passing through Dhok Ratta it reaches Daryabad where the water is highly polluted due to domestic and sewage pollution, soap and detergents, wastes such decaying vegetable and fruits, oil and greese from service stations and effluents of small industries. There is 28 feet natural fall the rock outcrop about 2½ miles above its confluence with the Soan river. The Leh passes on the back of the Ayub Park and discharges the Soan Camp in the Soan river. The length of the Leh in Rawalpindi is about 12 miles. The Leh and its tributaries are usually incised.

The climate of Islamabad and Rawalpindi is of temperate type, cold during winter and hot in summer. The average minimum temperature is 2[illegible]°C in January and maximum temperature rises up to 43°C in summer. The relative humidity is low most of the year, it rises up to 60 percent during the month of July and August. There are two periods of rainfall, i.e., winter and summer, the

average rainfall is about 36 inches per annum.

(2). Review on literature.

"Engineering Study for Islamabad Surface Drainage Projec prepared by Khan and Partners(1967)[44] is a useful work for getting information about topography,drainage and climate of Islamabad.

The book," Standard Methods for Examination of Water and Waste Water", was published jointly by American Associations of Public Health ,Water Works and Water Pollution Control Federation (1971)[5]. The methods of analysis presented are believed to represe the best current practice of American Water Analysis in connectio with ordinary problems of water purification,sewage disposal and sanitary investigations.The book also deals with examination of water for radioactivity,bacteriological examination and biologic sampling methods.Taylor (1958)[71] published his book," The Examinati of Waters and Water Supplies". This book deals with geological c conditions,river pollution, new chemical analytic procedures,EDTA methods for determining hardness of calcium and magnesium and als about the analysis of other salts.There are also informations abo the effects on human health due to the presence of certain salts and water borne infections.He also described aquatic organisms su as bacteria, diatoms,planktons,algae and some common invertebrate

Faridi (1971)[34] described the methods and preservation freshwater algae and wrote a key covering 280 genera of freshwate algae of Pakistan.Tiffany and Britton (1971)[80] a book,"Algae of Illinois", which contains recent literature on the description of freshwater algae.Edmondson (1959)[32] published a book,"Freshwater Biology", which contains taxonomy and description of freshwater algae, fungi and angiosperms.and invertebrates.

Biswas (1966)[22] studied the ecological features of phytoplanktons of Volta river and found the abundance of phosphat silicates and nitrates and paucity of ammonia and phytoplanktons during flood season. Dissolved nutrient decreased as flood subsid phytoplankton started appearing, dominated by diatoms first and later on blue green algae which caused water bloom in the month of May.There was virtual disappearance of nitrates at that time. After closure of the dam water bloom declined rapidly. In newly

formed lake , phosphate contents and ammonia increased and phytoplankton were also increased.The period of algal abundance resulted in decrease of nutrients and increase in pH of water. Ali(1979)[17] published a checklist of Freshwater Algae of Rawalpindi district and found 88 genera.

Akhtar and Ali(1969)[19] described a few genera and species of freshwater Rhizopods of Rawalpindi.The same authors(1976)[20] described 18 genera of the Rotifers of Pakistan.Kawakatsu(1973)[41] described 2 genera and 3 species of Planarians of Pakistan. Bhatia(1939)[25] described 4 species of Leeches of Dal Lake of Kashmir with the exception of Theromyzon sp.

Arora (1923)[1] studied Entromostraca (Waterfleas) of Lahore and described 18 genera and 27 species, Daphnia, Simocephalus Monia, Cypris, Eucypris, Diaptomus and Cyclops are most common.He stated that on sunny days swarms of Entromostraca were found on the surface. Mahoon et al. (1977)[60] described 12 new records of Entromostraca of Lahore. Among the new records there are species of Daphnia and Monia and among genera are Scapholebris , Alonella Alona and Wlassicsa. This type of microcrustacea are also found Rawalpindi. Shakoor (1968)[67] gave a taxonomic account of 5 species of freshwater prawns (Palaemon) of Pakistan.

Usinger (1956)[72] published his book," Aquatic Insects of California", the taxonomy of nymphs, larvae, pupae and adults are separately given .This book is helpful for the identification of aquatic insects up to generic level.The book also deals with the methods of collection of insects and benthic fauna as well as about different kinds of water pollution . Ali(1967)[6] described 6 genera and 7 species of mayfly(Order: Ephemeroptera) nymphs of Rawalpindi district. Akhtar and Ali (1976)[21] described 3 genera and 8 species of aquatic Lepidoptera whose larvae and pupae are found in water Khatoon and Ali (1978)[54] described 9 genera and 9 species of aquatic Hemiptera in addition to the work of Akhtar and Ali(1975) Khatoon and Ali (1975,1976 1nd 1977)[49,50 & 51] described 32 species of aquatic Coleoptera of Pakistan which include nearly

all common freshwater beetles of Pakistan. Khatoon and Ali(1977)[5] worked on Trichoptera of Pakistan and described the larvae of 15 genera and 22 species ; pupae of 5 genera and 6 species; adults 2 genera and 5 species.The same authors(1975)[47] described 28 gen of aquatic Diptera in larval stages which are common in Pakistan. Khatoon and Ali(1975)[48] described 6 species of aquatic Hymenopte and (1977)[53] 2 genera and 2 species of Neuroptera. Ali and Khato (1973)[11] described 23 genera of the nymphs of dragon and damsel -flies of Pakistan. Ali and Khatoon (1980)[18] worked on the macroinvertebrate and fish fauna of the Haro river and he found that throughout the year 54 species of macroinvertebrates, 12 of fish were found.

Khan and Dastagir (1971 and 1972)[45 & 46] wrote papers on "Gastropod and Pelecypods Fauna of Pakistan".The description of freshwater and marine molluscs is given of East and West Pakistan. Khatoon and Ali(1978)[55] described Freshwater Molluscs of Pakistan. The description of 11 genera and 16 species, the description includes genus Physa which was not described by previous authors.

Ahmad (1963)[2] published the list of fishes, fish enemies and fish culture etc. of all the districts of west Pakistan. Mirza and Kashmiri (1973)[61] described 28 species of fishes belon -ing to 21 genera and 4 orders from the Soan river,Rawalpindi. Qureshi (1960)[63] described common fishes of East and West Pakist

Khan (1968)[42] described Amphibian Fauna of district Jha He gave the account of 3 species of genus Rana and one species of Bufo. Khan(1977)[43] described Natrix piscator piscator (Schneider a common water snake collected from Jhang district and Muzaffarab

Khan and Mirza (1976)[77] gave the systematic account and keys for the identification of Chelonia and Crocodilia of Pakist Macan (1959)[56] published his book,"A Guide to Freshwater Invertebrate Animals", which contain simple keys for the identi -fication of animals and is helpful for the identification of aquatic animals up to genera.

Ahmad (1979)[3] gave the key and description of common freshwater angiospermic plants of Lahore. The monograph is useful

for the identification of common freshwater plants of Pakistan.

Whitton (1975)[73] in River Ecology gave the description of geology, chemical composition of water, aquatic flora and fauna, benthic communities and algae and macrophytes as environmental indicators as well as food chain.

Bishop (1973)[26] gave an account of freshwater organisms (Plants and animals) and their ecology.There is a detailed list of genera and species of freshwater organisms. He also mentioned the sources of water pollution.

Bardach and others (1972)[27] gave different practices about aquaculture including fish, shrimps, crabs, mussels, seaweeds and freshwater plants especially in tropical countries.

Reid (1961)[64] gave in book factors and processes that operate in lakes,streams and estuaries as dynamic systems. The book attempts to bring into summary, some of the major aspects of the knowledge that has been amassed from the study of inland waters estuaries by many investigators.

According to Reisen and Prins (1972)[66] community biomass could not be estimated by drifts because fluctuations in the standing crop were not significantly correlated with fluctuations in the drift rate , with the exception of Ephemerella sp. the drifts did not respond in a density dependent fashion to benthic populat -ion increases. Drifts seemed to be initiated by population or emergence activity.

Reisen (1975)[65] studied the ecology of streams of Honey Creek, collected 180 taxa of Macroinvertebrates which were distributed differently in different ecological conditions such riffles and pool areas and as well found on the surface and in the bottom.

Khan (1980)[39] gave an account of lotic community composition and some characteristics of stream animals such as shape and structures for adhesion.

Gaudet (1979)[36] studied seasonal changes in nutrients of a tropical swamps of Kenya and concluded that swamps effectively extract dissolved nutrients from rivers and carried to the lake during water flow.

Bell (1970)[23] stated that all the stages of the life cycle of midges, Tanytarsus dissimilis were subjected to low pH and extreme tolerance were determined.The life cycle could not completed below pH 5.5.

Chutter (1969)[31] found that the density of many groups of animals was reduced by the turbidity due to silt and sand but some animals were adversely affected when silt and sand settled a they increase in number.

Fernando (1964)[35] studied 21 freshwater habitats of Rangoon in relation to the ecology of Cules pipiens fatigens and it was found that the tolerance of this species for organic and inorganic materials was very high, physical factors might influen the density.

Sato (1973)[70] concluded limnological study of Tassha-gav river and found 19 species of aquatic insects , 2 species of protozoans , 10 species of fish , 59 species of diatoms, 18 blue green and 12 species of green algae.

Meehean and Ali (1967)[59] worked on ,"Productivity of bottom fauna in relation to the food of fish", and they found th the production of bottom fauna was generally high in low gradient and polluted areas.The productiviry of Wah streams was higher as compared to similar conditions of European and American streams. Heavy rains and flood reduce the number of bottom organisms.The study of the gut contents of fishes of the same places revealed that 70% of fishes live on bottom organisms. Ali (1968)[7] found th the bottom fauna of the streams of Hazara district consisted of typical aquatic organisms and it was found that out of 7 species fishes , 6 fishes lived primarily on bottom organisms.The same author (1968)[8] found that the bottom fauna was high in the stre of Kohat and Kurram Agency as compared to that of ponds and 50% of fishes live on bottom organisms. Ali (1969)[9] found the botto fauna of all the streams of Rawalpindi were affected by flood waters and the number and the weight were decreased after rains. Ali (1969)[10] found that the productivity of bottom fauna was higher in the polluted water of the Soan river after the conflue of the Leh.

Egglishaw (1969)[33] stated that benthic invertebrates i stream riffles are distributed with particular reference to thre main sources of food plant , detrius under stones, moss growing o stones and algal covering on stones. He noticed that with incre in plant detrius there was also an increase in the variety of bottom fauna. Bottom fauna are less aggregated in clumps of moss but more associated with algae.

Beck (1955)[24] proposed a simple method for reporting biological investigations in connection with stream quality surv. Authors believed that the biotic data are economical and are full as important as chemical and biochemical data and have not been more widely used in stream sanitation work because of extreme wordiness and technicality of biological reports.

Brungs (1971)[28] stated that Fathead minows were exposed to constant dissolved oxygen 1-0.5 mg/lit for all months. Number of the eggs produced were reduced at 2 mg/lit , no spawning on 1 1 mg/lit. Fry growth reduced significantly at below 7.9 mg/lit 18% of survivors at 4 mg/lit were deformed.

According to Avery (1970)[81] aquatic insects and salmon were sampled above and below a municipal sewage outfall of East Gallatin River. Numbers of Trichoptera ,Ephemeroptera ,Coleoptera and Plecoptera larvae 72 Km below the sewage outfall were lower than found above. These reductions were associated with the occurence of sewage fungus on the bottom. Diptera were numerous. A partial recovery was gained after 6.1 Km below sewage outfall. After 20 Km below insects were 13 times more than those found above and trout also increased in number.

Ali (1977)[12] studied effects of sewage pollution on the Ravi River, Lahore and found that the water was dark brown after receiving the waste and the bottom was blackish. The water was mesosaprobic (mildly polluted). Insect larvae of Brachydeutra, Ephydra and Psychoda were found which indicated pollution. The same authors (1977)[14] found that due to the domestic pollution in a stream in Choa Syedan Shah , there was increased in algal flora but reduction in the number and weight of fauna, the insect larvae which indicate pollution were found. Ali et al.(1977)[13] found in the Effluents of Industrial Complex of Kala Shah Kaku , the total hardness of water increased very much ,chloride contents were also higher. Twenty genera of algae and thirty seven of fauna were found before pollution and nine of algae and twelve of animals were found after pollution. The same authors (1977)[16] found during the study of stream near Peshawar that pH varied from 7.0 to 8.0 , dissolved oxygen from 5.8 to 9.9 mg/lit , total alkalinity and hardness were higher. 28 genera of algae, 29 of invertebrates and 14 species of

fishes were found.

Ito and Kuwada (1964) [37] stated that after receiving th waste therewis decrease of benthic animals in species number only tolerant species survive , change of dominant species in benthic animals with degrees of pollution : Limnodrilus was in strongly polluted zone , Tendipes in middle and Tendipes and Beatis in wea polluted, members of Trichoptera,Ephemeroptera and Plecoptera wer in clean water. Benthic fauna recovered gradually on the way to down stream with appearance of clean water species.

Nebcker (1974)[62] stated that polychlorinated Biphenyls were more toxic to Daphnia. In case of Tanytarsus there was less toxic and do not emerge abundantly.

Aziz and Sheikh (1974)[75] worked on,"Biological treatmer of a local paper mills waste of Lahore", and recommended dcertai methods for biological treatment of the waste.

Tariq et al.(1974)[76] studied the quality of the waste water of Lahore and the water of the Ravi River after receiving the wastes. In the first run of the pollution survey it was foun that there was neither significant reduction in D.O. resources nor increase in B.O.D. of the river water. This was due to high dilution ratio in the river at the time of sampling.

Sowage and Rabe (1973)[68] studied the effects of mine and domestic wastes on macroinvertebrate community structure in the Coeur'd Alene River. Mining, milling and smelting of rich Pb-Ag-ores have contributed fine inorganic solids as well as heavy met ions Zn,Cd , Cu and Pb . Other industries, including Phosphoric Acid Plant , a Fertilizer Plant and a Saw-Mill , contribute high nutrient wastes and cities discharges untreated domestic sewage directly into the river. Thus three years after trailings of impoundment and reduction in suspended and settled inorganic solids , only very limited benthic communities have colonized th river.

Johnson et al.(1971)[38] found that Invertebrates accumulated residues many times that of surrounding after exposu to 14C-labelled aldrin or DDT at levels 100 pptr (ng/lit). INIn addition, evidence of marked degradation of these pesticides wit specific trophic levels was found.These workers on the basis of their studies suggested that aquatic invertebrates influence the quantity and quality of insecticide residue pass via fish food-c -chain.Further it is stated that in aquatic ecosystem biological

magnification of insecticides at lower trophic levels provides a method of introduction of these substances to higher trophic levels even through those organisms, many or many not directly exposed to a pesticide.

I started research on,"Productivity of bottom fauna of freshwater bodies and its utilization in Punjab , N.W.F.P. and Azad Kashmir," since 1964.Latter, the effects of rains and pollution was studied on bottom fauna. As no work was done on Mayflies(Order: Ephemeroptera) , I started taxonomy of Mayflies in 1967 and described several new species .I am further working on ,"Effect of Different Kinds and Degrees of Pollution on Aquatic Organisms of Pakistan", under PL-480 (1974-1977) and the Co-operative Scientist after the completion of the project gave the following comments:

New Information Resulting from the Research:

1. Survey of the aquatic organisms of Pakistan was completed.
2. An inventry of physical and chemical properties of the water resources of Pakistan was completed.
3. The food of 65 species of fishes was determined.
4. The taxonomy of 9 groups of aquatic organisms was worked out and published in scientific literature.
5. Indicator species were identified for various types of organic and chemical water pollution.
6. A total of 59 scientific papers have been published from the study and a few more in progress.The enrichment of scientific literature will have obvious ripple effects in stimulating further research.

In "International Standards For Drinking Water", published by W.H.O. (1971)[82] , the standards are given which have been adopted as in whole or in part by a number of countries as applicable in deciding the factors for pure and acceptable water.

