

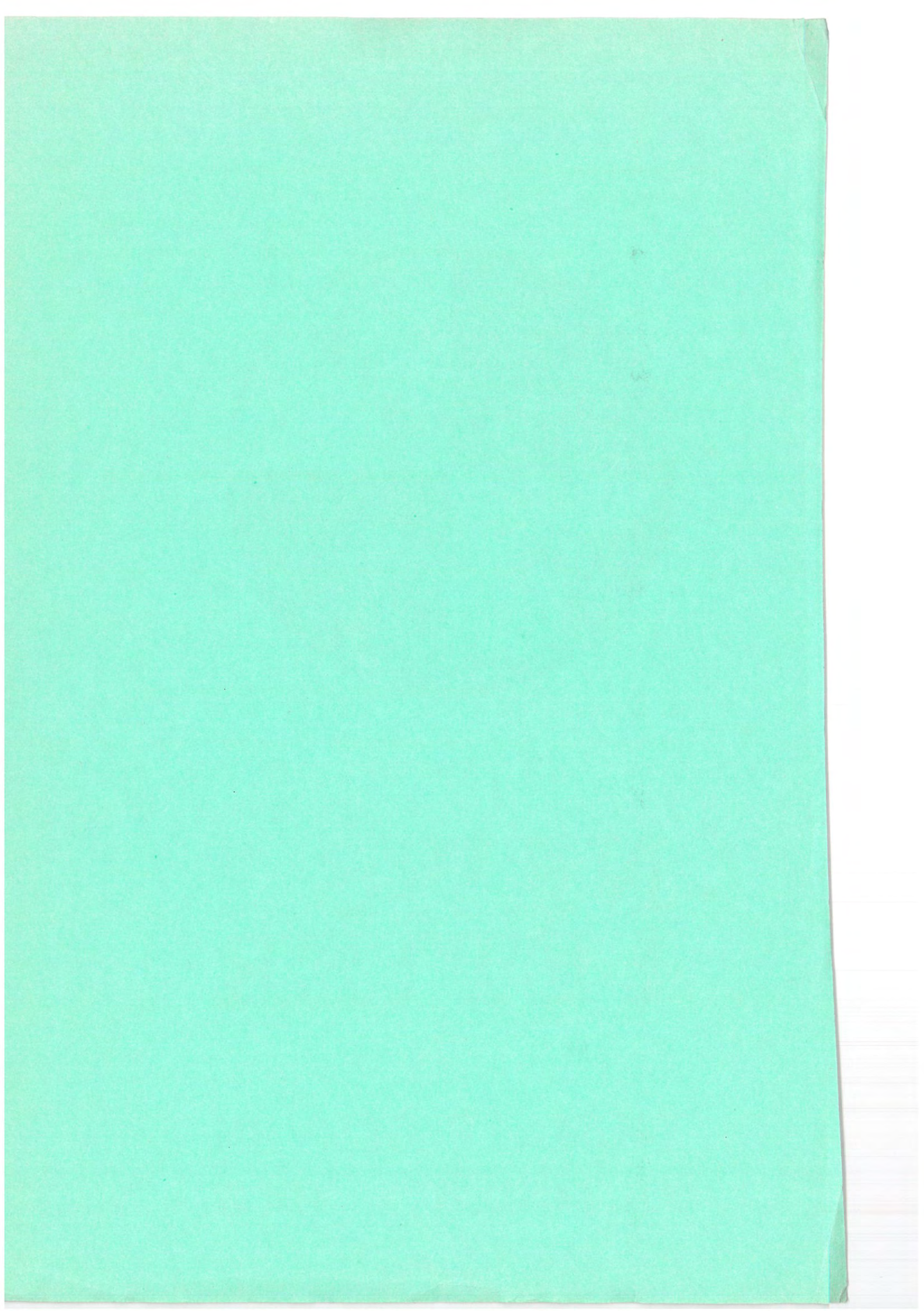
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NEWS LETTER

R. Marchant p.13

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NEW ZEALAND LIMNOLOGICAL SOCIETY

The Society was formed at a meeting in Christchurch in January 1968. It aims to provide a common meeting ground for freshwater workers in New Zealand, and to encourage and promote the exchange of news and views between them. In particular, a newsletter is compiled and circulated at least once a year and an annual conference is held.

The current subscription is \$5.00 per annum (student rate \$2.00 per annum). Further information may be obtained from the Secretary/Treasurer.

The Committee for 1975-1976:

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Lower Hutt)

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RESEARCH NOTES

A) FROM THE UNIVERSITIES

ZOOLOGY DEPARTMENT, UNIVERSITY OF AUCKLANDStaff Research

Professor E.C. YOUNG maintains his interest in freshwater insects although he is not involved in any research project at present.

Mr D.R. COWLEY has recently completed his Ph.D. on the systematics of the immature stages of N.Z. Trichoptera and is awaiting the results. This work includes a short section on adult taxonomy and a section on the characteristics of pupal Trichoptera (at family level). The bulk of the thesis covers the descriptions and distributions of larval caddis. The 46 species considered include most of our commoner forms (excluding the rhyacophilids).

Mrs M.H. LEWIS continues to write up her freshwater harpacticoid systematic work, which has been somewhat delayed by the arrival of a baby boy - congratulations.

Dr J.P. LEADER is now in the Physiology Department of the Otago Medical School and Dr P. CADWALLADER is working for the Fisheries and Wildlife Division of the C.S.I.R.O.

Ph.D. Students

BILL LANE continues his work on population parameters of rudd. He is also looking at its association with trout.

DAVID TOWNS is rounding off the field studies of his work on the benthic communities of the Waitakere stream.

M.Sc. Students

KEVIN WALDEN is completing his thesis on the ecology of the local mosquito species. He has been looking at the effect of numbers of individuals in restricted water habitats such as small tree-holes.

Theses completed

D.R. COWLEY. Systematic studies on the immature stages of New Zealand Trichoptera (Caddis Flies). (Ph.D.)

LOUISE GREEN. The structure and function of the hind-gut of the nymph of the dragonfly, *Uropetala carovei*. (M.Sc.)

SUZANNE HOWARD-SMITH. Organic pollution in Oratia Stream. (M.Sc.)

C.P. MAIN. Chloride ion and water balance in the larva of the fresh water trichopteran *Diplectrona zelandica*. (M.Sc.)

BOTANY DEPARTMENT, UNIVERSITY OF AUCKLAND

Professor V.J. CHAPMAN will retire on 31 January 1976 after 30 years in the Department as its head. Many members will appreciate his efforts in the Limnological field which include the setting up of the Field Station at Lake Rotoiti and several years as a member of the Officials Committee on Eutrophication, as well as extensive research on macrophytes.

Dr J.M.A. BROWN and Dr F.I. DROMGOOLE continue their work on the physiology and ecology of aquatic macrophytes, Lakes Tarawera and Okataina have been surveyed during the past year to extend the previous incomplete surveys. An underwater TV camera was used in Okataina with a tape recorder and a film on underwater vegetation is being edited from the records obtained.

Mr JOHN BROUSE continues his Ph.D. thesis work on photosynthetic pathways in the Hydrocharitaceae. Both light and dark fixation of $^{14}\text{CO}_2$ into C4 acids have been confirmed but, in line with previous reports, there appears to be no mobility of label beyond this point.

Miss ROSEMARY KING is investigating temperature responses and CO_2 supply factors in *Egeria* for her Ph.D. study.

Mr NICK MILLER has almost completed his M.Sc. study on nutrient uptake from lake substrates into *Lagarosiphon* under field conditions.

Mr JOHN CLAYTON has completed the field work and most of the computer analysis for his Ph.D. study of the submerged vegetation of Lake Rotorua and is currently writing up the thesis. He has recently undertaken a survey of hydro-electric proposals in the Bay of Plenty for an environmental impact report.

Miss K. LAM continues her Ph.D. thesis on blue-green algae of the Waikato River with monthly field surveys and laboratory growth studies.

UNIVERSITY OF WAIKATO

A variety of projects are in progress.

Dr M.A. CHAPMAN and Dr A.S. EDMONDS have participated in biological work on the Waikato River in collaboration with scientists from the Ministry of Works, N.Z. Electricity Department and the Waikato Valley Authority and a number of student theses are being supported through a research contract from the National Soil and Water Conservation Authority.

Dr CHAPMAN and Dr J.D. GREEN are writing up the results of studies on copepod production in Lakes Ototoa, Rotorua and Rotoiti, and Dr GREEN is

also analysing the rotifer fauna of the Waikato River and some local lakes.

During the summer Dr CHAPMAN with Dr H.W. MORGAN began a study of Lake Waahi at Huntly, financed by the Auckland Acclimatisation Society, and this is continuing.

Dr EDMONDS and Dr T.G.A. GREEN have supervised the establishment of controlled growth chambers for studies on aquatic macrophyte growth requirements, and have now been joined by Mr K. THOMPSON, whose research interests lie in the fields of aquatic primary production and of macrophyte-epiphyte relationships.

Dr MORGAN has been examining aspects of nitrogen fixation in Lake Waahi, bacterial-allophane clay interactions, and especially the ecology and physiology of thermophilic bacteria in the Rotorua district.

Dr C. WALLACE is at present on leave, looking into aspects of the genetics of the snail *Potamopyrgus*, and has also been continuing with her laboratory and field work on these animals.

Professor J.G. PENDERGRAST is continuing with work on aquatic insects, particularly on Hemiptera.

D.A. NASH (D. Phil.) is continuing his work on the energetics of *Paratya*, and also *Potamopyrgus* and *Paraleptamphopus*, and A.A. DEVCICH (D.Phil.) is amplifying his previous work on freshwater crayfish.

Mrs J.A. BAARS (M.Phil.) is writing up her studies on the phytoplankton of Lakes Okareka and Rotorua.

M.Sc. Students

L.S. LING is writing up his work on the benthic fauna of the Ohau Channel, Rotorua.

D. CAMPIN is assembling his information on the Tarawera River, and

F.H. LICKERS is analysing his data on swan ecology on Lake Whangape.

R.D.S. WELLS is studying the biology of yellow-eyed mullet (*Mugil cephalus*) and G. PATCHELL the catfish (*Tetalurus hebulosus*) in the Waikato River system.

J. BOUBEE is looking at the seasonal changes in fauna and carbon content of bottom sediments of the Waikato River.

T. WHITTLE is studying respiration and feeding in the crayfish *Paranephrops*, and R.D. NOBES is also looking at these features in the mussel *Hyridella menziesi*.

Miss C. JAMIESON is working on the biology and feeding behaviour of cyclopoid copepods in Lake Waahi.

R. PRESTIDGE is examining aspects of the life cycles and feeding behaviour of some local dragonflies and K. GARRETT is studying the population

biology of the hemipterans, *Corixa* and *Sigara*, in a peat lake.

B. COOPER is working on the interactions between bacteria and allophane clay particles with particular emphasis on phosphorus availability.

W. COOMBRIDGE is planning a study of primary production in Lake Waahi.

W. SNELGAR is looking at aspects of the physiology and growth of *Ceratophyllum demersum* and A. CHAMBERS is studying its growth rate in rapid flow nutrient systems.

Part III Students

Miss S. McLEISH is studying feeding behaviour of damselflies and

R. SMITH is working on oxygen uptake by some benthic invertebrates.

Miss J. ROBINSON is looking for lipids in freshwater crayfish tissues.

DEPARTMENT OF SOIL SCIENCE, MASSEY UNIVERSITY

Research Students and their topics

P.W. O'CONNOR (Post-doctoral Fellow) - Evaluation of the potential of soil and fertilizer materials for the phosphorus enrichment of streams draining catchments of different land use.

J.C. RYDEN (post-doctoral Fellow) - Removal of dissolved inorganic and organic phosphorus from sewage effluent using volcanic ash.

M.J. HEDLEY (Ph.D.) - Biological availability of particulate phase inorganic and organic phosphorus in streams.

A.H. RENNES (Ph.D.) - Impact of land-clearing operations, pasture establishment, and fertilizer application on water and sediment yield, and nitrogen and phosphorus loadings of streams draining two adjacent catchments.

A.N. SHARPLEY (Ph.D.) - Relative contributions of surface, sub-surface, and ground-water runoff to the concentrations and loadings of phosphorus in a stream draining a pasture catchment; relative significance of soil, fertilizer and animal manure as sources of phosphorus in surface runoff.

T.O. TAN (Ph.D.) - Soil transformations and losses in drainage waters of nitrogen added in dairy-shed effluent to a soil-pasture system.

B. BARGH (M.Agr.Sc.) - Amounts and particle size distribution of sediment in relation to the hydrology of two streams draining catchments of different land use.

J.G. COOKE (M.Phil.) - Evaluation of the methodology for sampling and chemical characterization of a range of effluents.

MICROBIOLOGY AND GENETICS DEPARTMENT, MASSEY UNIVERSITY

Two masterate theses supervised by Dr TIM BROWN and completed in 1974 are of interest to limnologists. Abstracts of these works are given below.

1. The incidence and variation of bacteria in a stock dam, by B.H. PYLE - The effects of agricultural activities, including grazing and fertilizer application, and environmental factors, on the incidence and variation of bacteria in a stock dam were investigated. A survey of water quality at sites around the edge of a dam was carried out over a period of 15 months. Samples were analysed for water temperature, pH, turbidity, dissolved oxygen, 5-day biochemical oxygen demand (BOD_5), total and soluble phosphorus, total nitrogen, ammonia, nitrite, nitrate, total plate count (TPC), total coliform (TC), faecal coliform (FC) and faecal streptococcal (FS) counts.