International Standard for Drinking Water. W.H.O. (1971).

Water Quality	Highest desireable	Maximum permissible.
pH range	7.0 to 8.5	6.5 to 9.2
Total hardness	100 mg/lit	500 mg/lit.
Calcium	75 mg/lit.	200 mg/lit.
Chloride (as Cl.)	200 mg/lit.	600 mg/lit.

Magnesium (as Mg^{++}) 30 mg/lit 150 mg/lit.

Towns (1978)[78] gave a list of 130 species of benthic insects found in Waitakere River and its tributaries and notes on 17 little known insects. The same author (1979) wrote on Zonati of fresh water invertebrate communities of New Zealand Kauri fore stream.

(3). Plan of Work:

The collection of water samples, algae, micro,macrofaun and bottom fauna was done on monthly basis from the 6 following places from June 1978 to May 1979.

1. The Leh stream before Zero Point,Islamabad.
2. The Leh stream after Zero Point,Islamabad.
3. Tanewali Kas, a tributary No.III after receiving the effluer of industries in sector I/9, Islamabad.
4. The Leh after confluence with its tributaries near Sewerage Treatment Plant, F-Block Satellite Town,Rawalpindi.
5. The Leh ,Daryabad.
6. The Leh near Scan Camp.

Next year, June 1979 to May 1980, the collection was do from the following places:

1. Tanewali Kas before receiving the effluents of Industries of I/9, Islamabad.
2. Badarwali Kas, the IVth tributary of the Leh near Sewerage Treatment Plant, while the rest 3 - 6 stations were the sam as in the previous year.

(4). Methods.

Physico-chemical nature.

Surface water was collected in plastic bottles in field pH was determined by battery-operated pH meter, temperature measurements were made in degrees centigrade,phenolphthalein and total alkalinity were determined by titrating samples against 0.0 H_2SO_4 using phenolphthalein and methyl orange as indicators. Alkalinity was expressed in terms of $CaCO_3$ mg/lit. Dissolved oxygen was determined by Winkler's method with Azide modificat Calcium as Ca^{++} hardness and total hardness were determined by

Complexo-metric titration by using 0.01M E.D.T.A.;Murexide and Erichrome Black T as indicators; chlorides were determined by Argentometric method; nitrates by colorimeter .Sodium, potassium and magnesium were determined by Flame Analyser.

Algae were collected by plankton net, hand picking, scrapping and squeezing the submerged vegetation.They were preserved in 3 to 4% formalin.Planktons and microfauna was collected by plankton net, preserved in 3 to 4% formalin.Macroinvertebrates were collected by dipnet, Surber One Square Foot Sampler and Ekman Dr Dredge. Bottom fauna was collected by Surber One Square Foot Sampler and Ekman Dredge. These samples were washed through sieves and were preserved in wide mouthed bottles in 8-10 formalin. In the laboratory, bottom fauna samples were again washed, placed in petri dishes, identified sorted and the organisms of each samples were dried on blotters and weighed in chemical balance.In this manner the spproductivity of bottom fauna was determined by number and weight per unit area. Fishes and frogs were caught by drag nets and preserved in 8% formalin.

(5). Results.

In the Annual Report May 1979 , the data of the stations 1-6 was given. This year from June 1979 to May 1980, the data was taken from two different places in Islamabad i.e, station 1 and and rest stations were the same as in the previous year.

1.	Physico-chemical nature of water.	Tables	1 - 12
2.	Flora	"	13 - 24
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4.	Macrofauna	"	37 - 48
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The non-polluted water if the Leh and its tributaries

The non-polluted water of the Leh and its tributaries was usually clear but after rains it becomes muddy. Tanewali Kas, a tributary , when gets the effluents of the industrial complex Islamabad becomes milky in colour in sector I/9 . The water of t Leh near Satellite Town beco es brown and the bottom black due t putrifaction ,this condition prevails throughout in the down stream up to the Soan Camp.

The lowest air and water temperatures were 10°C and 8°C respectively in the month of December, and highest temperatures were 34°C and 32°C in the month of July. pH of water varied fro 6.0 to 7.6 . Dissolved oxygen was usually low in polluted water, sometimes was absent, it varied from 6.2 mg/lit to 12.0 mg/lit in non-polluted water.Total alkalinity was varied from 58 to 400, total hardness 186 to 460 , calcium as Ca^{++} from 42 to 200 , magnesium as Mg^{++} from 2.4 to 57.6, Na^{+} from 12 to 67, K^{+} from 1.5 to 26; chlorides from 20 to 200 and nitrates from 1.3 to 5.8 mg/lit. Sodium absorption ratio (S.A.R.) values varied from 2.0 to 14.2.

Within two years the total number of algal species foun in the Leh and its tributaries ,were 54 and angiospermic plants were 4 .A few plants were found only in non-polluted water eg. Oedogonium sp., Microspora sp.,Mougeotia sp.,Coelastrum sp., Hydrodictyon sp., Potamogeton perfoliatus, Hydrilla verticellata and Typha angusta, while some were found only in polluted water such as Euglena,sp., Phacus sp., Microcystis sp., and Lyngbya sp.

Nearly 100 species of microinvertebrates were found including protozoans , rotifers ,round worms, crustaceans and th larvae. Mesodinium sp.,Spirozona sp.,Homalozoon sp.,Wolga sp. an Alonella sp. were found only in non-polluted water, many specie were found in both non-polluted and polluted water. Amphileptus Trachelophyllum sp.,Psychoda sp.,Histrio sp.,Carchesium sp. and Epistylis sp. were found in polluted water only.

Macrofauna included planarians,annelids,insects(young a adults) molluscs, fishes,frogs and tortoises. About 100 species macrofauna were found.Many species such as certain insects and

Table 1 Physico-Chemical Nature of Water of theLeh Stream,Rawalpindi,June 1979.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	25	26	31	27	30	30
Water temperature ^{o}C	27	25	30	29	25	26
pH	7.4	7.3	7.2	7.1	7.2	7.4
Dissolved (xygen mg/.it.	9.5	9.0	3.0	4.3	5.0	1.0
D.O. Saturation %	117.2	107.1	39.47	55.12	59.5	12.19
Total alkalinity mg/lit.	280	350	320	340	320	480
Total haedness mg/lit.	250	320	220	260	280	380
Calcium as Ca^{++}mg/lit.	84	116	80	99.2	104	128
Magnesium as Mg^{++} mg/lit.	9.6	7.2	4.8	2.88	4.80	14.40
Na^{++}(Sodium) mg/lit	22	22	38	32	56	60
K^{+} (Potassium) mg/lit.	3	4.2	4.2	6	16	20
Chlorides mg/lit.	21	19	31	30	37	37.7
Nitrates mg/lit.	Nil	1.7	1.3	2.6	2.4	1.8
S.A.R.* Value mg/lit.	4.5	4.0	8.3	6.33	10.7	10.8

Tap water Na^{+} (Sodium) = 22 mg/lit.

K^{+} (Potassium) = 1.5 mg/lit.

* Sodium Absorption Ratio Value.

Table 2 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, July 1979.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	32	31	31	34	33	32
Water temperature ^{o}C	28	28	31	32	28	27
pH	7.1	7.2	7.1	7.2	7.3	7.4
Dissolved Oxygen mg/lit.	6.2	9.0	4.5	5.8	3.8	4.2
Total alkalinity mg/lit.	300	320	360	280	290	280
Total hardness mg/lit.	270	300	280	270	300	330
Calcium as Ca^{++} mg/lit.	80	60	70	60	90	65
Magnesium as Mg^{++} mg/lit.	8.6	7.0	4.5	2.5	4.2	15
Na^{+}(Sodium) mg/lit.	20	20	35	32	50	60
K^{+} (Potassium) mg/lit.	3.2	4.2	4.6	6	15	19
Chlorides mg/lit.	25	20	30	31	35	38
Nitrates mg/lit.	Nil	Nil	1.3	2.0	2.4	1.6
S.A.R. Value mg/lit,	5.0	5.4	9.2	6.8	8.5	9.25

Table 3 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, August 1979.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	30	30	20	20	30	25
Water temperature ^{o}C	20	25	18	15	25	20
pH.	7	7	7	7	7	6.7
Dissolved Oxygen mg/lit.	5.4	9.3	9.5	7	6.5	3.5
D.O. Saturation %	58	110.9	99.6	68.9	77.56	38.16
Total alkalinity mg/lit.	320	180	320	340	320	360
Total hardness mg/lit.	254	246	280	186	220	276
Calcium as Ca^{++} mg/lit.	96	88	73.6	42.4	52.0	60.8
Magnesium as Mg^{++} mg/lit.	3.3	6.24	23.0	19.20	21.6	29.76
Na^{+} (Sodium) mg/lit.	40	23	27	55	41	67
K^{+} (Potassium) mg/lit.	1.5	2.5	4	7	5	12
Chlorides mg/lit.	28	31	35	46	42	58
Nitrates mg/lit.	Nil	2.5	3.6	4.0	3.5	3.1
S.A.R. Value mg/lit.	8	4.79	5.5	14.10	3.6	14.2

Table 4 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, Sept. 1979

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	29	25	21.5	25	25	31
Water temperature ^{o}C	20	21	21.5	21	20	23
pH.	7	7	7	7	6.7	7
Dissolved Oxygen mg/lit.	11	8.5	8	8.5	3.5	3.1
D.O. Saturation %	119.8	94.5	88.9	94.5	38.1	36
Total alkalinity mg/lit.	360	400	460	300	360	340
Total hardness mg/lit.	200	280	240	240	260	280
Calcium as Ca^{++} mg/lit.	60	96	88	72	96	73.6
Magnesium as Mg^{++} mg/lit.	12	9.6	4.8	14	4.8	13.4
Na^{+} (Sodium) mg/lit.	20.8	26	30	36	45	52
K^{+} (Potassium) mg/lit.	1.6	3	8	7.2	14	18.5
Chlorides mg/lit.	21	25	19	21	32	38
Nitrates mg/lit.	1.5	1.0	3.1	2.5	3.0	3.5
S.A.R. Value mg/lit.	4.71	5.09	6.25	7.7	9.6	11.1

Table 5 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, Oct. 1979.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	19	19	17	18	18	20
Water temperature ^{o}C	18	17	18	15	15	18
pH.	7	[illegible]	6	6.5	6.7	[illegible] 7
Dissolved Oxygen mg/lit.	11.5	12	3.1	1.5	1.7	3.8
D.O. Saturation %	120.5	123.2	31.8	14.7	16.7	34.6
Total alkalinity mg/lit.	290	360	380	340	400	415
Total hardness mg/lit.	210	280	280	242	280	260
Calcium as Ca^{++} mg/lit.	80	88	64	65.6	48	72
Magnesium as Mg^{++} mg/lit.	2.4	14.4	4.8	18.6	38.4	43.3
Na^{+} (Sodium) mg/lit.	21	26	27	30	40	60
K^{+} (potassium) mg/lit.	1.6	3.6	0.6	6.8	16.1	24
S.A.R. Values mg/lit.	4.6	5.35	6.5	6.6	9.6	8.8
Chlorides mg/lit.	21	18	17	23	36	48

Table 6 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, Nov. 1979.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	20	15	15	20	18	18
Water temperature ^{o}C	15	13	13	15	16	15
pH.	7.2	7.6	6	6	6.5	6.7
Dissolved Oxygen mg/lit.	9.5	10	4.2	Nil	2.8	4.6
D.O. Saturation %	93.6	94.3	40	Nil	28.1	45.3
Total alkalinity mg/lit.	184	180	306	300	306	324
Total hardness mg/lit.	300	340	360	400	340	340
Calcium as Ca^{++} mg/lit.	64	104	80	72	72	88
Magnesium as Mg^{++} mg/lit.	33.6	19.2	38.4	53	38	28.8
Na^{+}(Sodium) mg/lit.	20	26	44	34	48	52
K^{+} (Potassium) mg/lit.	1.6	3.2	6.4	5.2	13.2	18
Chlorides mg/lit.	19	16	17	19	32	36
S.A.R. Value mg/lit.	4	4.8	8.1	6	9.2	9.66

Table 7 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, Dec. 1979.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	12	11	11	12	10	15
Water temperature ^{o}C.	10	10	12.5	13	8	13
pH.	7.0	7.2	7.4	7.1	7.0	7.3
Dissolved Oxygen mg/lit.	11.2	10.3	8.4	4.1	2.3	3.1
D.O. Saturation %	98.85	90.9	77.5	38.7	19.4	30
Total alkalinity mg/lit.	280	300	380	290	240	380
Total hardness mg/lit.	300	280	290	284	386	480
Calcium as Ca^{++} mg/lit.	84.8	91.2	99.2	108.8	124.8	107.2
Magnesium as Mg^{++} mg/lit.	21.12	12.48	10.08	2.88	18.24	50.8
Na^{+} (Sodium) mg/lit.	34	25.6	26	34	40	50
K^{+} (Potassium) mg/lit.	2.8	3.2	7.2	6.8	14.2	24
Chlorides mg/lit.	16	21	27	22	33	59
Nitrates mg/lit.	0.18	Nil	3.8	2.5	1.5	0.95
S.A.R. Value mg/lit.	6.2	3.2	3.2	4.1	4.4	5.6

Table 8 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, Jan. 1980.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	16	15	15	16	10	12
Water temperature ^{o}C	15	18	15	15	9	10
pH.	7.3	7.2	7.1	7.0	7.1	7.3
Dissolved Oxygen mg/lit.	6.1	5.3	6.1	4.3	3.7	3.1
D.O. Saturation %	53.8	55.5	53.9	37.8	31.9	27.4
Total alkalinity mg/lit.	282	266	428	350	276	374
Total hardness mg/lit.	350	234	200	280	350	372
Calcium as Ca^{++} mg/lit.	76	88	20	10.4	64	80
Magnesium as Mg^{++} mg/lit.	38.4	2.8	36	17.28	45.6	41.28
Na^{+} (Sodium) mg/lit.	22	24.8	102	30.4	32	48
K^{+} (Potassium) mg/lit.	6.4	2	2	6	2	8
Chlorides mg/lit.	12	18	31	33	22	55
Nitrates mg/lit.	2.0	1.5	2.5	1.6	3.5	3.8
S.A.R. Value mg/lit.	4.1	5.2	27.2	11.5	6.1	8.71

Table 9 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, February 1980.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	13	14	13	15	16	14
Water temperature ^{o}C	14	13	15	16	14	13
pH.	7.1	7.2	7.3	7.2	7.4	7.3
Dissolved Oxygen mg/lit.	9.0	8.5	4.5	5.5	6.0	3.2
D.O. Saturation mg/lit.						
Total alkalinity mg/lit.	100	120	120	140	200	210
Total Hardness mg/lit.	380	392	390	340	400	380
Calcium as Ca^{++} mg/lit	90	100	112	108	80	88
Magnesium as Mg^{++} mg/lit.	32.0	26.0	18.0	50.2	52.6	40.2
Na^{+}(Sodium) mg/lit.	15	20	18	25	35	30
K^{+} (Potassium) mg/lit.	2.0	3.5	3.0	4.0	1.0	12
Chlorides mg/lit.	20	25	35	30	35	50
Nitrates mg/lit.	0.15	0.5	1.2	1.4	1.0	1.3
S.A.R. Value mg/lit.	4.9	7.0	7.0	3.2	2.0	5.0

Table 10 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, March 1980.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	16	18	20	20	23	22
Water temperature ^{o}C	12	15	18	18	19	21
pH.	7.3	7.5	7.4	7.1	7.5	7.2
Dissolved Oxygen mg/lit.	7	6.8	10.2	10	3.5	Nil
D.O. Saturation %	64.6	66.9	106.9	104.8	37.4	Nil
Total alkalinity mg/lit.	158	212	220	210	310	420
Total hardness mg/lit.	180	240	200	220	280	280
Calcium as Ca^{++} mg/lit.	48.	46.	49.5	60	72	76
Magnesium as Mg^{++} mg/lit.	14.4	23.4	23.5	14.4	24	21
Na^{+} (Sodium) mg/lit.	16	24	28	26	36	50
K^{+} (Potassium) mg/lit.	4.8	6	2.4	2.8	14.4	23.1
Chlorides mg/lit.	8	11	14	21	36	40
Nitrates mg/lit.	Nil	Nil	2.4	1.4	1.5	2.0
S.A.R. Value mg/lit.	4.1	5.7	6.5	6.5	7.4	11.5

Table 11 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, April 1980.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	21	22	21	25	30	30
Water temperature ^{o}C	22	24	24	22	25	25
pH.	7.5	7.8	7.6	7.2	7.2	7.3
Dissolved Oxygen mg/lit.	4.5	4.8	2.3	Nil	Nil	1.8
D.O. Saturation %	51.1	56.2	27	Nil	Nil	21.5
Total alkalinity mg/lit.	320	240	242	334	340	460
Total hardness mg/lit.	320	230	282	290	350	320
Calcium as Ca^{++} mg/lit.	18.4	65.6	62.4	76	47.5	84
Magnesium as Mg^{++} mg/lit.	65	16.3	29.28	24	55.2	26.4
Na^{+} (Sodium) mg/lit.	30	36	52	36	56	60
K^{+} (Potassium) mg/lit.	6	4.8	14	8	22	26
Chlorides mg/lit.	27	25	23	23	50	52
Nitrates mg/lit.	0.15	Nil	2.8	1.6	3.5	3.0
S.A.R. Value mg/lit.	6.6	7.9	10.8	7.2	4.34	4.9

Table 12 Physico-Chemical Nature of Water of the Leh Stream, Rawalpindi, May 1980.