The bacterial content of faecal samples from animals around the dam and of littoral sediments was determined. Experiments with incubation of fresh and sterilized pond water samples were carried out to examine the effects of trophic status and nitrate and phosphate addition on bacterial growth and survival.

The presence of grazing animals and wildlife around the dam resulted in significant increases in BOD_5 , turbidity, FS and FC counts. Turbidity, ammonia, nitrate, \log_{10} TPC, \log_{10} TC and \log_{10} FC were positively correlated with the amount of rainfall in the 5 days prior to sampling. While dissolved oxygen saturation was positively correlated with water temperature, ammonia, nitrate, \log_{10} TPC and \log_{10} TC exhibited a negative correlation. Ammonia, nitrate and \log_{10} TPC were correlated with turbidity, and \log_{10} TPC was correlated positively with ammonia and nitrate concentrations. Fertilizer application resulted in slightly increased phosphate concentrations.

The bacterial content of cattle and goose faeces was similar to those reported in the literature, with FC/FS ratios less than 0.01.

FC and FS bacteria were observed to grow in sterilized pondwater samples in pure cultures and in a community of indigenous bacteria harvested from the water. Addition of phosphate and nitrate, and increasing trophic status caused growth stimulation in both pure culture and in the mixed community. In fresh samples, while indigenous bacterial populations increased, indicator bacteria survived longer in less eutrophic water.

It was concluded that BOD_5 , turbidity, FC and FS counts were good

indicators of animal pollution in this situation. Land drainage and mixing of dam sediments resulted in increased indigenous bacterial counts and chemical enrichment. While the physico-chemical nature and trophic status of the water may have influenced bacterial growth and survival, direct pollution, land drainage and mixing of sediments were overriding factors. The concentrations of faecal indicator bacteria encountered suggested that pathogenic organisms such as *Salmonella* could be present in littoral water and bottom sediments.

2. Classification and identification of the aetiological agents of primary amebic meningo-encephalitis together with preliminary investigations of public health measures, by R.T.M. CURSONS - The taxonomy of the aetiological agents of Primary Amebic Meningo-encephalitis (PAM) was investigated to determine the reliability of the common features of the three current schemes. It is concluded that the scheme of Singh and Das (1970) is the most suitable and should be generally adopted. The acceptance of one scheme will remove much of the confusion which characterises the classification of these organisms.

Current identification methods that differentiate between *Naegleria gruberi* (the non-pathogen) and *Naegleria fowleri* (the pathogen) were also investigated over a wider range of parameters than previously, to establish their relative usefulness. The controversial identification of the 1968 New Zealand cases (isolates BH and BL) as a Myxomycete by Mandal *et al.* (1970) was re-examined. Evidence is presented to demonstrate that they are *N. gruberi*.

It was established that there was no general selection for the non-pathogen over the pathogen at 37°C as indicated by their respective Q_{O_2} values at 27°C and 37°C. That there is potential for adaptation to a range of temperatures was shown.

The failure of chlorine as a disinfectant for these soil-amebae was also examined. The ineffectiveness of normal levels of chlorination was confirmed and therefore the use of NaCl and the basic dyes Malachite Green and Brilliant Green investigated. It was found that no amebae could survive a concentration of 1.5% (W/V) of NaCl in axenic culture, of $1.5 \mu\text{g}/\text{cm}^3$ of Malachite Green and of 3.0 μg of Brilliant Green.

Mr Cursons is now a Departmental Demonstrator and is registered for Ph.D. studies into: "The distribution, occurrence and control of the aetiological agents of primary amebic meningo-encephalitis."

ZOOLOGY DEPARTMENT, VICTORIA UNIVERSITY OF WELLINGTON

Dr P.H.J. CASTLE is currently on leave, pursuing his interest in systematics and life history studies of eels.

Dr G.W. GIBBS has returned from leave where he investigated the role of grazing insect larvae on periphyton growth at the F.B.A. River Laboratory in England. He hopes to be able to continue with an interest in this field. The five-year programme at Pukepuke Lagoon, Manawatu, has been terminated but further work is planned to examine the emergence cycles of winged insects there.

STELLA PENNY is completing her Ph.D. with detailed analytical work on the communities of benthic invertebrates in the Wainuiomata River.

ZOOLOGY DEPARTMENT, UNIVERSITY OF CANTERBURY

Dr V.M. STOUT has recently returned from sabbatical leave, which included attendance at the 17th Conference on Great Lakes Research at Hamilton, Ontario, the 19th Congress of the International Association of Limnology at Winnipeg (at which a paper was presented on "A preliminary account of some lakes at different altitudes in southwest New Zealand") and the 1st International Congress of Ecology at The Hague. Visits were made to limnologists in U.S.A., Canada, U.K., Austria, Africa and Australia.

Work, particularly on lakes Grasmere and Pearson, the Waitaki Basin lakes, some Westland lakes, and Lake Ellesmere, is at various stages of preparation for publication and in press.

LESLEY McDONALD has completed the experimental work of feeding plastic beads to the copepod *Boeckella dilatata*. She is now measuring the beads that were ingested and finishing the counting and analysis of her plankton samples, taken from lakes Benmore, Aviemore and Waitaki.

JOY WOODS spent 5 weeks at Cape Bird, Antarctica during the 1974-75 summer obtaining more field data from the lakes for her M.Sc. thesis. Experimental work on the survival and fecundity of the Antarctic rotifer *Philodina gregaria* in different algal concentrations, temperatures and salinities is nearing completion.

JOY CRUMPTON is preparing several papers on her studies on the damselflies, *Austrolestes colenisonis* and *Xanthocnemis zealandica*.

PADDY RYAN is continuing his Ph.D. study of the food and feeding of the short finned eel population in Lake Ellesmere. Much of the emphasis of this study is now on laboratory studies into digestion and food perception.

Dr M.J. WINTERBOURN is continuing his study of Middle Bush Stream, Cass. Work on the caddisfly, *Zelandopsycha ingens* has been completed and is being written up at present. During the summer, Dr Winterbourn and Mrs SALLY DAVIS studied some of the chemical changes in beech leaves which occur during their breakdown in the stream. At present continuous monitoring of stream temperature and discharge is being carried out and an attempt is being made to study periphyton production. Dr Winterbourn has organised a research contract with the N.Z. Forest Service for a Ph.D. student to study entomology of stream insects in the West Coast Beech Forest Scheme area. This work should start by January 1976.

BRENT COWIE, an Honours III student, is examining the distribution of mosses and their associated faunas in the headwaters of Middle Bush Stream.

ROBIN McCAMMON is writing his M.Sc. thesis which will present organic energy budgets for Middle Bush Stream.

ROB OGILVIE completed field work at the Glen Tui River last summer and has been analysing data since. His Ph.D. thesis will examine the relationships between standing crop, drift and production of the mayfly *Deleatidium* and should be presented in 1976.

COLIN GREIG is continuing his M.Sc. study on *Deleatidium* and littoral algal production in Lake Grasmere. He has completed field work and has been doing radioactive feeding studies in recent months. The thesis should be presented in early 1976.

BILL GRIFFITHS who came to Canterbury from Alberta, is studying the food and growth of perch (*Perca fluviatilis*) in the lower Selwyn River and Lake Ellesmere for his M.Sc. Collections of fish were made in three seasons, spring, summer and autumn and these have provided the basic material for the study. Fish aging has been done using a fin ray sectioning technique which may be superior to more conventional methods. A series of digestion experiments, using bullies as food has also been carried out in the laboratory. Bill hopes to have his thesis completed in October 1975.

STEWART TOSHACH has been evaluating the performance of a waste treatment plant being installed by a fellmongery on the Kaiapoi River in North Canterbury. He has been using biological criteria and other measures employed in water classification. Stewart's project is part of the

requirements for the M.Sc. in Resource Management at Canterbury and Lincoln. ALAN CARPENTER began an M.Sc. thesis on aspects of the biology of the shrimp, *Paratya curvirostris* this year. He is studying population structure and the breeding cycle of three populations, examining microdistribution, salinity relationships and intends to describe a number of the larval stages.

In the May 1975 vacation a Biological Society scientific trip was made to the Lake Sumner Forest Park in North Canterbury under the leadership of EWAN FORDYCE, a Limnological Society member. ALAN CARPENTER and JOHN STARK made an initial ecological survey of the thermal springs which occur within beech forest and John is writing up his findings as a B.Sc.(Hons) project.

Dr C.L. McLAY reports that further progress on the development of a simulation model of organic matter breakdown in a mountain stream awaits the receipt of a few more inputs from the real world. He is furthering an interest in the development of the Rakaia River with particular reference to the enhancement of the quinnat salmon run.

Two research students are working with Professor P.S. CORBET.

KEN DEACON is studying aspects of seasonal regulation in dragonflies, with particular reference to the factors affecting larval growth rate, and to the effects of altitude on phenology.

JANE PETERSON is studying aspects of seasonal regulation in dragonflies, with particular reference to the factors affecting rate of embryonic development, and to the maturation and longevity of adults.

DEPARTMENT OF ZOOLOGY, UNIVERSITY OF OTAGO

Dr D. SCOTT is spending most of his time looking after students, and what time remains is spent on advisory work.

Both Dr C.W. BURNS and Dr S.F. MITCHELL have recently returned from study leaves, and are writing up the results of research on Otago lakes.

Mrs N.M. GRIMMOND intends to compare growth patterns in young *Hyridella* sp. in various New Zealand lakes.

Ph.D. Students

Miss CAROLE McARTHUR is studying aspects of the immune response of *Anguilla australis*.

Mrs JUDITH MASON has finished her work on the feeding behaviour of *Daphnia carinata* from Tomahawk Lagoon and has started writing her thesis.

Mr P.K.B. NAYAR is writing up results of his work on an energy budget for *Daphnia carinata*.

Mr COLIN QUILTER is writing up his thesis on circadian activity rhythms in *Paranehrops zealandicus*, the freshwater crayfish.

Mr BARRY ROBERTSON is investigating the relation between primary production and reducing conditions on the bed of Waikouaiti Estuary.

Mr COLE SHIRVELL is studying effects of water abstraction on the communities in Deep Stream.

M.Sc. Students

Mr ALAN GRAHAM has finished work and is beginning to write up results of his study of the ecology and productivity of the chironomid larvae in Lake Hayes.

Mr DAVID WITHEROW is studying effects of grade size on the redd mortality of trout eggs.

Proposed visits by Scientists with freshwater interests

1976 Dr H.R. MacCRIMMON, University of Guelph. (Salmonid fisheries).

1977 Dr F.H. RIGLER, Canada (Phosphorus dynamics in lake water, coordinator Char Lake I.B.P., Zooplankton feeding behaviour).

DEPARTMENT OF MICROBIOLOGY, UNIVERSITY OF OTAGO

The following personnel are involved in microbiology of water:

Dr MARGARET LOUITT - work supported by Golden Kiwi Grant.

SIEW YOON CHONG (B.Sc.), M. EDWARDS (B.Sc.Hons), Miss V. HUNT (Part III Honours), H. NEIL (Part III Honours), F.M. PATRICK (B.Sc.Hons), Miss S. RAWSTORN, Miss D. WELCH (B.Sc.)

Projects fall into several main categories as Dr Loutit explains:

1. Metals, bacteria and food chains: Small amounts of metals in effluents are concentrated by bacteria, which are then ingested by higher organisms. In this way metals are passed through food chains. We are studying various parts of food chains in both fresh water and marine environments. Another project involves the role of epiphytic bacteria on plants growing in water in influencing the levels of metals in these plants.

2. Photosynthetic bacteria occur on sewage oxidation ponds and other habitats where anaerobic conditions occur at times. We are interested in isolation of these bacteria and we are trying to assess the conditions that lead to their "blooming", or suddenly increasing in numbers. The nitrogen fixing ability of isolates is being studied. In addition, pyrolysis - gas liquid chromatography is being used to study their taxonomy.

3. *E. coli* in water: Various aspects of this project cover:

(a) Levels of *E. coli* in fresh water subject to agricultural run-off.

- (b) Biological factors influencing die-off of *E. coli*.
- (c) Contribution of birds to *E. coli* levels in water.
- (d) Investigation of high results in "faecal coliform" estimates due to *Enterobacter* from soil and water.
- (e) Survival of *E. coli* in soils introduced from animal wastes, and investigation of the possibility of *E. coli* entering ground water.

B) RESEARCH ORGANISATIONS

FISHERIES RESEARCH DIVISION, MINISTRY OF AGRICULTURE AND FISHERIES

Wellington

There have been no staff changes, since the last newsletter, and most projects are continuing as outlined there. Research by DON JELLYMAN on an unexploited eel population in Lake Pounui is now under way.

An eel-ladder catching immigrating elvers has been incorporated into a weir built on the outlet stream. 6 600 elvers have been trapped and transferred into the lake during the first 8 months of operation. Trials are in progress to perfect a method of cold-branding eels suitable for short term capture-recapture experiments.

In addition to the eel work, a study has commenced on the age, growth and reproductive biology of perch, *Perca fluviatilis*, in the lake.

Rotorua

Dr G.R. FISH. The completion of the report by Swedish consultants on the eutrophication of Lake Rotorua has stimulated considerable interest and several control projects are now in active preparation or under way. A number of research programmes, coordinated by a scientific committee, have been initiated and the Fisheries Research team in Rotorua are following an expanded project on the limnology, fishery and sediments of Lakes Rotorua and Rotoiti which will be correlated with data collected by other government departments on the hydrology and nutrient budget of the lake and its catchment.

Dr P.C. HUNT has completed his work on the trout fishery of Lake Rotoaira and the Tongariro River. He has left the division to take up an appointment with the Severn-Trent Water Authority but will be completing the preparation of several papers for the publication of his New Zealand data in the near future.