	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Air temperature ^{o}C	20	20	21	22	27	27
Water temperature ^{o}C	24	25	24	25	25	25
pH.	7.6	7.5	7.3	7.2	7.1	7.1
Dissolved Oxygen mg/lit.	7.2	9.1	3.4	2.8	Nil	2.5
D.O. Saturation %	84.4	106.6	40	33	Nil	30
Total alkalinity mg/lit.	320	260	560	320	420	460
Total hardness mg/lit.	272	182	206	246	326	312
Calcium as Ca^{++} mg/lit.	68.8	32	32	47.2	44.8	56.8
Magnesium as Mg^{++} mg/lit.	24	23	30.4	38.10	51.36	40.8
Na^{+} (Sodium) mg/lit.	30	34	56	30	48	56
K^{+} (Potassium) mg/lit.	7.5	5.0	10	8	12	24
Chlorides mg/lit.	50	20	68	64	60	200
Nitrates mg/lit.	0.25	Nil	2.0	2.5	2.0	4.0
S.A.R. Value mg/lit.	6.2	9.2	14.4	6.5	9.8	11.3

Table 13 Flora. June, 1979.

Plants.	Stations. 1	2	3	4	5	6
ALGAE						
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.			+			
5. .Cosmarium sp.						
6. .Pediastrum sp.				+	+	
7. .Scenedesmus sp.					+	+
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+		+	+	
13. .Mougeotia sp.						
14. . Oedogonium sp.	+	+			+	+
15. .Spirogyra sp.	+	+	+			
16. .Ulothrix sp.	+					
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.				+		
20. .Meridion sp.			+			
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.	+	+		+		
24. .Rhoicosphenia sp.	+	+				
25. .Cocconeis sp.	+	+		+	+	+
26. .Stauroneis sp.		+				
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+		+	+	
30. .Synedra sp.	+	+		+	+	
31. .Mastogloia sp.						
32. .Gyrosigma sp.				+		
33. .Pleurosigma sp.						
34. Amphipleura sp.			+			
35. .Anomoeneis sp.						
36. .Caloneis sp.		+		+		
37. . Neidium sp.						
38. .Pinnularia sp.	+	+				
39. .Navicula sp.	+	+	+	+	+	+

Continued:- + + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+		+		
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.			+	+	+	+
44. . Phacus sp.			+		+	+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.	+		+	+		+
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.		+				
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus	+					
56 . Lemna paucicostata		+	+	+		
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 14 Flora. July, 1979.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.		+				
3. .Tetraedron sp.						
4. .Closterium sp.				+	+	
5. .Cosmarium sp.						
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.		+		+		
13. .Mougeotia sp.						
14. . Oedogonium sp.						
15. .Spirogyra sp.			+			
16. .Ulothrix sp.	+	+				
17. .Microspora sp.			+			
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.						
24. .Rhoicosphenia sp.						
25. .Cocconeis sp.						
26. .Stauroneis sp.		+				+
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+				
30. .Synedra sp.	+	+		+		
31. .Mastogloia sp.						
32. .Gyrosigma sp.		+				
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoerneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.						
38. .Pinnularia sp.						
39. .Navicula sp.	+	+		+	+	+

Continued:- + + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+				
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.				+	+	
44. . Phacus sp.						
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.						
49. .Oscillatoria sp.	+	+	+	+	+	
50. .Microcoleus sp.						
51. .Lyngbya sp.			+			
52 .Phormidium sp.				+	+	
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55. .Potamogeton perfoliatus	+	+				
56 . Lemna paucicostata	+					
57 . Typha angustata		+				
58 . Hydrilla verticillata		+				

Table 15 Flora. August, 1973.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.				+		+
5. .Cosmarium sp.				+		
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+		+		
13. .Mougeotia sp.	+	+				
14. . Oedogonium sp.	+	+	+			
15. .Spirogyra sp.			+			
16. .Ulothrix sp.	+			+	+	
17. .Microspora sp.	+					
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.						+
23. .Gomphonema sp.						
24. .Rhoicosphenia sp.				+		
25. .Cocconeis sp.						
26. .Stauroneis sp.		+		+	+	
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+		+	+		+
30. .Synedra sp.	+	+	+	+		+
31. .Mastogloia sp.						
32. .Gyrosigma sp.			+	+		
33. .Pleurosigma sp.						
34. Amphipleura sp.					+	
35. .Anomoeneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.		+		+		
38. .Pinnularia sp.	+			+		
39. .Navicula sp.	+	+	+	+	+	+

Continued:- + + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.		+		+	+	
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						+
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.	+	+	+	+	+	+
44. . Phacus sp.				+		+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.	+				+	
47. .Anacystis sp.						
48. .Spirulina sp.				+		+
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.				+		
52 .Phormidium sp.	+					
53. .Coelosphaerium sp.						+
54. .Microcystis sp.					+	
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55. .Potamogeton perfoliatus	+					
56 . Lemna paucicostata						
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 16 Flora. Sept, 1979.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.		+	+	+	+	+
4. .Closterium sp.						
5. .Cosmarium sp.						
6. .Pediastrum sp.			+			
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+		+	+	
13. .Mougeotia sp.		+				
14. . Oedogonium sp.	+	+			+	+
15. .Spirogyra sp.	+	+	+	+	+	
16. .Ulothrix sp.						
17. .Microspora sp.						
18. .Tetraspora sp.					+	
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.	+	+	+	+	+	
23. .Gomphonema sp.	+	+	+			
24. .Rhoicosphenia sp.	+	+	+	+		+
25. .Cocconeis sp.	+	+	+	+		
26. .Stauroneis sp.		+				
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+	+	+	+	
30. .Synedra sp.	+	+	+		+	+
31. .Mastogloia sp.						+
32. .Gyrosigma sp.	+					
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoeneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.	+	+		+		
38. .Pinnularia sp.						
39. .Navicula sp.	+	+	+	+	+	

Continued:-

+ + Present , - = Absent.

OPlants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+		+	+	+	+
41. .Cymbella sp.	+	+	+	+		
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.			+	+		+
44. . Phacus sp.				+		+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.						
49. .Oscillatoria sp.		+	+		+	+
50. .Microcoleus sp.	+					
51. .Lyngbya sp.						
52 .Phormidium sp.	+					
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55. .Potamogeton perfoliatus	+	+				
56 . Lemna paucicostata						
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 17 Flora. Oct, 1979.

Plants.	Stations. 1	2	3	4	5	6
ALGAE						
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.	+	+		+	+	+
5. .Cosmarium sp.		+				
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+	+	+	+	
13. .Mougeotia sp.						
14. . Oedogonium sp.	+	+				
15. .Spirogyra sp.	+	+	+	+		+
16. .Ulothrix sp.						
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.	+	+	+	+		
24. .Rhoicosphenia sp.	+	+	+			
25. .Cocconeis sp.			+	+		
26. .Stauroneis sp.						
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.		+	+	+	+	
30. .Synedra sp.	+	+		+		+
31. .Mastogloia sp.						
32. .Gyrosigma sp.	+	+				
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoerneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.						
38. .Pinnularia sp.						
39. .Navicula sp.	+	+	+	+		

Continued:- + + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+		+	+	
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.			+	+	+	+
44. . Phacus sp.				+		
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.					+	+
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus						
56 . Lemna paucicostata						
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 18 Flora. Nov, 1979.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.	+	+		+	+	
5. .Cosmarium sp.		+		+	+	
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.		+	+		+	
13. .Mougeotia sp.			+			
14. . Oedogonium sp.	+	+	+	+	+	+
15. .Spirogyra sp.	+	+	+	+		+
16. .Ulothrix sp.					+	
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.	+					
22. .Surirella sp.						
23. .Gomphonema sp.	+	+			+	+
24. .Rhoicosphenia sp.	+	+	+	+	+	
25. .Cocconeis sp.	+	+	+	+	+	
26. .Stauroneis sp.					+	
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+	+	+	+	+
30. .Synedra sp.	+		+	+	+	
31. .Mastogloia sp.						
32. .Gyrosigma sp.	+	+				+
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoeneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.				+		+
38. .Pinnularia sp.		+				
39. .Navicula sp.	+	+	+	+	+	+

Continued:- + + Present , - = Absent.

OPlants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+			+		
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.	+		+	+	+	+
44. . Phacus sp.						
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.	+	+			+	
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus		+				
56 . Lemna paucicostata		+	+			
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 19 Flora. Dec. 1979.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.	+					
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.	+					+
5. .Cosmarium sp.	+	+				
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.	+		+			
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+		+	+	
13. .Mougeotia sp.						
14. . Oedogonium sp.				+	+	
15. .Spirogyra sp.		+	+	+		
16. .Ulothrix sp.				+		
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.		+	+		+	
24. .Rhoicosphenia sp.	+	+			+	
25. .Cocconeis sp.	+	+			+	
26. .Stauroneis sp.						
27. .Diatoma sp.						
28. .Diploneis sp.	+					
29. .Fragilaria sp.	+	+	+	+	+	+
30. .Synedra sp.	+	+	+	+	+	+
31. .Mastogloia sp.						
32. .Gyrosigma sp.						
33. .Pleurosigma sp.	+	+		+		+
34. Amphipleura sp.						
35. .Anomoeneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.			+			
38. .Pinnularia sp.						
39. .Navicula sp.	+	+	+	+	+	

Continued:- + + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+		+		+
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.	+	+	+	+	+	+
44. . Phacus sp.			+			+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.						
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55. .Potamogeton perfoliatus						
56 . Lemna pauticostata		+		+		
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 20 Flora. Jan. 1980

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.	+					
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.						
5. .Cosmarium sp.						
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.	+	+	+			
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.	+	+	+	+	+	
12. .Cladophora sp.						
13. .Mougeotia sp.					+	
14. . Oedogonium sp.						
15. .Spirogyra sp.	+	+	+	+	+	+
16. .Ulothrix sp.				+		
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.	+					
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.	+		+	+	+	+
24. .Rhoicosphenia sp.	+	+				
25. .Cocconeis sp.	+	+				
26. .Stauroneis sp.						
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+	+	+	+	+
30. .Synedra sp.	+	+		+		+
31. .Mastogloia sp.						
32. .Gyrosigma sp.	+			+		+
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoeneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.						
38. .Pinnularia sp.						
39. .Navicula sp.						

Continued:- + + Present , - = Absent.

OPlants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+	+	+		
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.		+	+	+	+	+
44. . Phacus sp.		+		+		+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.		+	+	+		
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.						
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus		+				
56 . Lemna paucicostata	+		+			
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 21 Flora. Feb, 1980.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.						
5. .Cosmarium sp.						
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.						
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+				
13. .Mougeotia sp.						
14. . Oedogonium sp.		+				
15. .Spirogyra sp.		+	+	+	+	
16. .Ulothrix sp.	+					
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.						
24. .Rhoicosphenia sp.	+					
25. .Cocconeis sp.						
26. .Stauroneis sp.						
27. .Diatoma sp.						
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+	+	+	+	+
30. .Synedra sp.	+	+	+	+		+
31. .Mastogloia sp.						
32. .Gyrosigma sp.						
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoerneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.	+					
38. .Pinnularia sp.	+			+		+
39. .Navicula sp.						

Continued:- + + Present , - = Absent.

OPlants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.		+	+	+	+	+
41. .Cymbella sp.						
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.			+			
44. . Phacus sp.						
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.		+				
49. .Oscillatoria sp.		+			+	
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus	+	+				
56 . Lemna paucicostata						
57 . Typha angustata		+				
58 . Hydrilla verticillata	+	+				

Table 22 Flora. March, 1980.

Plants. ALGAE	Stations 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.						
5. .Cosmarium sp.						
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.		+				
9. .Hydrodictyon sp.		+				
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+	+			
13. .Mougeotia sp.						
14. . Oedogonium sp.						
15. .Spirogyra sp.	+	+		+	+	+
16. .Ulothrix sp.						
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						-
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.	+					
24. .Rhoicosphenia sp.	+	+		+		
25. .Cocconeis sp.	+	+	+	+	+	+
26. .Stauroneis sp.						
27. .Diatoma sp.						
28. .Diploneis sp.	+	+	+	+	+	
29. .Fragilaria sp.	+	+		+		
30. .Synedra sp.	+	+		+		
31. .Mastogloia sp.						
32. .Gyrosigma sp.	+			+		+
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoerneis sp.						
36. .Caloneis sp.			+			
37. . Neidium sp.						
38. .Pinnularia sp.						
39. .Navicula sp.	+	+	+	+	+	+

Continued:- + + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+		+	+		
41. .Cymbella sp.	+	+				
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.	+		+	+	+	+
44. . Phacus sp.					+	
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.						
49. .Oscillatoria sp.		+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus						
56 . Lemna paucicostata	+	+		+		
57 . Typha angustata						
58 . Hydrilla verticillata						

Table 23 Flora.

April, 1980.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.						
4. .Closterium sp.	+					
5. .Cosmarium sp.	+					
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.		+				
10. Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+	+			+	
13. .Mougeotia sp.						
14. . Oedogonium sp.	+		+			
15. .Spirogyra sp.		+	+	+	+	+
16. .Ulothrix sp.						
17. .Microspora sp.						
18. .Tetraspora sp.				+		
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.	+	+				
21. .Amphiprora sp.				+		
22. .Surirella sp.	+					
23. .Gomphonema sp.	+	+		+	+	+
24. .Rhoicosphenia sp.	+		+			
25. .Cocconeis sp.	+	+	+	+	+	+
26. .Stauroneis sp.		+		+		+
27. .Diatoma sp.				+		
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+	+	+	+	+
30. .Synedra sp.	+	+	+	+		
31. .Mastogloia sp.						
32. .Gyrosigma sp.	+	+		+		
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoeoneis sp.	+					
36. .Caloneis sp.						
37. . Neidium sp.						
38. .Pinnularia sp.	+		+			
39. .Navicula sp.	+	+	+	+	+	+

Continued:-

+ + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+		+	+	
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.	+	+	+	+	+	+
44. . Phacus sp.	+	+	+	+	+	+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.					+	
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						+
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus		+				
56 . Lemna paucicostata	+			+		
57 . Typha angustata						
58 . Hydrilla verticillata		+				

Table 24 Flora.

May, 1980.

Plants. ALGAE	Stations. 1	2	3	4	5	6
PHYLUM: CHLOROPHYTA						
CLASS: CHLOROPHYCEAE						
1. .Chlorella sp.						
2. .Chlorococcum sp.						
3. .Tetraedron sp.	+	+	+	+	+	
4. .Closterium sp.						
5. .Cosmarium sp.						
6. .Pediastrum sp.						
7. .Scenedesmus sp.						
8. .Coelastrum sp.						
9. .Hydrodictyon sp.	+					
10. .Stigeoclonium sp.						
11. .Rhizoclonium sp.						
12. .Cladophora sp.	+					
13. .Mougeotia sp.						
14. . Oedogonium sp.	+	+				
15. .Spirogyra sp.		+	+	+	+	
16. .Ulothrix sp.			+	+		
17. .Microspora sp.						
18. .Tetraspora sp.						
CLASS:BACILLARIOPHYCEAE						
19. .Rhizosolenia sp.						
20. .Meridion sp.						
21. .Amphiprora sp.						
22. .Surirella sp.						
23. .Gomphonema sp.	+	+		+		
24. .Rhoicosphenia sp.	+	+				
25. .Cocconeis sp.	+	+	+	+	+	+
26. .Stauroneis sp.	+					
27. .Diatoma sp.			+			
28. .Diploneis sp.						
29. .Fragilaria sp.	+	+	+	+		
30. .Synedra sp.	+	+	+	+	+	+
31. .Mastogloia sp.						
32. .Gyrosigma sp.	+	+				
33. .Pleurosigma sp.						
34. Amphipleura sp.						
35. .Anomoerneis sp.						
36. .Caloneis sp.						
37. . Neidium sp.	+	+				
38. .Pinnularia sp.						
39. .Navicula sp.	+	+	+		+	+

Continued:-

+ + Present , - = Absent.

Plants.	Stations.					
	1	2	3	4	5	6
40. .Nitzschia sp.	+	+	+	+	+	+
41. .Cymbella sp.	+	+		+		
PHYLUM: PYRROPHYTA CLASS: DINOPHYCEAE						
42. .Ceratium sp.						
PHYLUM: EUGLENOPHYTA CLASS: EUGLENOPHYCEAE						
43. .Euglen sp.	+		+	+		+
44. . Phacus sp.	+		+	+	+	+
PHYLUM: MYXOPHYTA CLASS: MYXOPHYCEAE						
45. .Merismopedia sp.						
46. .Chrococcus sp.						
47. .Anacystis sp.						
48. .Spirulina sp.						
49. .Oscillatoria sp.	+	+	+	+	+	+
50. .Microcoleus sp.						
51. .Lyngbya sp.						
52 .Phormidium sp.						
53. .Coelosphaerium sp.						
54. .Microcystis sp.						
PHYLUM: TRACHEOPHYTA CLASS: ANGIOSPERMAE						
55.. .Potamogeton perfoliatus						
56 . Lemna paucicostata	+			+	+	
57 . Typha angustata						
58 . Hydrilla verticillata				+		

Table 25 Animals. June, 1979.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.						+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.		+				+
9. Enchelyodon sp.						
10. Pseudoporodon sp.		+				+
11. Porodon sp.						
12. Coleps sp.						
13. Mesodinium sp.						
14. Didinium sp.		+				
15. Chaetospira sp.						
16. Perispira sp.			+			
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.			+			
21. Bryophyllum sp.						
22. Loxophyllum sp.				+		+
23. Acineria sp.						+
24. Lionotus sp.			+			
25. Loxodes sp.						
26. Chilodonella sp.						
27. Pleuronema sp.						
28. Paramecium sp.			+	+	+	
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.			+			

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
Disematostoma sp.						
33. Condylostoma sp.		+				
34. Stentor sp.						
35. Climacostomum sp.						
36. Bursaria sp.		+				
37. Bursaridium sp.						
38. Discomorpha sp.	+				+	
39. Trichospira sp.			+	+	+	
40. Holosticha sp.						
41. Euplotes sp.						+
42. Pauroleptes sp.						
43. Histrio sp.				+		
44. Aspidisca sp.						
45. Stylonichia sp.			+			
46. Mesostoma sp.						
47. Spirostomum sp.			+			
48. Vorticella sp.		+			+	
49. Epistylis sp.						
50. Systilis sp.					+	
PHYLUM: NEMATA						
51. Dorylaimus sp.						
PHYLUM:ROTIFERA						
52. Monostyla sp.						
53. Brachionus sp.	+					
54. Wolga sp.						
55. Rotaria sp.	+		+		+	+
56. Keratella sp.						
57. Platyias sp.				+	+	
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM:ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.					+	

Continued:- += Present - = Absent

Table 26 Animals. July, 1979

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.	+	+	+	+	+	+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.						
13. Mesodinium sp.						
14. Didinium sp.		+		+	+	
15. Chaetospira sp.						
16. Perispira sp.						
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.			+			+
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.		+		+		+
23. Acineria sp.						
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.	+	+	+	+	+	+
27. Pleuronema sp.						
28. Paramecium sp.	+	+	+	+	+	+
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.		+		+	+	

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.	+					
33. Condylostoma sp.						
34. Stentor sp.						
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.		+	+		+	+
38. Discomorpha sp.	+	+	+	+	+	+
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
42. Pauroleptes sp.						
43. Histrio sp.		+				
44. Aspidisca sp.						
45. Stylonichia sp.	+					
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.	+	+	+	+	+	+
49. Epistylis sp.						
50. Systilis sp.		+		+		+
			+		+	
PHYLUM: NEMATA						
51. Dorylaimus sp.						
PHYLUM: ROTIFERA						
52. Monostyla sp.	+	+	+	+	+	+
53. Brachionus sp.						
54. Wolga sp.						
55. Rotaria sp.	+	+	+	+	+	+
56. Keratella sp.	+		+		+	
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.				+		+
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.	+	+			+	
66. Cyclops sp.						
67. Cereodaphnia sp.	+	+	+	+	+	+
	+	+	+	+	+	+

Continued:- += Present - = Absent

Daphnia Sp.

August, 1974.

Table 27 Animals.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.			+			+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						+
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp. (Urostyla sp.)	+		+		+	
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.					+	
13. Mesodinium sp.		+				
14. Didinium sp.				+		
15. Chaetospira sp.		+				
16. Perispira sp.			+			
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.						
23. Acineria sp.						
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.					+	+
27. Pleutonema sp.			+			
28. Paramecium sp.	+	+			+	
29. Spirozona sp.		+				
30. Colpoda sp.						
31. Colpidium sp.					+	

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						+
33. Condylostoma sp.					+	
34. Stentor sp.			+			
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.		+				+
38. Discomorpha sp.			+			
39. Trichospira sp.					+	
40. Holosticha sp.						
41. Euplotes sp.						+
42. Pauroleptes sp.						
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.			+			
46. Mesostoma sp.						
47. Spirostomum sp.				+		
48. Vorticella sp.						
49. Epistylis sp.				+		
50. Systilis sp.						
PHYLUM: NEMATA						
51. Dorylaimus sp.				+		
PHYLUM: ROTIFERA						
52. Monostyla sp.		+				
53. Brachionus sp.						
54. Wolga sp.		+				
55. Rotaria sp.				+		
56. Keratella sp.				+		+
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						+
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.			+			
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.						
Cypris sp						

Continued:- +== Present, -== Absent

Sept. 1979.

Table 28 Animals.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.						
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.				+	+	
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.						
13. Mesodinium sp.						
14. Didinium sp.		+				
15. Chaetospira sp.						
16. Perispira sp.						
17. Homalozoon sp.						+
18. Cranotheridium sp.						
19. Spathidiodes sp.						+
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.						
23. Acineria sp.						+
24. Lionotus sp.						
25. Loxodes sp.			+			
26. Chilodonella sp.	+			+		+
27. Pleutonema sp.		+				
28. Paramecium sp.	+		+	+	+	+
29. Spirozona sp.		+			+	
30. Colpoda sp.						
31. Colpidium sp.						

Continued:- + = Present , - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.	+					
33. Condylostoma sp.						
34. Stentor sp.						+
35. Climacostomum sp.		+				
36. Bursaria sp.						
37. Bursaridium sp.		+			+	-
38. Discomorpha sp.				+	+	
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.		+				
42. Pauroleptes sp.						+
43. Histrio sp.				+		+
44. Aspidisca sp.						
45. Stylonichia sp.		+				
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.	+	+		+	+	+
49. Epistylis sp.		+				
50. Systilis sp.	+	+				
	+					
PHYLUM: NEMATA						
51. Dorylaimus sp.			+		+	
PHYLUM: ROTIFERA						
52. Monostyla sp.						
53. Brachionus sp.						
54. Wolga sp.						
55. Rotaria sp.	+		+	+	+	
56. Keratella sp.						
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.				+		
66. Cyclops sp.						
67. Cereodaphnia sp.						
	+				+	

Continued:- +== Present , - = Absent

Oct, 1979.

Table 29 Animals.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.				+		+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.						
13. Mesodinium sp.						
14. Didinium sp.						
15. Chaetospira sp.						
16. Perispira sp.						
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.			+			+
23. Acineria sp.			+			
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.						
27. Pleuronema sp.						
28. Paramecium sp.			+		+	+
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.						
oxytricha sp.					+	

Continued:- + = Present, - = Absent.

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
33. Condylostoma sp.						
34. Stentor sp.						
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.						+
38. Discomorpha sp.						
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
42. Pauroleptes sp.						
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.					+	
49. Epistylis sp.					+	
50. Systilis sp.						
PHYLUM: NEMATA						
51. Dorylaimus sp.						
PHYLUM: ROTIFERA						
52. Monostyla sp.			+			
53. Brachionus sp.						
54. Wolga sp.			+		+	+
55. Rotaria sp.						
56. Keratella sp.						
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.						
Cypris Sp.	+					

Continued:- += Present, - = Absent

Table 30 Animals. Nov, 1979.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.						
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.						
13. Mesodinium sp.						
14. Didinium sp.					+	
15. Chaetospira sp.	+					
16. Perispira sp.						
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.				+		+
23. Acineria sp.						
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.		+	+			+
27. Pleuronema sp.				+	+	
28. Paramecium sp.		+			+	
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.						
Acineta sp.	+					
Dysteria sp.						+

Continued:- + = Present , - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
33. Condylostoma sp.						
34. Stentor sp.						
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.						
38. Discomorpha sp.				+		
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
42. Pauroleptes sp.						
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.	+	+	+	+		+
49. Epistylis sp.	+					
50. Systilis sp.	+					
Carchesium sp.			+	+		+
PHYLUM: NEMATA						
51. Dorylaimus sp.						
PHYLUM: ROTIFERA						
52. Monostyla sp.		+				
53. Brachionus sp.						
54. Wolga sp.						
55. Rotaria sp.	+	+	+	+		
56. Keratella sp.		+				
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.						+

Continued:- += Present, - = Absent

Table 31 Animals. Dec, 1979.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.		+	+	+		
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
Metopus sp.			+			
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
Leucophrydium sp.						
7. Chaenea sp.			+			
		+		+		
8. Placus sp.						
9. Enchelyodon sp.						
Stokesia sp.			◆		◆	+
10. Pseudoporodon sp.						
11. Porodon sp.						
Castropus sp.						
12. Coleps sp.						+
13. Mesodinium sp.						
14. Didinium sp.						+
15. Chaetospira sp.						
16. Perispira sp.						
17. Homalozoon sp.			+			
18. Cranotheridium sp.				+		
19. Spathidiodes sp.				+		
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.				+		
23. Acineria sp.						
24. Lionotus sp.						
25. Loxodes sp.						+
26. Chilodonella sp.	+	+				
27. Pleuronema sp.						
28. Paramecium sp.	+	+	+	+	+	+
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.					+	
oxytricha sp.						

Continued. + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.		+				
33. Condylostoma sp.						
34. Stentor sp.						
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.						+
38. Discomorpha sp.						+
39. Trichospira sp.			+			
40. Holosticha sp.						+
41. Euplotes sp.						
42. Pauroleptes sp.			+			
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.			+	+		+
49. Epistylis sp.						
50. Systilis sp.	+	+	+	+	+	
Carchesium sp.						
PHYLUM: NEMATA						
51. Dorylaimus sp.						
PHYLUM: ROTIFERA						
52. Monostyla sp.						+
53. Brachionus sp.						
54. Wolga sp.					+	
55. Rotaria sp.		+				
56. Keratella sp.						
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						+
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.						

Continued:- + = Present , - = Absent

Table 32 Animals.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.	+	+	+		+	
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp. (Metopus sp.)				+		
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.		+				
13. Mesodinium sp.						
14. Didinium sp.						
15. Chaetospira sp.						
16. Perispira sp.						
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.						
21. Bryophyllum sp.						+
22. Loxophyllum sp.						
23. Acineria sp.						
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.	+	+	+		+	+
27. Pleuronema sp.	+	+	+	+	+	+
28. Paramecium sp.						
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.			+	+	+	+

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
33. Condylostoma sp.						
34. Stentor sp.						
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.				+		
38. Discomorpha sp.	+		+			
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
42. Pauroleptes sp.						
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.	+	+		+		
49. Epistylis sp.						
50. Systilis sp.					+	
Cachesium sp						+
PHYLUM: NEMATA						
51. Dorylaimus sp.			+		+	
PHYLUM: ROTIFERA						
52. Monostyla sp.						
53. Brachionus sp.						
54. Wolga sp.		+				
55. Rotaria sp.						
56. Keratella sp.						
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.		+				

Continued:- += Present, - = Absent

Feb, 1980.

Table 33 Animals.

Micro MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.		+			+	+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.						
13. Mesodinium sp.						
14. Didinium sp.						
15. Chaetospira sp.						
16. Perispira sp.	+		+		+	+
17. Homalozoon sp.	+	+	+			+
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.		+			+	
23. Acineria sp.						
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.	+	+	+	+		+
27. Pleuronema sp.						
28. Paramecium sp.	+	+	+	+	+	+
29. Spirozona sp.					+	
30. Colpoda sp.			+			
31. Colpidium sp.	+				+	+

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
33. Condylostoma sp.						
34. Stentor sp.			+		+	
35. Climacostomum sp.						
36. Bursaria sp.						
37. Bursaridium sp.		+		+	+	
38. Discomorpha sp.	+	+	+	+	+	+
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
42. Pauroleptes sp.						
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.	+	+	+	+	+	+
49. Epistylis sp.						
50. Systilis sp.			+			+
PHYLUM: NEMATA						
51. Dorylaimus sp.	+		+	+		+
PHYLUM: ROTIFERA						
52. Monostyla sp.	+		+	+	+	
53. Brachionus sp.						
54. Wolga sp.						
55. Rotaria sp.	+	+	+	+	+	
56. Keratella sp.		+	+		+	+
57. Platyias sp.			+			
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.			+			
66. Cyclops sp.			+	+		+
67. Cereodaphnia sp.	+		+		+	+

Continued:- + = Present, - = Absent

March, 1930

Table 34 Animals.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.						
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.					+	+
7. Chaenea sp. Halteria sp.	+		+		+	
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.	+		+	+	+	+
13. Mesodinium sp.						
14. Didinium sp. Strobilidium sp.			+	+	+	+
15. Chaetospira sp.						
16. Perispira sp. Strombidium sp.	+	+		+		
17. Homalozoon sp.						
18. Cranotheridium sp.		+			+	
19. Spathidiodes sp.						
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.		+			+	
23. Acineria sp.			+			
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.						
27. Pleuronema sp.						
28. Paramecium sp.						+
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp. Oxytricha sp.			+			

Continued:- + = Present , - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
33. Condylostoma sp.						
34. Stentor sp.						
35. Climacostomum sp.	+					
36. Bursaria sp.						
37. Bursaridium sp.						
38. Discomorpha sp.						+
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
42. Pauroleptes sp.			+		+	
43. Histrio sp.						
44. Aspidisca sp.						
45. Stylonichia sp.			+			
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.	+	+				
49. Epistylis sp.		+				
50. Systilis sp.		+				
Carchesium sp.	+	+	+			+
PHYLUM: NEMATA						
51. Dorylaimus sp.			+	+	+	+
PHYLUM: ROTIFERA						
52. Monostyla sp.						
53. Brachionus sp.						
54. Wolga sp.						
55. Rotaria sp.						
56. Keratella sp.						
57. Platyias sp.						
58. Epiphanes sp.						
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
Fucypris sp. 65. Alonella sp.		+				
66. Cyclops sp.		+				
Daphnia sp. 67. Ceriodaphnia sp.		+		+		
cypris sp.		+				
Naupius stage.			+			

Continued:- + = Present, - = Absent

Table 35 Animals. April, 1980.