Dr D.J. EDWARDS completed some further trials with grass carp in local farm drainage channels this summer and maintained the stock of experimental fish in the laboratory ponds. This stock has grown well and will soon be of a suitable size and age for work on artificial spawning to begin. Unfortunately Dr Edwards has had to leave the Division and return to the United Kingdom. However he was able to complete his paper on the field trials and it will be published shortly.

Christchurch

Dr J.V. WOOLLAND is continuing work on the ecology and population dynamics of juvenile quinnat salmon in the Glenariffe Stream, and is now supervising all aspects of the quinnat salmon research programme. Good estimates are being obtained of the salmon fry outmigration from Glenariffe and progress is being made with smolt enumeration. Scale readings of angler-caught Rakaia salmon have been used to examine the relationship between the duration of juvenile freshwater residence and survival to adulthood. A major salmon fry retention scheme will be started this year, using a small lake in the upper reaches of the Glenariffe Stream. The first returns of hatchery reared and wild salmon marked as juveniles were recorded at the Glenariffe Trap this year.

R.H. GOODE, under the supervision of I.F. WEST (F.R.D., Wellington), has been continuing the aerial surveys of the Rakaia salmon spawning grounds, this year using a helicopter in place of a fixed-wing aircraft. An estimate of the angler catch of Rakaia salmon during the 1974-75 season has also been obtained, and a further angler census will be conducted this year.

J.R. GALLOWAY is supervising field work for the quinnat salmon research programme. Surveys of the main salmon spawning areas in the Rakaia River system are continuing. Work is nearing completion on the development of a salmon rearing pond at Glenariffe. Pontoon traps for the live capture of juvenile salmon outmigrants have been successfully developed for use at Glenariffe.

M. FLAIN is still writing up past years' work, along with the monitoring of the current year's salmon run.

G.A. ELDON is working on the ecology of the Canterbury mudfish *Neochanna burrowsius*. Some large populations of this species have now been found which, it is hoped, will supply ample material for his studies. A small pond with an observation port has been constructed for behavioural studies on the mudfish and traps have been built for capturing them in the wild.

Dr P.R. TODD is engaged on a regular sampling programme on the eel populations in Lake Ellesmere. Data are being collected on species and sex distribution within the lake and in inflow rivers. Otoliths for age and growth investigations are being collected and the size and age composition of the migrants are being determined. Catch/effort figures for the eel fishery are being analysed to determine the present trend in the fishery.

C.L. HOPKINS has begun work on the life history of *Galaxias fasciatus*, one of the 'whitebait' galaxiids. Some data have been collected on the timing and extent of the breeding season, development of maturity, fecundity and age at first maturity. Otoliths are being collected for age analysis.

ECOLOGY DIVISION, D.S.I.R.

The freshwater section of Ecology Division of D.S.I.R. is based at Taupo. Laboratory facilities, acquisition of equipment, and recruitment of staff is progressing slowly. The Taupo laboratory will eventually fill 7000 sq.ft. and will house a staff of 25.

The staff and their scientific interests are listed below.

Ms B. DON, T.O. Chemical analyst - mainly forms of nitrogen and phosphorus.

Mr M.T. DOWNES, T.O. Automated analytical technology.

Mr M.M. GIBBS, T.O. Chemical analyst.

Dr D.J. FORSYTH, S.O. Benthic faunas and zooplankton.

Dr P.H. JOHN, S.O. Hydrodynamicist/hydrologist.

Ms L. KEMP, Technician trainee. Chemical analyst.

Dr M.A. LOCK, S.O. Detritus in aquatic systems.

Mr I. McCALLUM, T.O. Benthos and zooplankton.

Mr G. PAYNE, T.O. Algal floras and bioassays.

Ms J. SIMMISS, Typist/Clerk.

Mr W.F. VINCENT, S.O. Algologist.

Dr E. WHITE, S.O. Nutrient budgets and runoff studies.

Dr H. PAERL is due to take up a post as scientist in July. He is a general limnologist with special interests in applying A.T.P. assay techniques.

Two other scientists from overseas are expected to join the staff by the end of the year.

Further vacancies exist for both technical and scientific officers and these will be filled this year if appropriate people can be found.

N.Z. OCEANOGRAPHIC INSTITUTE, D.S.I.R.

During August 1974 bathymetric surveys were carried out on Lakes Tutira, Waikopiro and Orakei, Hawkes Bay at the request of the Ministry of Agriculture and Fisheries who are involved in eutrophication problems on these lakes. Lake Rotongaio, a small lake close to the eastern shore of Lake Taupo was surveyed during October 1974. Charts of these lakes are in press.

In March 1975 further benthic and surface sediment sampling was made on Lakes Pukaki and Tekapo. Short sediment cores were obtained from Lake Pukaki and coverage with seismic profiler was made on both lakes to endeavour to establish sedimentation rates.

Bottom sediment sampling was carried out for the Ministry of Works and Development on Lake Roxburgh and a sounding survey of Fraser Dam was made at this time.

The benthic fauna collected is being worked on by W. de L. MAIN. Bathymetric survey results and sediment data are being compiled by J. IRWIN.

ENTOMOLOGY DIVISION, D.S.I.R., AUCKLAND

TREVOR CROSBY has left the editorial staff of Science Information Division, D.S.I.R. Wellington, after an interesting year of editing bulletins from diverse fields, especially geology. He has taken up a position with Entomology Division as curator with overall responsibility for the New Zealand National Arthropod Collection, and for identifying and doing research on freshwater insects. His particular interests at the moment include research on Simuliidae and preliminary investigations connected with the Waitomo Caves research programme.

AUCKLAND INSTITUTE AND MUSEUM

KEITH WISE, entomologist, reports that one of his main jobs at present is producing a list of New Zealand insects. An outline of this project is given below.

"List of the Hexapoda of the New Zealand sub-region" - The aims are:

1. To provide a systematic list of current genera and species of the Hexapoda of New Zealand, by name, author and date.
2. To provide the original name, author, and reference to the first publication of the name and description, of each genus and species.
3. To provide a synonymic list for each current species, where applicable.

4. To provide indications of distribution where species occur outside the three main islands of N.Z. and their close off-shore islands.
5. To provide references to the first records in the N.Z. sub-region for species which also occur elsewhere.
6. To publish this list as a Bulletin of the Auckland Institute and Museum in 1975, which is the bicentennial anniversary of the first publication giving names and scientific descriptions of New Zealand insects. This publication was "Systema entomologiae..." by J.C. Fabricius, the descriptions being of insects collected by Banks and Solander who were with Captain Cook on the "Endeavour".

NATIONAL MUSEUM OF N.Z., WELLINGTON

Dr FRANK CLIMO continues his research on the zoogeography of the New Zealand subterranean molluscs, particularly on the affinities of sections of the New Zealand fauna with subterranean species in Yugoslavia.

Mr R.G. ORDISH is engaged on a systematic review of New Zealand fresh water hydraenids (Coleoptera). He has completed the description of two species of subterranean Dytiscidae found in the Waimea Valley.

CANTERBURY MUSEUM

Mr R.A. SAVILL has been appointed full time Curator of Entomology. He is continuing his studies on tiger beetles.

Mr A.G. MCFARLANE hopes to publish a paper this year on N.Z. Hydropsychidae (Trichoptera).

WESTPORT

IAN McLELLAN is completing a paper on southern and alpine stoneflies. This will include the description of 13 new species, 4 new genera and a new subfamily. He is also interested in Thaumaleidae (Diptera) and has a number of European and N.Z. species reared from larvae.

CAWTHRON INSTITUTE, NELSON

Dr P.A. GILLESPIE left in November, 1974, on a two-year leave of absence from the Cawthron Institute, during which he will carry out research in limnology and aquatic microbiology in the United States and

Canada. He presented a paper "Seasonal variation of heterotrophic potential in Lake Rotoroa", at the 75th Annual Meeting of the American Society for Microbiology in New York on 1 May 1975. At present he is working on project CEPEX at Sydney, British Columbia. He is studying the effect of sublethal concentrations of copper on microorganisms in the marine environment.

A study of nitrate levels in subsurface well waters, as compared with levels of nitrate in nearby rivers was completed by Mr D.J. STANTON and Miss JUDY L. MARTIN. It is to be published in the N.Z. Journal of Marine and Freshwater Research.

Mr E.T. CHITTENDEN retired in August, 1974. A paper covering his recent work, in collaboration with C.W. CHILDS and R. SMIDT of the Soil Bureau, D.S.I.R., has been accepted by the N.Z. Journal of Marine and Freshwater Research.

Dr ANGELA J. RAMSAY joined the staff of the Institute in January, 1975. Her research is on the role of bacteria in the decomposition of phytoplankton. At the present time she is studying the release of nutrients by the bacterial decomposition of the blue-green alga, *Oscillatoria rubescens*.

Mr MICHAEL SPENCER is continuing the programme on mineralization of dissolved organic compounds in New Zealand lakes using the heterotrophic potential method involving the uptake and oxidation of ^{14}C -labelled substrates by aquatic microorganisms.

The research staff of the Cawthron Institute including Dr D.M. UPDEGRAFF, Dr B.B. BOHLOOL, Dr ANGELA RAMSAY, Mr MICHAEL SPENCER, Mr D.J. STANTON and Miss C.E. BEASLEY, are involved in a study of the degree of water pollution and the rate of flushing by tides and ocean currents of the Waimea Inlet and Nelson Haven.

Dr B. BEN BOHLOOL and Miss C.E. BEASLEY are studying microbial activities in intertidal sediments and the impact of municipal, industrial, and agricultural effluents on respiratory activity, and nitrogen fixation and nitrification potential in the intertidal zone of the Waimea Inlet. They are also examining the survival of faecal coliform bacteria and faecal streptococci in the intertidal mud receiving various effluents. A publication is in preparation, "Occurrence of *Sulfolobus acidocaldarius*, an extremely thermophilic, acidophilic bacterium, in New Zealand hot springs: Isolation and immunofluorescence characterization".

Dr M.D. COOKE is continuing her work on the genetic transfer of antibiotic resistance among *Escherichia coli* bacteria isolated from shellfish and polluted water. She is writing a paper for publication entitled "Antibiotic resistance of coliform bacteria isolated from freshwater shellfish".

C) MANAGEMENT ORGANISATIONS

MINISTRY OF AGRICULTURE AND FISHERIES, FISHERIES MANAGEMENT DIVISIONTurangi

Messrs E.J. CUDBY and D.J.P. TURNER have begun an investigation of the fish population of Lake Otamangakau, a recently formed hydro-electric impoundment west of Lake Rotoaira. Effects of volcanic eruptions on aquatic organisms are being investigated and an analysis of temperature records, collected during the past two years in the Whakapapa River by N.Z.E.D., is in progress.

Auckland

G. COATES, Fisheries Management Officer in Auckland, reports.

The study of migratory fish movements in the Waikato River at Huntly, as part of the Huntly Power Station Biological Study, was completed in June 1975. The report is to be presented at the end of August. The study included the migration of glass eels, elvers, adult eels and mullet.

Throughout the year I have continued dealing with technical and legislative problems associated with freshwater fish farms (particularly eel farms).

Wellington

LAUREL TEIRNEY reports. The operation of the destratification equipment installed in Lake Tutira during October 1974 was postponed because of a mechanical failure. This has since been corrected and mixing is planned to commence in October 1975. The sampling which has been continued on a reduced basis will be carried out more regularly following this date. Moves to control the input of nutrients from the catchment area have been initiated.

Hawkes Bay

The Silver Carp (*Hypophthalmichthys molitrix*) project being undertaken in Hawkes Bay is reported on by ANDY CARRUTHERS.

Monitoring of the growth rate of a number of Silver Carp, confined to a floating cage in Lake Orakai is continuing. The fish were released into the cage in December 1973 and a fish weighing 100 g and length 15 cm increased to 1460 g and length 43.5 cm by April 1975. From April to

July a slight decrease in weight occurred. Difficulty is being experienced with the spawning experiments because of inconsistent maturing but partial success was achieved with one pair of fish in January 1975 and the eggs lived for a few hours. Water temperatures appear to have a considerable influence on maturing of the fish.

The second stage of the experiment has been delayed because of insufficient numbers of fish. It will involve sectioning off 1 ha of Lake Orakai with a barrier to prevent the interchange of water, and stocking it with 3000 fish. The cropping potential of Silver Carp on phytoplankton populations will be examined using the remainder of the lake as a control.

From Christchurch, CHAS HARDY writes:

The Christchurch section of the Fisheries Management Division, Ministry of Agriculture and Fisheries, deals with all freshwater fisheries matters in the South Island, with the exception of the Nelson/Marlborough area.

The work is principally advisory and for this purpose we maintain liaison with acclimatisation societies, catchment boards, and other government departments whose activities have some effect on freshwater fisheries.

The staff consists of myself (CHAS HARDY), BILL JOHNSON, ARTHUR TURNER and JIM MACE. We are currently involved with major investigations concerning fisheries water requirements in relation to proposed irrigation schemes on the Taieri and Waiau rivers; proposed water allocation and management plans for the Rangitata, Oreti and Waiau rivers; and proposed hydro-electric development on the Hurunui, Wilberforce and Clutha rivers.

JIM MACE is particularly concerned with determining the effects of the upper Waitaki river basin power development on the fishery and the ways in which these effects can be mitigated or compensated for.

My major activity is the supervision of the induced run project (a joint project between the Ministry and the South Island Salmon Committee) being conducted at the Silverstream hatchery. This project involves the rearing and release of 90-day quinnat salmon smolts into the Kaiapoi River with the aim of inducing an adult salmon run to return at maturity to the hatchery. The ova derived from the return run will be used for other salmon management projects.