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.				+		+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.						
7. Chaenea sp.						+
8. Placus sp.						
9. Enchelyodon sp.						
10. Pseudoporodon sp.	+					
11. Porodon sp.						
12. Coleps sp.	+					
13. Mesodinium sp.		+			+	
14. Didinium sp.						
15. Chaetospira sp.				+		
16. Perispira sp.						+
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.					+	
20. Amphileptus sp.						
21. Bryophyllum sp.						
22. Loxophyllum sp.					+	+
23. Acineria sp.						
24. Lionotus sp.						+
25. Loxodes sp.						
26. Chilodonella sp.	+	+				+
27. Pleuronema sp.						
28. Paramecium sp.		+		+	+	+
29. Spirozona sp.						
30. Colpoda sp.	+					+
31. Colpidium sp.						

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
Faentonia Sp		+				
33. Condylostoma sp.						
34. Stentor sp.						
cinetochilum sp				+		
35. Climacostomum sp.				+	+	
36. Bursaria sp.						
37. Bursaridium sp.	+		+			
38. Discomorpha sp.	+	+				
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
Podophrya Sp				+		
42. Paurodontes sp.					+	
43. Histrio sp.					+	+
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.		+	+	+		+
49. Epistylis sp.		+				+
50. Systilis sp.				+		+
Carchesium Sp			+			+
PHYLUM: NEMATA						
51. Dorylaimus sp.						
PHYLUM: ROTIFERA						
52. Monostyla sp.						
53. Brachionus sp.						
54. Wolga sp.						
55. Rotaria sp.		+	+	+	+	+
56. Keratella sp.						
57. Platyias sp.						
58. Epiphanes sp.			+			
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.						

Continued:- += Present, - = Absent

Table 36 Animals.

May, 1928

MICROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: PROTOZOA						
CLASS: RHIZOPODA						
1. Centropyxis sp.	+	+	+	+	+	+
2. Difflugia sp.						
3. Dinamoeba sp.						
CLASS: CILIOPHORA						
4. Urotricha sp.						
5. Ileonema sp.						
6. Trachelophyllum sp.				+		
7. Chaenea sp.						
8. Placus sp.	+			+		
9. Enchelyodon sp.						
10. Pseudoporodon sp.						
11. Porodon sp.						
12. Coleps sp.		+		+		
13. Mesodinium sp.						
14. Didinium sp.						
15. Chaetospira sp.						
16. Perispira sp.						
17. Homalozoon sp.						
18. Cranotheridium sp.						
19. Spathidiodes sp.						
20. Amphileptus sp.					+	
21. Bryophyllum sp.						
22. Loxophyllum sp.						
23. Acineria sp.		+	+			
24. Lionotus sp.						
25. Loxodes sp.						
26. Chilodonella sp.						
27. Pleuronema sp.						
28. Paramecium sp.				+	+	+
29. Spirozona sp.						
30. Colpoda sp.						
31. Colpidium sp.						

Continued:- + = Present, - = Absent

MICROFAUNA	Stations. 1	2	3	4	5	6
32. Urocentrum sp.						
33. Condylostoma sp.						
34. Stentor sp.	+					
35. Climacostomum sp.	+					
36. Bursaria sp.						
37. Bursaridium sp.		+				
38. Discomorpha sp.	+	+	+	+		+
39. Trichospira sp.						
40. Holosticha sp.						
41. Euplotes sp.						
Podophyra sp.					+	
42. Fauroleptes sp.						
43. Histrio sp.					+	
44. Aspidisca sp.						
45. Stylonichia sp.						
46. Mesostoma sp.						
47. Spirostomum sp.						
48. Vorticella sp.			+			+
49. Epistylis sp.						
50. Systilis sp.						+
PHYLUM: NEMATA						
51. Dorylaimus sp.	+					+
PHYLUM: ROTIFERA						
52. Monostyla sp.		+	+	+	+	+
53. Brachionus sp.						
54. Wolga sp.				+		
55. Rotaria sp.			+		+	+
56. Keratella sp.	+					+
57. Platyias sp.						+
58. Epiphanes sp.						+
59. Cyrtonia sp.						
60. Euchlanis sp.						
61. Asplanchna sp.						
62. Lecane sp.						
63. Philodina sp.						
64. Filinia sp.						
PHYLUM: ARTHROPODA						
CLASS: CRUSTACEA						
65. Alonella sp.						
66. Cyclops sp.						
67. Cereodaphnia sp.		+				

Continued:- +== Present, - = Absent

Table 37 Animals.

June, 1979

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex			+	+	+	+
2. Limnodrilus sp.				+		
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.						
5. Erpobdella sp.	+		+			
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+				
18. Baetis meeheanis		+				
19. Caenis kimminis	+					
20. Choroterpes gadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus						
29. CCheumatopsyche betteni		+				
30. Psychomia wigginsi						
Coleoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+					
35. Enochrus fusca						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.					+	
41. Psychoda sp.						
42. Culicoides sp.						
43. Tanypus sp.			+	+	+	+
44. Chironomus sp.						
45. Hydrobaenus sp.						
Pasyhella sp.	+	+				
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysogona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazna sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.						
Gastropoda						
62. Lymnaea acuminata	+					
63. Lymnaea luteola						
64. Lymnaea pinguis			+	+		
65. Physa gyrina						
66. Indoplanorbis(Planorbis) exustus						
67. Zootecus insularia						
Fishes						
68. Puntius conchonius						
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs						
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 38 Animals. July, 1979.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex	+			+	+	+
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.	+					
5. Erpobdella sp.	+	+				
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+				
18. Baetis meeheanis	+					
19. Caenis kimminis	+	+				
20. Choroterpes qadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Nemoura sp					+	
Hemiptera						
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
richoptera						
28. Hydropsyche straightus						
29. CCheumatopsyche betteni		+				
30. Psychomia wiggindi						
oleoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+	+				
35. Enochrus fusca						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.						
41. Psychoda sp.						
42. Culicoides sp.						
43. Tanypus sp.		+				
44. Chironomus sp.			+	+	+	+
45. Hydrobaenus sp.	+	+				
Eusynella sp.	+					
46. Tabanus sp.	+	+				
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.					+	
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.						
stropoda						
62. Lymnaea acuminata						
63. Lymnaea luteola	+					
64. Lymnaea pinguis	+					
65. Physa gyrina	+					
66. Indoplanorbis(Planorbis) exustus						
67. Zootecus insularis						
ishes						
68. Puntius conchonius						
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
rogs						
73. Rana cyanophlyctis						
resh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 39 Animals. August, 1979.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex				+	+	+
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.						
5. Erpobdella sp.	+					
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis		+				
18. Baetis meeheanis		+				
19. Caenis kimminis	+	+				
20. Choroterpes qadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata elongata	+					
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus						
29. CCheumatopsyche betteni		+	+			
30. Psychomia wigginsi						
Coleoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli		+				
35. Enochrus fusca						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.						
41. Psychoda sp.				+		
42. Culicoides sp.		+		+		
43. Tanypus sp.						
44. Chironomus sp.			+	+		+
45. Hydrobaenus sp.	+	+				
46. Pentaneura sp.	+					
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.					+	
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.		+				
Gastropoda						
62. Lymnaea acuminata						
63. Lymnaea luteola						
64. Lymnaea pinguis	+					
65. Physa gyrina						
66. Indoplanorbis(Planorbis) exustus	+				+	
67. Zootecus insularis						
Fishes						
68. Puntius conchonius	+					
69. Barilius vagra						
70. Clarias batrachus	+					
71. Bagarius bagarius						
72. Chela cachius						
Frogs						
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 40 Animals. Sept, 1972

MACROFAUNA	Stations. 1	2	3	4	5	6
planarian sp						
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex		+	+	+	+	+
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.	+					
5. Erpobdella sp.	+	+				
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.		+				
9. Agrion sp. Gymbolum sp		+				
10. Chromagrion sp.		+				
11. Dromogomphus sp.						
12. Progomphus sp.		+				
13. Brechmorhoga sp.						
14. Dythemis sp.		+				
15. Erythrodiplax sp.						
16. Paltothemis sp. Notonecta sp		+				
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+				
18. Baetis meeheanis	+	+				
19. Caenis kimminis	+	+		+		
20. Choroterpes gadrica		+				
21. Cloeon gillican		+				
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata Mesovelia Sp	+					
25. Plea nerringi Micronecta striata	+					
26. Corixa substrata Micronecta Common		+				
Notonecta sp		+				

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus		+				
29. CCheumatopsyche betteni	+	+		+		
30. Psychomia wigginsi						
Coléoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+	+				
35. Enochrus fusca Helochares arlnatus		+		+		
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.						
41. Psychoda sp.				+	+	
42. Culicoides sp.			+	+		
43. Tanypus sp.		+				
44. Chironomus sp.	+	+	+	+		+
45. Hydrobaenus sp. Psychoda sp.	+	+	+	+	+	+
46. Tabanus sp.		+		+		
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						+
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora.sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.		*			+	
58. Anopheles sp.	+	+				
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.						
Gastropoda Melania lisbocensis	+					
62. Lymnaea acuminata						
63. Lymnaea luteola						
64. Lymnaea pinguis		+				+
65. Physa gyrina		+	+	+	+	
66. Indoplanorbis(Planorbis) exustus		+				
67. Zootecus insularis	+					
Fishes Noemachilus balia						
68. Puntius conchonius	+	+				
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs						
73. Rana cyanophlyctis	+	+				
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Oct. 1979.

Table 41 Animals.

MACROFAUNA	Stations. 1	2	3	4	5	6
Planarian sp		+				
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex		*	+	+		
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.	+					
5. Erpobdella sp.		+	+			
	+					
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+	+	+		
18. Baetis meeheanis	+	+		+		
19. Caenis kimminis	+	+		+		
20. Choroterpes qadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera	+					
24. Rheumatobates maculata	+					
25. Plea nerringi						
26. Corixa substrata		+				

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus		+	+			
29. CCheumatopsyche betteni		+	+		+	
30. Psychomia wigginsi						
Coleoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+	+				
35. Enochrus fusca Helochares tamteri				+		
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus Norpus Cephalodytes ratus		+				
Lepidoptera						
39. Cataclysta hubneri		+				
Diptera						
40. Simulium sp.	+	+				
41. Psychoda sp.	+				+	
42. Culicoides sp.				+		+
43. Tanypus sp.	+	+				
44. Chironomus sp.		+		+	+	+
45. Hydrobaenus sp.	+	+		+		
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.					+	
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.	+	+		+		
Gastropoda						
62. Lymnaea acuminata	+					
63. Lymnaea lutepla	+					
64. Lymnaea pinguis						
65. Physa gyrina	+	+	+			
66. Indoplanorbis(Planorbis) exustus						
67. Zootecus insularis						
Fishes						
68. Puntius conchonius	+					
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs						
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 42 Animals. Nov. 1979.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA	+	+				
CLASS: OLIGOCHAETA						
1. Tubifex tubifex			+	+	+	+
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.	+					
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.	+					
14. Dythemis sp.						
15. Erythrodiplax sp.	+					
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+	+	+		
18. Baetis meeheenis	+	+		+		
19. Caenis kimminis	+	+				
20. Choroterpes qadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata	+	+	+			
25. Nolonecta sp.		+				
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus		+	+			
29. Cheumatopsyche betteni		+	+			
30. Psychomia wiggindi						
Coleoptera						
31. Acenus bruesi		+				
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+		+	+		+
35. Enochrus fusca						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.		+				
41. Psychoda sp.			+	+	+	+
42. Culicoides sp.						
43. Tanypus sp.				+		
44. Chironomus sp.		+		+		+
45. Hydrobaenus sp.	+	+		+		
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.					+	
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.					+	
61. Protenthes sp.	+					
Gastropoda Aleiclapeson sp.	+					
62. Lymnaea acuminata						
63. Lymnaea luteola	+					
64. Lymnaea pinguis	+					
65. Physa gyrina	+	+				
66. Indoplanorbis(Planorbis) exustus						
Melania tuberculata						
67. Zootecus insularis					+	
Fishes						
68. Puntius conchonius						
69. Barilius vagra	+					
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs						
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 43 Animals. Dec. 1979.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex	+	+	+	+	+	+
2. Limnodrilus sp.				+		
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.						
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.		+				
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+	+			
18. Baetis meeheanis		+				
19. Caenis kimminis			+			
20. Choroterpes qadrica		+				
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus	+	+				
29. Cheumatopsyche betteni						
30. Psychomia wigginsi		+	+			
Coleoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli		+				
35. Enochrus fusca Nrelmis hintoni						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri		+				
Diptera						
40. Simulium sp.	+	+	+			
41. Psychoda sp.						
42. Culicoides sp.			+	+	+	
43. Tanypus sp.						
44. Chironomus sp.	+	+	+	+		+
45. Hydrobaenus sp.	+	+	+	+		
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.					+	
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora.sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.					+	
58. Anopheles sp.						
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.				+	+	
61. Protenthes sp.		+				
Gastropoda						
62. Lymnaea acuminata		+				
63. Lymnaea luteola						
64. Lymnaea pinguis		+				
65. Physa gyrina						
66. Indoplanorbis(Planorbis) exustus		+	+	+		+
67. Zootecus insularis						
Fishes						
68. Puntius conchonius						
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs Noemacheilus botia				+		
73. Rana cyanophlyctis				+		
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 44 Animals. Jan, 1980.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex	+	+	+	+	+	
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.				+		
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+		+		
18. Baetis meeheanis	+	+		+		
19. Caenis kimminis	+	+		+		
20. Choroterpes qadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata	+					