It is in its third year and currently we have some 600 000 salmon juveniles being reared for release this year.

An essential part of this project has been the development of a satisfactory artificial diet for the hatchery production of salmon smolts.

Government has recently announced a policy of quinnat salmon development aimed at enhancing the sport fishery and providing for some commercial utilisation. To this end the Ministry will shortly acquire the Silverstream hatchery which will be upgraded over five years to produce a minimum of 2 000 000 salmon smolts annually for release.

Silverstream will become a pilot station concerned with the development of hatchery techniques and will be operated by the Christchurch section of Fisheries Management Division.

DEPARTMENT OF INTERNAL AFFAIRS, ROTORUA

PAT BURSTALL, Conservator of Wildlife reports:

Dr PETER MYLECHREEST is studying the impact of the hydro-electric manipulation of Lake Waikaremoana on lake limnology and Rainbow/Brown trout populations. This three year programme is well under way with laboratory facilities established at Home Bay. However, the effect of sewage enrichment from the community at Home Bay is prejudicing study of the implications of lake level variation in this locality and plans have been developed to completely remove all waste from this National Park catchment.

Mr CHRIS RICHMOND is continuing with the regular water quality monitoring programme on lakes Rerewhakaaitu, Rotoehu, Rotorua, Rotomahana, Okataina, Rotoma, Tikitapu, Tarawera, Rotoditi, Rotokakahi, Okareka and Okaro. Prevention being better than cure, the Department is also involved in the Water Classification procedure for the Bay of Plenty, Poverty Bay and Lake Rotorua.

Fisheries Management operations in the Conservancy include the regular daily trapping and marking of migrant rainbow and brown trout in the Ngongotaha, Tokaanu and Tongariro systems. Quantitative data is correlated and ova from stripping is hatched and reared at the Ngongotaha hatchery. Liberations of yearling trout have ranged from Northland to Southern Lakes and have totalled nearly 20 000. The winter trapping programme at Waikaremoana is continuing on the Waiotukupuna Stream in 1975.

Major stream surveys were carried out on the headwaters of the Rangitikei, Ngaruroro and Moawhango systems. The first two were as further investigation for the programme to establish a Steelhead fishery

on the East Coast of the North Island and the latter as a basis for the management of the future Fontinalis fishery in the Moawhango Lake which will be created by N.Z.E.D. to supply Taupo-Waitaki hydroelectric complex.

DEPARTMENT OF INTERNAL AFFAIRS, QUEENSTOWN

R.T. HUTCHINSON reports:

As part of the investigation programme on landlocked quinnat salmon in Lake Wakatipu, a small release of smolts was made in Diamond Creek during the year. For future identification these fish were marked by removal of a pelvic fin. Trapping of the 1975 spawning run was undertaken as usual during April and May but severe flooding disrupted operations during the first two weeks of April and above-average water levels continued in the creek throughout most of the trapping period. Final results indicated a total run of salmon well below the 1974 level.

At Lake Paringa on the West Coast, an attempt was made to trap the anadromous quinnat salmon spawning run into the Windbag stream to gain accurate data on numbers, sex and size of spawning fish. Here again flooding was a problem but the trial did show that trapping can be undertaken successfully for monitoring of the run and collection of ova if necessary.

River and stream survey work continued with a full survey being completed on the Wilkin river system in the Wanaka catchment and survey work beginning on the Electric river and Walker Creek in the Monowai catchment. On Lake Hawea the rainbow trout spawning run into Long Gully is being trapped to ascertain the numbers, if any, of hatchery reared trout returning to spawn.

Efforts to build up a brood stock of Atlantic salmon met with some success following transference of wild adults to the Wanaka hatchery. One pair of salmon spawned in the holding area, producing a limited number of fry which have since been converted to an artificial diet and are growing well.

AUCKLAND REGIONAL AUTHORITY

The people currently engaged in fresh water work in the Auckland Regional Authority laboratories are listed below.

Dr TURID REID, Field Studies Scientist - (a) Water quality and phytoplankton populations in Lake Pupuke. The data from this study will

be compared with work done by students of the University of Auckland Zoology Department in the 1960s. (b) Water quality studies in the Hoteo and Waiwera Rivers are expected to commence later on this year. (c) "Base line" study of water quality in the Auckland Region has been commenced this year in conjunction with Mr D. OGILVIE. This is expected to be a continuing study.

Mr OGILVIE, Head Scientist Water, and Mr A.E. TAYLOR, Scientist Water, are studying the stratification and destratification, both natural and artificial, of reservoirs, the chemistry of reservoir waters, including nutrients and computer programmes are being developed for iron, manganese, oxygen, oxygen deficit, heat, and stability budgets of reservoirs. Chemical studies are being made of the Waikato River in conjunction with the joint Ministry of Works and Development and Waikato Valley Authority Waikato River study, and our own investigation of the River as a water supply source.

Miss L.A. LEVIS, Scientist Water - (a) The identification and enumeration of plankton and zooplankton in the Authority's reservoirs and lower Waikato River. (b) In conjunction with Dr A. Chapman of University of the Waikato, study of plankton and nutrient interactions in some of the lower Waikato lakes. (c) Studies aimed at attempted prediction of plankton populations in impoundments planned in the lower Waikato.

RANGITIKEI-WANGANUI CATCHMENT BOARD

CHRIS R. FOWLES is involved in a number of activities: (a) Monitoring and surveys of natural water quality throughout the Rangitikei-Wanganui Catchment District. (b) Effects of various types of discharges (e.g. industrial, dairy effluent, sewage) on natural waters. (c) Limited monitoring of three Wanganui freshwater lakes in relation to summer public usage, and run-off from surrounding farmland. (d) Some monitoring and concentrated effects on the waters of part of the Tongariro Power Scheme in respect to contamination by eruptions of Mt. Ruapehu crater lake. (e) Completion of a 13 month survey of variations in the chemical, physical and bacteriological quality of a small beach resort stream (Himatangi Beach).

The Rangitikei-Wanganui Catchment Board now has five full-time staff and two part-time. A laboratory has been established which is self-sufficient for the majority of chemical, physical and biological tests required in terms of administering the 1967 Water and Soil Act.

Mr N. MARK-BROWN has recently begun concentrated work relating to the underground water in the Oroua Downs area - including availability, aquifer locations, water quality, sources etc. - and will be continued in collaboration with the Manawatu Board.

WILDLIFE SERVICE, DEPARTMENT OF INTERNAL AFFAIRS, WELLINGTON

Mr KERRY POTTS is carrying out an investigation of the limnology of Pukepuke Lagoon and associated dune lakes with particular reference to foods and feeding of waterfowl.

CHRISTCHURCH DRAINAGE BOARD

Dr JIM ROBB, biologist employed by the board is concerned primarily with changes occurring on the Avon-Heathcote Estuary. He hopes to obtain more information on: (a) Earlier states of the sediments and their present status; (b) early vegetation distributions within the estuary, especially knowledge of *Zostera*; (c) better and more definitive information on changes in the Heathcote River over the last 100 years or so; (d) nutrient and bacterial distribution patterns within the estuary.