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus	+	+		+		
29. Cheumatopsyche betteni	+	+		+	+	
30. Psychomia wigginsi						
Coleoptera						
31. Acenus bruesi	+			+	+	
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+					
35. Enochrus fusca						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.	+	+		+		
41. Psychoda sp.	+	+	+	+	+	+
42. Culicoides sp.						
43. Tanypus sp.						
44. Chironomus sp.	+	+	+	+	+	+
45. Hydrobaenus sp.	+	+	+	+	+	+
46. Tabanus sp.	+					
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.	+					
Gastropoda Anlochasb						
62. Lymnaea acuminata		+				
63. Lymnaea luteola	+	+				
64. Lymnaea pinguis	+	+		+		
65. Physa gyrina	+			+		
66. Indoplanorbis(Planorbis) exustus	+					
67. Zootecus insularis						
Fishes Mastacembelus pancalus	+					
68. Puntius conchonius						
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs Nannophrys ceylonensis	+					
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 45 Animals. Feb, 1980.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex	+	+	+	+	+	
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.						
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.		+				
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.						
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+				
18. Baetis meeheanis	+					
19. Caenis kimminis	+					
20. Choroterpes qadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
richoptera						
28. Hydropsyche straightus	+					
29. Cheumatopsyche betteni	+	+				
30. Psychomia wigginsi						
oleoptera						
31. Acenus bruesi	+					
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli						
35. Enochrus fusca						
36. Paracymus testacea						
37. Ochthebius minutus						
38. Oreodytes vittatus						
epidoptera						
39. Cataclysta hubneri						
iptera						
40. Simulium sp.	+			+		
41. Psychoda sp.	+	+	+	+		+
42. Culicoides sp.						
43. Tanypus sp.	+	+		+		+
44. Chironomus sp.	+	+		+		+
45. Hydrobaenus sp.						
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora.sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.						
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.	+					
tropoda						
62. Lymnaea acuminata		+				
63. Lymnaea luteola		+				+
64. Lymnaea pinguis	+			+	1	+
65. Physa gyrina						
66. Indoplanorbis(Planorbis) exustus	+					
67. Zootecus insularis						
shes						
68. Puntius conchonius						
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
ogs						
73. Rana cyanophlyctis						
esh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 46 Animals. March, 1980.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex	+	+	+	+	+	
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.						
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola Onychurus sp					+	
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.	+					
10. Chromagrion sp. Neoneura sp						
11. Dromogomphus sp.						
12. Progomphus sp.	+					
13. Brechmorhoga sp.						
14. Dythemis sp.	+					
15. Erythrodiplax sp. Sympetrum sp						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)	+					
17. Baetis macanis						
18. Baetis meeheanis						
19. Caenis kimminis						
20. Choroterpes qadrica	+					
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus	+					
29. Cheumatopsyche betteni						
30. Psychomia wigginsi	+					
Coleoptera						
31. Acenus bruesi						
32. Ancyronyx sandersoni	+					
33. Berosus mucronatus						
34. Ectoparia blaisdelli						
35. Enochrus fusca						
36. Paracymus testacea (Acolus hintoni)	+					
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.	+	+				
41. Psychoda sp.						
42. Culicoides sp.	+	+		+	+	+
43. Tanypus sp.						
44. Chironomus sp.	+			+		
45. Hydrobaenus sp.	+	+	+	+		
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora.sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.			+			
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.	+					
Gastropoda (Calopsectra sp.)		+				
62. Lymnaea acuminate						
63. Lymnaea luteola	+					
64. Lymnaea pinguis						
65. Physa gyrina		+		+		
66. Indoplanorbis(Planorbis) exustus						
67. Zootecus insularia						
Fishes (Lepidocephalus marginata)	+					
68. Puntius sophore						
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs (Microhyla ornata)	+					
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 47 Animals. April, 1980

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex	+	+	+	+	+	+
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.	+					
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.						
9. Agrion sp.						
10. Chromagrion sp.						
11. Dromogomphus sp.						
12. Progomphus sp.	+					
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp. Pantala sp.		+				
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+	+				
18. Baetis meeheanis						
19. Caenis kimminis	+	+				
20. Choroterpes gadrica						
21. Cloeon gillican						
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hymenoptera Odemon mucsebeeth	+					
Hemiptera Nepa harrisi	+					
24. Rheumatobates maculata						
25. Plea nerringi						
26. Corixa substrata						

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus	+					
29. Cheumatopsyche betteni	+					
30. Psychomia wigginsi						
Coleoptera Psephenus Stenopodus	+					
31. Acenus bruesi						
32. Ancyronyx sandersoni Dineutus sp.		+				
33. Berosus mucronatus						
34. Ectoparia blaisdelli						
35. Enochrus fusca						
36. Paracymus testacea Neoclinus Tintoni	+	+				
37. Ochthebius minutus						
38. Oreodytes vittatus						
Lepidoptera						
39. Cataclysta hubneri						
Diptera						
40. Simulium sp.	+					
41. Psychoda sp.						
42. Culicoides sp.					+	+
43. Tanypus sp.		+				
44. Chironomus sp.	+	+	+	+		+
45. Hydrobaenus sp.	+				+	
46. Tabanus sp.						
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.						
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.						
58. Anopheles sp.						
59. Culex sp.						
60. Orthocladius (Cricotopes) sp.						
61. Protenthes sp.		+				
Gastropoda Corbicula Stolatella	+					
62. Lymnaea acuminata						
63. Lymnaea luteola	+	+				
64. Lymnaea pinguis						
65. Physa gyrina			+	+		
66. Indoplanorbis (Planorbis) exustus						
67. Zootecus insularis						
Fishes						
68. Puntius conchonius		+				
69. Barilius vagra						
70. Cirrhina reba						
71. Bagarius bagarius						
72. Chela cachius						
Frogs						
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 48 Animals. May, 1980.

MACROFAUNA	Stations. 1	2	3	4	5	6
PHYLUM: ANNELIDA						
CLASS: OLIGOCHAETA						
1. Tubifex tubifex		+	+			+
2. Limnodrilus sp.						
CLASS: HIRUDINEA						
3. Theromyzon sp.						
4. Glossiphonia sp.						
5. Erpobdella sp.						
PHYLYM: ARTHROPODA						
CLASS: INSECTA						
Collembola						
6. Entomobrya sp.						
7. Folsomia sp.						
Odonata(Dragon & damselfly nymphs).						
8. Ischnura sp.	+	+				
9. Agrion sp.						
10. Chromagrion sp.	+	+				
11. Dromogomphus sp.						
12. Progomphus sp.		+				
13. Brechmorhoga sp.						
14. Dythemis sp.						
15. Erythrodiplax sp.						
16. Paltothemis sp.						
Ephemeroptera(Mayfly nymphs)						
17. Baetis macanis	+					
18. Baetis meeheanis						
19. Caenis kimminis	+	+				
20. Choroterpes gadrica						
21. Cloeon gillican		+				
22. Ecdyonurus islamabadicus						
23. Ephemerella sp.						
Plecoptera(Stonefly nymphs)						
Hemiptera						
24. Rheumatobates maculata	+	+				
25. Plea nerringi						
26. Corixa substrata		+				
Micronecta striata		+				

Continued:- + = Present, - = Absent

MACROFAUNA	Stations. 1	2	3	4	5	6
27. Microvelia melvini						
Trichoptera						
28. Hydropsyche straightus	+					
29. CCheumatopsyche betteni	+					
30. Psychomia wigginsi						
Coleoptera Ephemus. Spinopsis	+					
31. Acenus bruesi	+					
32. Ancyronyx sandersoni						
33. Berosus mucronatus						
34. Ectoparia blaisdelli	+					
35. Enochrus fusca						
Neoelmis fonteni						
36. Paracymus testacea	+					
37. Ochthebius minutus.						
Hydrochara caminatus.	+					
38. Oreodytes vittatus					+	
Lepidoptera						
39. Cataclysta hubneri	+	+		+		+
Diptera						
40. Simulium sp.	+	+				+
41. Psychoda sp.	+	+				+
42. Culicoides sp.					+	
43. Tanypus sp.						
44. Chironomus sp.	+	+		+		
45. Hydrobaenus sp.	+	+				+
46. Tabanus sp.	+	+				
47. Eristalis sp.						
48. Ephydra sp.						
49. Brachydeutra sp.						
50. Chrysozona sp.					+	
51. Limonia sp.						
52. Limnophora sp.						
53. Arazma sp.						
54. Weidemannia sp.						
55. Dixa sp.						
56. Lispe sp.						
57. Aedes sp.					+	
58. Anopheles sp.						
59. Culex sp.			+	+	+	+
60. Orthocladius(Cricotopes)sp.						
61. Protenthes sp.						
Gastropoda						
62. Lymnaea acuminata						
63. Lymnaea luteola	+	+				
64. Lymnaea pinguis						
65. Physa gyrina		+		+	+	
66. Indoplanorbis(Planorbis) exustus						
67. Zootecus insularia						
Fishes Melania tuberculata		+		+		
68. Puntius conchonius	+	+				
69. Barilius vagra	+					
Pomus Sigma						
70. Cirrhina reba		+				
71. Bagarius bagarius						
72. Chela cachius						
Frogs Rhacophalus punctatus.		+				
73. Rana cyanophlyctis						
Fresh water tortoises						
74. Trionyx sp.						

+ = Present , - = Absent

Table 49 Productivity of Bottom Fauna/Sq Meter. June, 1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	84	-	-	-	-	-
Oligochaetes.	-	-	42	1611	85	1950
Leeches.	254	-	21	-	-	-
Ephemeroptera(nymphs).	678	5258	-	-	-	-
Odonata (nymphs)	-	-	-	-	-	-
Hemiptera	-	-	-	-	-	-
Plecoptera(nymphs)	-	-	-	-	-	-
Trichoptera (larvae)	-	678	-	-	-	-
Trichoptera(pupae)	-	-	-	-	-	-
Trichoptera(adults)	-	-	-	-	-	-
Coleoptera(larvae)	84	-	-	-	-	-
Coleoptera(adults)	-	-	-	-	-	-
Diptera(larvae)	3392	2035	64	4325	42	-
Diptera(pupae)	-	339	-	254	-	-
Diptera (adults).	-	-	-	-	-	-
Lepidoptera(larvae)	-	-	-	-	-	-
Neuroptera(larvae)	-	-	-	-	-	-
Gastropods.	170	-	21	170	-	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2	4662	8310	148	6360	127	1950
Total Weight/M^2 Gms/M^2.	13.144	11.024	0.742	19.08	0.424	4.24

Table 50 Productivity of Bottom Fauna/Sq.Meter. July, 1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians	-	-	-	-	-	-
Oligochaetes.	42	-	-	636	2459	254
Leeches.	254	170	-	-	-	-
Ephemeroptera(nymphs)	678	3392	-	-	-	-
Odonata (nymphs).	-	-	-	-	-	-
Hemiptera.	-	-	-	-	-	-
Plecoptera(stonefly nymphs)	-	-	-	-	42	-
Trichoptera(larvae)	-	5088	-	-	-	-
Trichoptera(pupae)	-	-	-	-	-	-
Trichoptera(adults).	-	-	-	-	-	-
Coleoptera(larvae)	85	169	-	-	-	-
Coleoptera(adults).	-	-	-	-	-	-
Diptera (larvae)	2926	2714	53	2756	85	85
Diptera(pupae).	424	848	-	-	-	-
Diptera(adults).	-	-	-	-	-	-
Lepidoptera(larvae)	-	-	-	-	-	-
Neuroptera (larvae).	-	-	-	-	-	-
Gastropods.	212	-	-	-	-	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2	4621	12381	53	3392	2586	339
Total Weightin ^{2} Gms/M^2	7.844	27.984	0.021?	6.996	4.664	0.212

Table 51 Productivity of Bottom Fauna/Sq.Meter. August, 1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	-	-	-	297	1272	254
Leeches.	85	-	-	-	-	-
Ephemeroptera(nymphs).	424	4749	-	-	-	-
Odonata(nymphs).	-	-	-	-	-	-
Hemiptera.	85	-	-	-	-	-
Plecoptera(stonefly nymphs).	-	-	-	-	-	-
Trichoptera(larvae)	-	2120	42	-	-	-
Trichoptera(pupae)	-	170	-	-	-	-
Trichoptera(adults).	-	-	-	-	-	-
Coleoptera(larvae).	-	85	-	-	-	-
Coleoptera (dults).	-	-	-	-	-	-
Diptera(larvae).	2714	1442	890	1399	42	42
Diptera (pupae)	678	-	-	85	-	-
Diptera (adults).	-	-	-	-	-	-
Lepidoptera(larvae)	-	-	-	-	-	-
Neuroptera(larvae).	-	-	-	-	-	-
Gastropods.	170	-	-	-	42	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	4156	8566	932	1781	1356	296
Total Weight/in.Gms/M^2.	3.816	11.448	1.06	3.180	1.908	0.0848

Table 52 Productivity of Bottom Fauna/Sq.Meter. September, 1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	-	85	254	339	594	339
Leeches.	106	254	-		-	-
Ephemeroptera (nymphs)	1442	2417	-	170	-	-
Odonata (nymphs)	-	85	-	-	-	-
Hemiptera	-	-	-	-	-	-
Plecoptera(stonefly nymphs)	-	-	-	-	-	-
Trichoptera(larvae)	-	1272	-	339	-	-
Trichoptera(pupae)	-	85	-	-	-	-
Trichoptera (adults)	-	-	-	-	-	-
Coleoptera (larvae)	1007	382	-	-	-	-
Coleoptera (adults).	-	-	-	170	-	-
Diptera (larvae)	276	1526	477	18656	42	11660
Diptera (pupae)	-	85	-	594	-	339
Diptera (adults)	-	-	-	-	-	-
Lepidoptera(larvae)	-	-	-	-	-	-
Neuroptera(larvae)	-	-	-	-	-	-
Gastropods.	159	339	-	-	21	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	2990	6530	731	20268	657	12338
Total Weight/in Gms/M^2.	9.475	22.472	0.6413	54.272	2.120	23.744

Table 53 Productivity of Bottom Fauna/Sq.Meter . Oct. 1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	85	85	-	-	-	-
Oligochaetes.	-	-	11	636	-	13568
Leeches.	191	-	11	-	-	-
Ephemeroptera (nymphs)	1187	8141	64	1526	-	-
Odonata (nymphs)	85	-	-	-	-	-
Hemiptera	85	-	-	-	-	-
Plecoptera(stonefly nymphs)	-	-	-	-	-	-
Trichoptera (larvae)	-	6190	138	-	42	-
Trichoptera(pupae).	-	-	-	-	-	-
Trichoptera(adults)	-	-	-	-	-	-
Coleoptera(larvae)	2883	339	-	-	-	-
Coleoptera (adults).	-	-	-	-	42	-
Diptera(larvae)	678	6614	-	5373	-	45453
Diptera(pupae).	21	678	-	-	-	1696
Diptera (adults).	-	-	-	-	-	-
Lepidoptera(larvae).	-	85	-	-	-	-
Neuroptera (larvae).	-	-	-	-	-	-
Gastropods.	254	-	21	-	-	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	5469	22132	245	7535	84	60717
Total Weight/M^2.Gms/M^2.	75.82	50.108	11.458	11.372	0.318	127.852

Table 54 Productivity of Bottom Fauna/Sq.Meter. Nov. 1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	21	170	-	-	-	-
Oligochaetes.	-	-	148	170	1569	339
Leeches.	-	-	-	-	-	-
Ephemeroptera(nymphs).	615	8480	64	85	-	-
Odonata(nymphs).	42	-	-	-	-	-
Hemiptera.	21	-	-	-	-	-
Plecoptera(stonefly nymphs)	-	-	-	-	-	-
Trichoptera(larvae).	-	25440	318	-	-	-
Trichoptera(pupae).	-	-	-	-	-	-
Trichoptera(adults).	-	-	-	-	-	-
Coleoptera(larvae).	466	1017	42	-	-	339
Coleoptera(adults).	-	-	-	-	-	-
Diptera(larvae).	74	5088	-	1569	127	5130
Diptera(pupae).	-	339	21	63	636	2374
Diptera(adults).	-	-	-	-	-	-
Lepidoptera(larvae)	-	-	-	-	-	-
Neuroptera (larvae).	-	-	-	-	-	-
Gastropods.	85	170	-	-	85	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	1324	30704	593	1887	2417	8182
Total Weight/M^2. Gms/M^2.	27.772	225.567	1.547	272.208	3.074	113.164

Table 55 Productivity of Bottom Fauna /Sq.Meter. Dec.1979.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	170	80	180	339	594	44096
Leeches.	-	-	-	-	-	-
Ephemeroptera(nymphs).	5512	636	85	-	-	-
Odonata (nymphs).	-	-	-	-	-	-
Hemiptera	-	-	-	-	-	-
Plecoptera(nymphs)	-	-	-	-	-	-
Collembola.	-	170	-	-	-	-
Trichoptera(larvae).	382	6381	-	-	254	-
Trichoptera(pupae)	-	-	-	-	-	-
Trichoptera (adults).	-	-	-	-	-	-
Coleoptera(larvae)	-	1526	21	-	-	-
Coleoptera (adults).	-	-	-	-	-	-
Diptera (larvae)	4537	1463	21	2671	127	6784
Diptera(pupae).	170	-	21	85	127	-
Diptera (adults).	42	-	11	-	-	-
Lepidoptera(larvae).	-	170	-	-	-	-
Gastropods.	-	297	42	254	42	170
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	10813	10723	381	3349	1144	51050
Total Weight/in. Gms/M^2.	7.632	34.658	3.021	78.29	3.18	215.392

Table 56 Productivity of Bottom Fauna/Sq.Meter. Jan. 1980.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	424	-	117	5936	975	1184
Leeches.	-	-	-	-	-	-
Palaemon.	-	-	-	-	-	503
Ephemeroptera(nymphs)	157	2714	-	1781	-	-
Hemiptera.	-	-	-	-	-	-
Plecoptera(nymphs).	-	-	-	-	-	-
Trichoptera (larvae).	848	1018	-	5088	42	-
Trichoptera(pupae)	-	-	-	-	-	-
Trichoptera(adults).	-	-	-	-	-	-
Coleoptera(larvae)	-	-	-	763	42	-
Coleoptera (adults).	-	-	-	-	-	-
Diptera (larvae)	1611	3562	11	4579	42	678
Diptera(pupae)	85	339	21	85	42	170
Diptera(adults).	-	170	-	-	-	-
Lepidoptera (larvae)	-	-	-	-	-	-
Neuroptera(larvae).	-	-	-	-	-	-
Gastropods.	85	170	-	254	-	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	3210	7973	149	18486	1143	2541
Total Weight/M^2. Gms/M^2.	30.528	80.56	0.318	23.744	4.452	8.48.

Table 57 Productivity of Bottom Fauna/Sq.Meter. Feb. 1980.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	170	8141	95	276	551	4070
Leeches.	-	-	-	-	-	-
Ephemeroptera(nymphs).	1950	7802	-	-	-	-
Odonata(nymphs)	-	339	-	-	-	-
Hemiptera.	-	-	-	-	-	-
Plecoptera(stonefly nymphs)	-	-	-	-	-	-
Trichoptera(larvae).	6445	2035	-	-	-	-
Trichoptera(pupae).	-	-	-	-	-	-
Trichoptera(adults).	-	-	-	-	-	-
Coleoptera(larvae)	1272	-	-	-	-	-
Coleoptera (adults).	-	-	-	-	-	-
Diptera(larvae).	2544	24422	-	254	-	1696
Diptera(pupae)	85	1018	21	106	-	-
Diptera(adults).	-	-	11	-	-	-
Lepidoptera(larvae).	-	-	-	-	-	-
Neuroptera(larvae).	-	-	-	-	-	-
Gastropods.	-	678	-	42	-	3392
Bivalves.	339	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number/M^2.	12805	44435	127	678	551	9158
Total Weight/in.Gms/M^2.	156.88	176.384	0.212	5.724	2.12	323.936

Table 58 Productivity of Bottom Fauna/Sq.Meter. March,1980.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	763	424	42	4876	170	17723
Leeches.	85	-	-	-	-	-
Collembola (nymphs).	-	-	-	-	42	-
Ephemeroptera (nymphs).	254	-	-	-	-	-
Odonata (nymphs).	-	-	-	-	-	-
Hemiptera.	-	-	-	-	-	-
Plecoptera(nymphs).	-	-	-	-	-	-
Trichoptera(larvae).	382	-	-	-	-	-
Trichoptera(pupae).	-	-	-	-	-	-
Trichoptera(adults).	-	-	-	-	-	-
Coleoptera(larvae).	2162	-	-	-	-	-
Coleoptera(adults).	85	-	-	-	-	-
Diptera (larvae).	975	42	42	2162	85	-
Diptera(pupae)	-	53	21	424	42	42
Diptera(adults).	-	32	21	85	-	-
Lepidoptera(larvae).	-	-	-	-	-	-
Neuroptera(larvae).	-	-	-	-	-	-
Gastropods.	42	11	-	42	-	-
Bivalves.	-	-	-	-	-	-
Fishes.	42	-	-	-	-	-
Total Number/M^2.	4790	562	126	7589	339	177625
Total Weight in Gms./M^2.	58.597	1.198	0.127	7.208	0.254	29.256

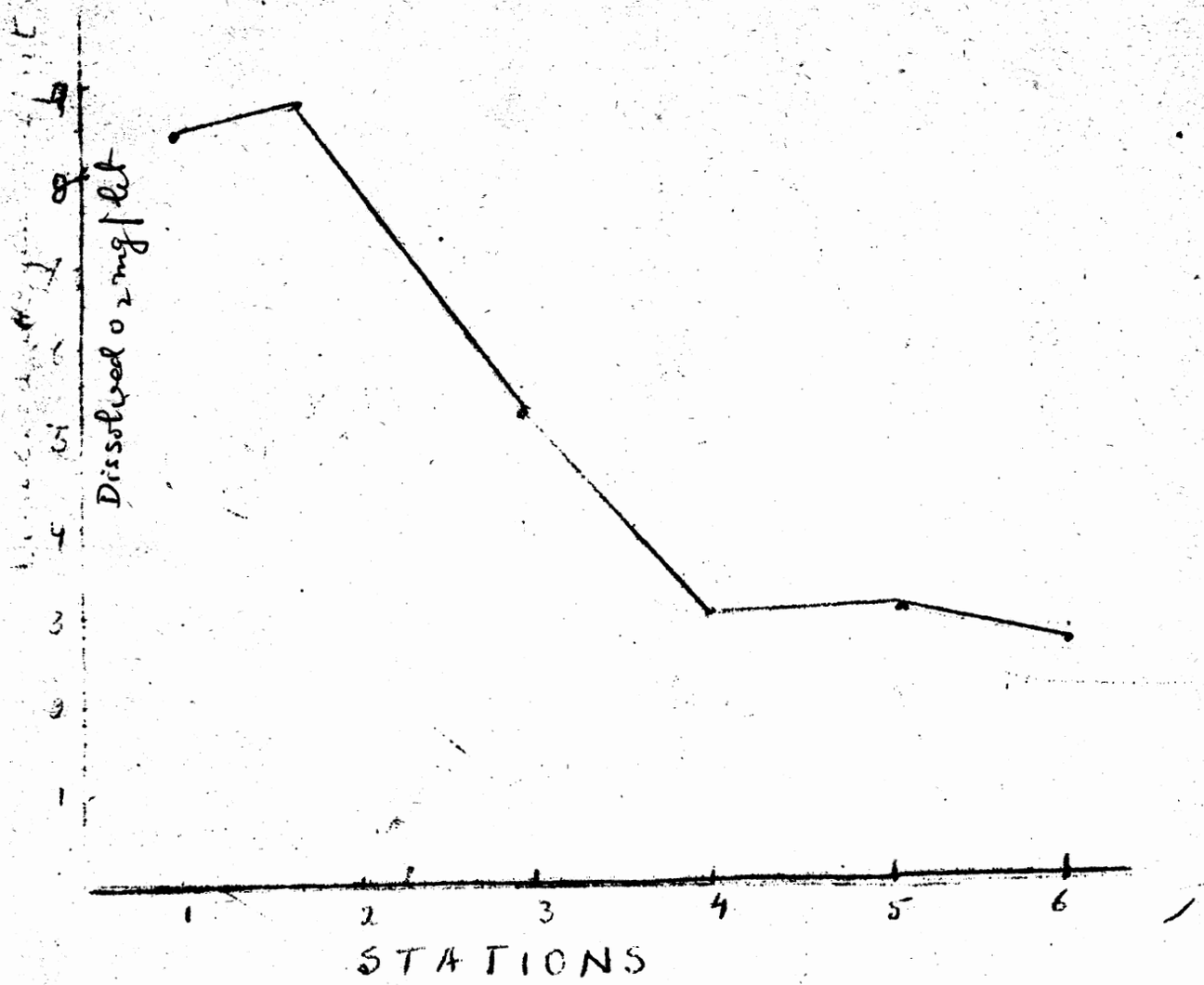
Table 59 Productivity of Bottom Fauna/Sq.Meter. April, 1980.

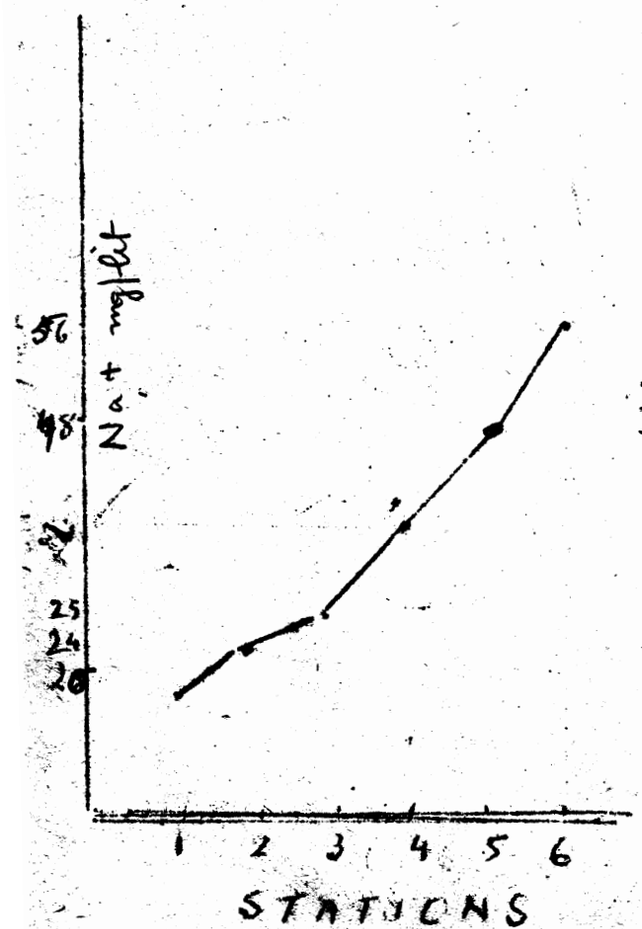
Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	5	1781	42	74	42	72080
Leeches.	21	-	-	-	-	-
Ephemeroptera(nymphs)	307	-	-	-	-	-
Odonata (nymphs).	5	127	-	-	-	-
Hemiptera .	5	-	-	-	-	-
Plecoptera (nymphs)	-	-	-	-	-	-
Trichoptera (larvae).	11	-	-	-	-	-
Trichoptera(pupae).	-	-	-	-	-	-
Trichoptera (adults).	-	-	-	-	-	-
Coleoptera(larvae).	85	170	-	-	-	-
Coleoptera (adults).	-	-	-	-	-	-
Diptera (larvae).	212	3689	-	1470	-	85
Diptera(pupae).	42	85	-	170	42	-
Diptera(adults).	-	-	-	-	-	85
Lepidoptera (larvae).	-	-	-	-	-	-
Neuroptera(larvae).	-	-	-	-	-	-
Hymenoptera (larvae).	-	-	-	-	-	170
Gastropods.	148	-	-	42	-	-
Bivalbes.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number /M^2.	841	5852	42	1756	84	72420
Total Weight in Gms./M^2.	8.798	28.408	0.148	9.116	0.127	195.04

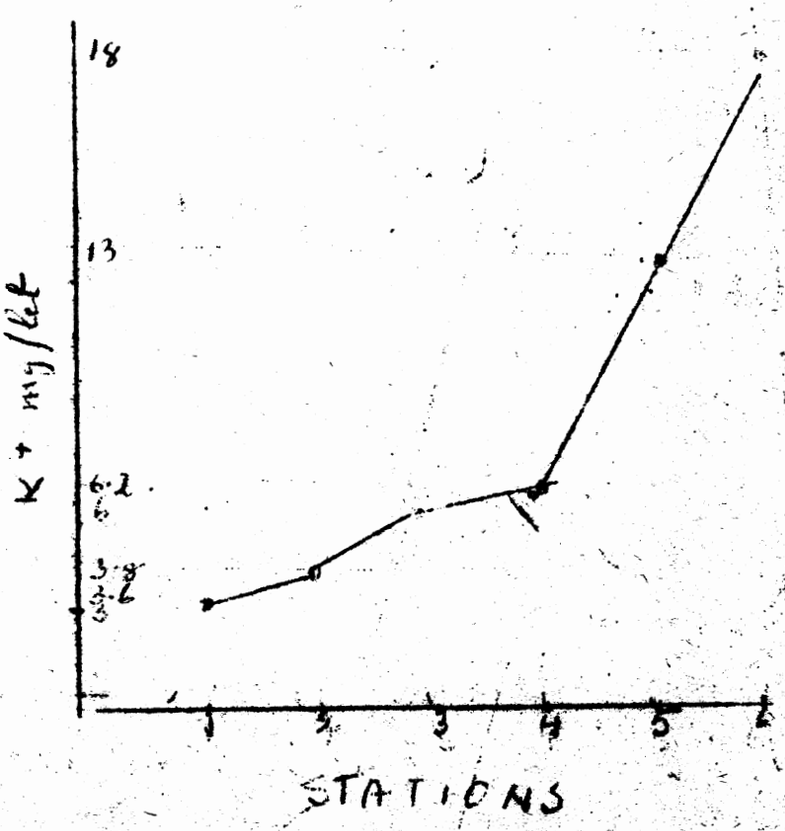
Table 60 Productivity of Bottom Fauna /Sq.Meter. May, 1986.

Animals.	Station 1.	Station 2.	Station 3.	Station 4.	Station 5.	Station 6.
Planarians.	-	-	-	-	-	-
Oligochaetes.	-	212	212	-	-	40958
Leeches.	-	-	-	-	-	-
Ephemeroptera(nymphs).	954	254	-	-	-	-
Odonata (nymphs).	64	42	-	-	-	-
Hemiptera.	42	21	-	-	-	-
Plecoptera(nymphs).	-	-	-	-	-	-
Trichoptera(larvae)	7292	-	-	-	-	-
Trichoptera (pupae)	85	-	-	-	-	-
Trichoptera (adults).	-	-	-	-	-	-
Coleoptera(larvae).	360	-	-	-	-	-
Coleoptera (adults).	21	-	-	-	-	-
Diptera (larvae).	551	297	-	4325	2459	48972
Diptera (pupae).	-	21	-	339	1102	4113
Diptera (adults).	-	21	-	-	-	85
Lepidoptera(larvae).	21	-	-	-	-	-
Neuroptera (larvae).	-	-	-	-	-	-
Gastropods.	170	-	-	64	-	-
Bivalves.	-	-	-	-	-	-
Fishes.	-	-	-	-	-	-
Total Number /M^2.	9560	868	212	4728	3561	94128
TotalWeight in Gms./M^2.	57.876	3.816	0.53	15.9	6.36	137.8

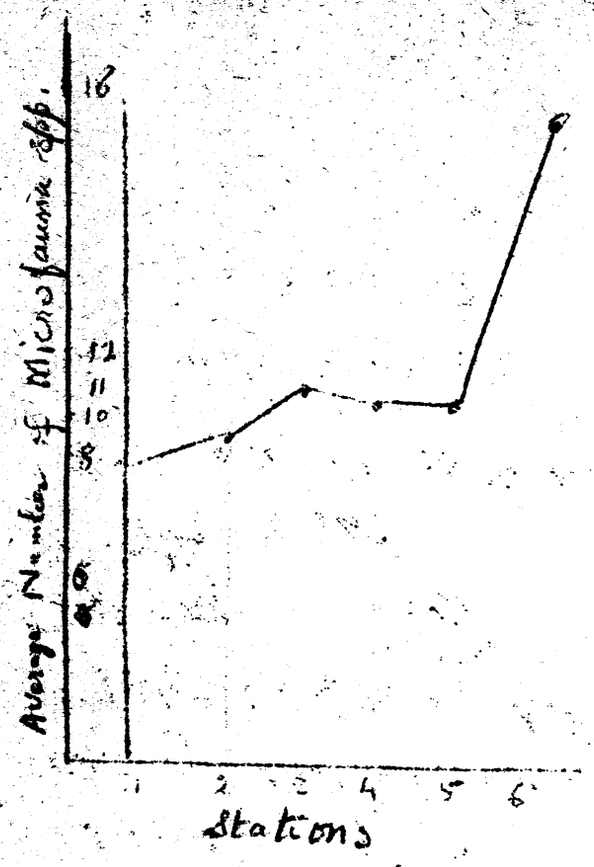
Graphic representation of Dissolved Oxygen, Na^+ and K^+.



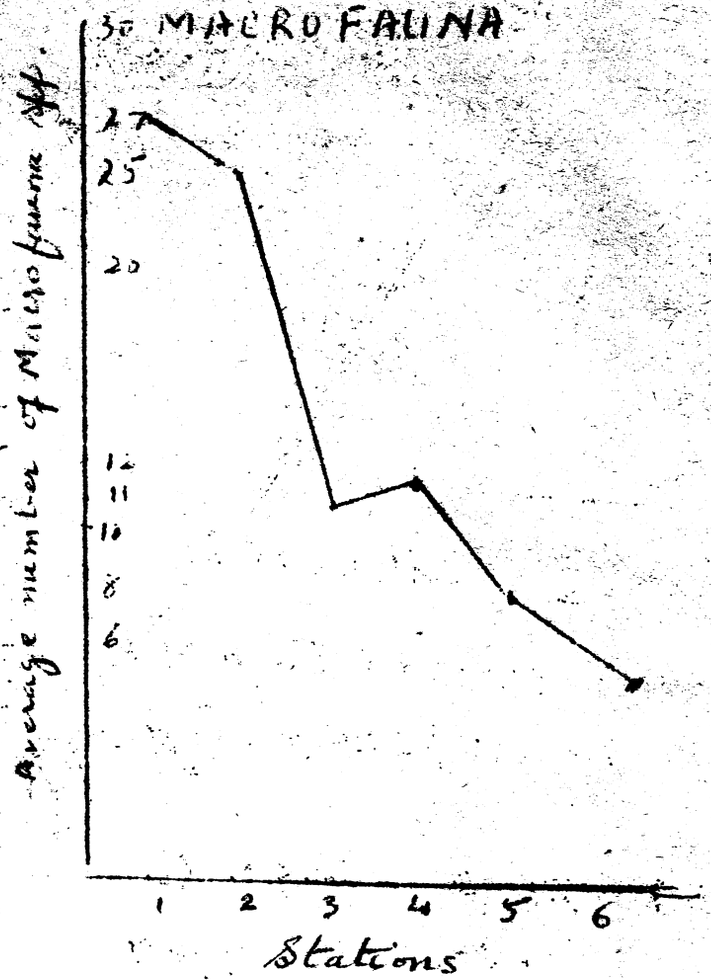




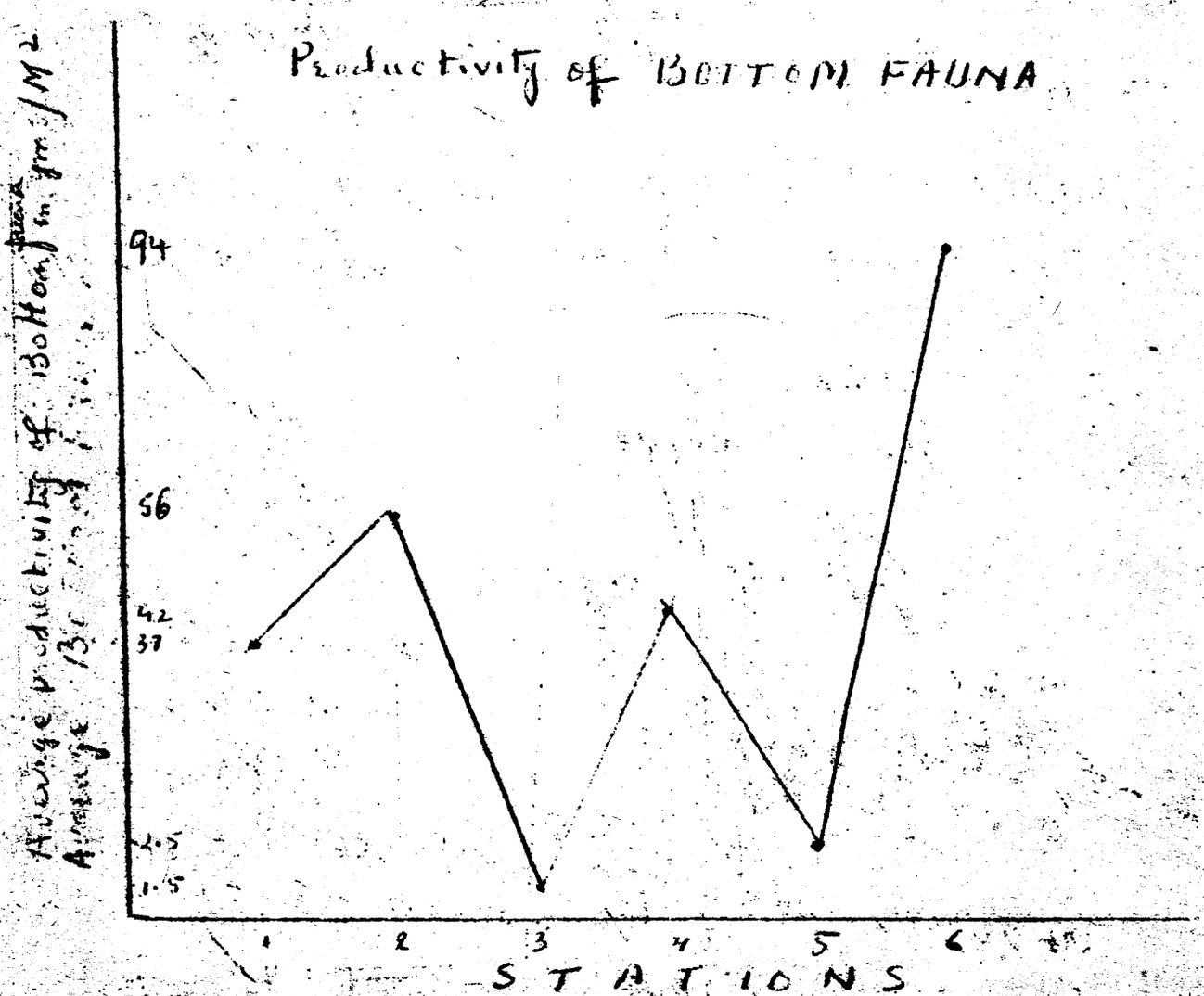
MICROFAUNA



MACROFAUNA



Productivity of BOTTOM FAUNA



most of the fishes can not tolerate pollution and were not found in the Leh stream after Satellite Town.

Productivity of Bottom Fauna.

According to Usinger (1956)[72] productivity was used by W. Hazzard to classify streams. His standards were : Grade 1(rich stream - more than 2152 bottom organisms by number or more than 22 gms. by weights per square meter; Grade II(average)- 1076 to 2152 organisms or 11 to 22 gms. weight; Grade III(Poor)- less than 1076 organisms or less than 11 gms weight per square meter.

The productivity of bottom fauna was usually rich in the Leh and its tributaries in Islamabad. At station 3, in the III tributary, the productivity dropped and was lowest after receiving industrial effluents. It increased on station 4 as the pollution was diluted due to clean water of the Badarwali Kas(4th tributary), it again slightly decreased at the station 5 (Daryabad) and highest at station 6 (Soan Camp.).

Fishes were found in the non-polluted water of the Leh and its tributaries. The bigger size of fishes were found in the deep water near Zero Point and Badarwali Kas .Frogs were usually found in non-polluted water.Tortoises were found only near Soan Camp. At the Soan Camp, Channa punctatus ,a bigger size of fish was found and young of Chela sp. were found in spring 1979.

(6) Discussion.

The water of the Leh and its tributaries passes over the hilly tract and dissolves calcium from limestone bed , so calcium as Ca^{++} is slightly higher than W.H.O.'s International Standard of Drinking Water(1971)[82]. The permissible limit of total hardness is 100 mg/lit.(1971)[82] but in the Leh and its tributaries,it was 250 to 390 mg/lit which was sufficiently high. Magnesium and nitrates and chlorides were within the limits. In the Leh stream,presence of nitrates indicates slight sewage pollution,so it was higher in polluted water. Sodium and potassium were gradually increased in quantity from non-polluted to polluted water, the highest quantities were found at the Soan Camp (Table 61). Na^{+} and K^{+} can be used as

indicators of domestic pollution.Dissolved oxygen also indicates pollution.The highest dissolved oxygen was found in non-polluted water but there was sudden drop at station 3 where Industrial Effluents were present. There was gradual decrease of dissolved oxygen in stations from 3 to 6, usually very little at the Soan Camp . Fish can not live below 5.0 mg/lit dissolved oxygen except Channa punctatus and they were found in the Leh at station 6.The young of Chela sp. were present at station 6 in spring 1979 and it seems that they ascended from the Soan River in search of food. The Industrial Complex of Islamabad consists of effluents of Flour Mills,Vegetable Ghee Factory, 7-UP Beverage Factory, Marble Factories and Steel Mills, so there seems to be no deleterious substance Pollution is due to putrefaction of wheat and flour and increase in total hardness due to the effluents of Marble Factories.

According to Ali(1979), 88 species of algae were found in district Rawalpindi,while in the Leh, 54 species were found which are sufficient number for a stream flora..The highest number was found in non-polluted water and lowest on Soan Camp, algae are affected by pollution water.The number of microfauna increased by pollution and highest number on the Soan Camp.Macrofauna species were highest in non-polluted water and lowest on the Soan Camp. About 100 macrofauna taxa were found in the Leh stream and its tributaries which is good member of a stream fauna. As mentioned by Avery (1970), the numbers of Ephemeroptera,Trichoptera and Coleoptera below sewage outfall were lower than those found above. In the Leh stream, the above mentioned groups of insects(Mayfly nymphs and caddisfly larvae) were either few in number, or absent in polluted waters ,although a large number of these insects were found in non-polluted water.Nymphs of dragon and damselflies were found only in non-polluted water.According to Hazzard classification(1956)[72] of streams , the productivity of bottom fauna by number and weight was very high except station 3 and station 5 and highest at the Soan Camp. In the non-polluted and

polluted water insect groups differ, greater number of Ephemeroptera and Trichoptera at stations 1 and 2 and Diptera on the Soan Camp.

The presence of sufficient number of algal species shows that primary producers are enough in the stream. It is generally thought that plankton are found only in standing waters such as ponds and lakes. Whitton (1975)[73] mentioned that zooplankton of a river might form an integral part of lotic community and contribute significantly to biological productivity of ecosystem. A number of plankton were found in the Leh stream. According to Whitton (1975)[73] macroinvertebrates in flowing water ecosystem function as shreddars, collectors, grazers and predators - served as interre-lated carbon dioxide producing, temporary storage bins for organic compounds, which are eventually converted to carbon dioxide. In the Leh macroinvertebrate fauna was found in good number nearly at all stations. The benthic fauna usually consists of macroinvertebrates which were usually in large number in the Leh stream. According to Meehean and Ali(1967)[59] and Ali(1968)[7 & 8] and (1975)[15] macroinvertebrates form the food of many fishes, so it is quite evident that the Leh stream contains enough food for fishes. Ali(1969)[9] stated a large number of bottom organisms were drifted during flood seasons.

The Leh stream is much affected by the floods, so in the intrest of fish culture, certain improvements should be made. Usinger (1956)[72], "Streams fish need pools for protection and riffles for food production and spawning, for stream improvement there should be both types of habitats 1:1 in ratio. Pools can be created by small dams or by deflectors strategically placed. Banks are stabilized by planting to prevent erosion",. The above mentioned improvement can be done in the upper reaches of the Leh and its tributaries will be developed for the fish culture in Islamabad.

Pollution in the Leh stream is usually due to organic matter, "Most studies on enrichment indicate that community respiration exceeds photosynthesis", Whitton (1975)[73].

The same condition was found in the Leh, highest number of fauna was found on the Soan Camp, but least quantities of dissolved oxygen was present. Soaps and detergents are also toxic but in the Leh, they affected little on algae and inverte -brates. Na^+ and K^+ shows gradual increase in quantities from non-polluted water, so they can be used as domestic pollution indicators . Among macrophytes Hydrilla and Potamogeton serve to indicate nonpolluted water . Among macrofauna, nymphs of mayflies , dragonflies ,larvae of caddisflies and mussels indicat non-polluted water .Lemna is usually found in organically pollute water. Among algae Scenedesmus ,Closterium ,Euglena ,Phacus and and Microcystis are indicators of pollution. Among microfauna Centropyxis ,Euplotes,Epistylis ,Carchesium ,Colpidium,Oxytricha and Spirozona indicate polluted water. Among macrofauna , Tubifex Tubifex ,larvae of Culex, Culicoides,Chironomus, Lispe , Eristalis,Ephydra and Brachydeutra indicate pollution.

(7) Conclusion.

A large area of Islamabad i.e., about 90 square miles is drained by the Leh and its tributaries where the water is usually non-polluted. It is just possible that these streams can be used for water supplies .Due to erosion these streams are lying in low areas and their water can not be used for irrigation unless lifted above. The water of the Leh in Rawalpindi is unfit even for irrigation.If These streams are properly managed can be used for fish and crab culture . For spawning and food, pool areas may be maintained by using deflectors such as logs or constructing small dams.

The effluents of Industrial Complex of Islamabad are harmful and spoil the water quality, so the used water of th industries should not be discharged into streams without treatmen The large drains of Rawalpindi town should be diverted into sewerage lines, the water from dhobighats and service station may not be allowed to enter in the Leh stream. The pollution in

Rawalpindi is mainly due to domestic and sewerage wastes.

Physical pollution of the water is due to erosion which can be controlled by planting trees along the banks. Pollution indicator species were also determined.

(8) Need for Additional Research.

More extension work should be done on effect of pollution. Regular 24 hours collection should be done before and after the discharge of major industrial effluents and sewage from drains at least once a season each month. Bacteriological studies may also be done, so that a correlation may be found between water quality and organisms.

(9) List of Publications.

1. Ali, S.R. 1979 A checklist of Freshwater Algae of Rawalpindi District. Bull. Hydrobiol. Res. Ser.2. No.5 : 48-54.

2. _____ 1979 Distribution of Mayflies (Order : Ephemeroptera) of Pakistan. Abstract, 3rd International Conf. on Ephemeroptera, Canada. p.4.

3. Khatoon, S. & Ali, S.R. 1979 Nymphs of order Odonata of Pakistan. Abstract, Biology Section, 19th Annual Sci. Conf. Sci. Soc. Pak. p. 35.

4. Ali, S.R. et al. 1979 Effects of Industrial Wastes on Aquatic Fauna. Abstract (Biology), 26th & 27th Pakistan Sci. Conf. Pak. Assoc. Advan. Sci. p. 53.

5. Ali, S.R. & Khatoon, S. 1980 Microfauna of the Leh stream and some indicator species (submitted for publication).

6. _____ 1980 Seasonal Variation in the algal flora of the Leh stream and its tributaries (Manuscript).

(10) List of Scientists.

1. Syed Rashid Ali M.Sc. Principal Investigator 25%

2.	Mushtaq Ahmad. M.Sc.	Research Officer 100% from May 15 to August 12,1978.
3.	Mohammad Tariq Raja . (M.Sc.)	Research Officer 100% from Oct. 1 to 19, 1978.
4.	Miss Sanjeeda Khatoon. (M.Sc.)	Research Officer 100% from Oct.20, 1978 to 14th May,1980.
5.	Jamrose Khan Lab.Asstt.	100% from May 15 to 31, 1978.
6.	Jamil Ahmed " "	100% from June 1,1978 to 14th May, 1980.

(11) Graduate Degrees.

Miss Sanjeeda Khatoon M.Sc. Research Officer applied for admission to Ph.D. Degree in Zoology in Quaid-e-Azam University, Islamabad.

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10. _____ 1969 Effect of water pollution on the Bottom Fauna of the Soan river,Rawalpindi. Jadid Sci. 11(1) : 33-38.

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