It is envisaged that late next year (1976) a biological, chemical and geological research programme will be initiated at Brooklands Lagoon and in the lower Styx River and possibly the lower reaches of the Waimakariri River.

NEW ZEALAND ELECTRICITY DEPARTMENT, HAMILTON

Freshwater Research Personnel

Dr BRIAN T. COFFEY - Ecology and control of aquatic weeds with particular reference to hydro-electric lakes. Biological surveys for Environmental Impact Reports (particularly Huntly and Broadlands P.S.).

Dr PHYLLIS L. COLEMAN - Biological surveys for Environmental Impact Reports with particular reference to phytoplankton and periphyton.

Dr Coffey is transferring from his present position as Engineering Scientist (Botany), New Zealand Electricity Department, to Ruakura Agricultural Centre, Ministry of Agriculture and Fisheries, as Scientist (Aquatic weeds).

NEW ZEALAND COMMITTEE FOR WATER POLLUTION RESEARCH

The New Zealand Committee for Water Pollution Research held a conference on Wastewater Treatment at Massey University on 26-30 May, 1975, in conjunction with the Biotechnology Department of Massey University, the National Water and Soil Conservation Authority and the N.Z.-United States Educational Foundation. There were two days of presented papers: the first on physical, chemical and biological methods of treatment, and the second on the measurement and characterization of effluents, including discussions on water quality measurements, water classification and the role of Regional Water Boards in defining effluent standards. Two days of workshops were led by Professor W. Wesley Eckenfelder, Distinguished Professor of Environmental and Water Resources Engineering at Vanderbilt University, Nashville, Tennessee (on Primary and Secondary Treatment) and Dr A.L. Downing, consulting engineer and formerly Director of the U.K. Water Pollution Research Laboratory at Stevenage (on outfalls, mixing phenomena, and sludge treatment and disposal). The final day was reserved for discussions of topics raised during the previous sessions.

The Chairman, Professor R.L. Earle, represented the Committee at the 7th International Conference of Water Pollution Research in Paris, in September 1974. The next International Conference will be held in Sydney on 17-22 October, 1976, with the possibility of a pre-Conference symposium in New Zealand.

Dr G.J. Stander, the President of the Governing Board of the International Association, and Dr S.H. Jenkins, the Executive Editor of the Journal, "Water Research", will visit New Zealand for a few days at the end of July, 1975.

A further newsletter has been prepared, and copies are available from the undersigned.

V.M. Stout

"NEW ZEALAND LAKES"

edited by V.H. Jolly & J.M.A. Brown, Auckland/Oxford University Presses, Auckland.

This book, a milestone in New Zealand limnology, is expected to be available by the end of 1975. The table of contents listed below indicates the comprehensive scope of the work.

Table of Contents

1. Morphology and Classification - J. Irwin
2. Glacial Lakes - M. Gage
3. Volcanic Lakes - J. Healy
4. Light Penetration - J.D. Green
5. Thermal Conditions - V.H. Jolly and J. Irwin
6. Heat Budgets - J.D. Green
7. Canterbury, Westland and Nelson Lakes - V.M. Stout
8. Chemical and Biological Conditions in Lakes of the Volcanic Plateau
- R.H.S. McColl
9. Impounded Lakes of the Waikato River - C.F. Hill
10. A Nutrient Budget for Lake Rotorua - G.R. Fish
11. Eutrophication and the Trout Environment - A.M.R. Burnet and
D.A. Wallace
12. Phytoplankton in Some New Zealand Lakes - E.A. Flint
13. Phytoplankton of Lakes Rotorua and Rotoiti (North Island) -
U.V. Cassie
14. A Note on Quantitative Phytoplankton Studies in Some South Island
Lakes - C.W. Burns
15. Zooplankton - M.A. Chapman, J.D. Green, and V.H. Jolly
16. Macrophytes - R. Mason
17. Ecology of Macrophytes - J.M.A. Brown
18. Macrophyte Distribution in the Waikato Lakes - B.T. Coffey
19. Littoral Fauna - M.J. Winterbourn and M.H. Lewis
20. The Benthic Fauna - D.J. Forsyth
21. Fishes - R.M. McDowall, C.L. Hopkins, and M. Flain
22. Sport Fisheries - P.J. Burstall
23. The Bird Fauna - R.A. Falla
24. The Colonization of Lakes by Gulls - L. Gurr

VISITS BY OVERSEAS RESEARCH WORKERS

VISIT OF PROFESSOR FALLIS TO THE UNIVERSITY OF CANTERBURY

Professor A.M. Fallis, an Erskine Fellow from the School of Hygiene, University of Toronto, Canada, visited the University of Canterbury for four months at the beginning of this year. The purpose of his visit was to examine our wild birds for the presence of protozoan blood parasites of the genus *Leucocytozoon* which, with only one exception, are transmitted by simuliid flies. Mrs F.R. Allison and Mr S.A. Bisset both of the University of Canterbury, worked with him during his stay. The abundance of both simuliids and wild birds in some areas in New Zealand suggested that conditions would be ideal for the transmission of the haematozoans. However, although many blood smears from 42 different species of birds were examined, only the Fiordland crested penguin was infected with a species of *Leucocytozoon*. This species is new and it was found to infect a high proportion of the penguins at Jackson's Bay where work on the transmission was conducted. It was found that three species of blackflies, one of which proved to be new, fed on the penguins at Jackson's Bay. All species were able to transmit the parasite. Blackflies which had fed on an infected penguin were collected and the development of the species of *Leucocytozoon* in these was followed. It is hoped that a paper on the work completed will be submitted for publication shortly. Further work on the parasite, blackfly behaviour and biology of the new blackfly species is planned for spring.

S.A. Bisset

VISIT OF DR H.H. AND MRS JEAN ROSS TO NEW ZEALAND

The visit of these well known freshwater entomologists was a great success caddis-wise (pers.comm.) and an enjoyable and stimulating experience for those who had the privilege of their company.

Dr Ross wanted to see our caddis flies "on location" and the glorious weather for the greater part of his visit enabled him to do this pretty well up to the limits of his physical capacity. He had already had a tough assignment for nearly two months collecting in Fiji and Australia before coming to this country.

In addition to making a synoptic collection of N.Z. Trichoptera, Dr Ross was specially interested in the case-makers, particularly the sericostomatids and *Helicopsyche*. Mrs Ross acts as technician and recorder. She is a Trichopterologist in her own right, having co-authored papers with her husband.

The Westland and alpine scenery was a constant delight to them and particularly the beech forest. More colour film went into shots of beech forest than into anything else ("to show our friends at home the famous New Zealand *Nothofagus* forest").

Dr Ross now Professor of Entomology at University of Georgia, is best known for his publications while attached to the Illinois Natural History Survey. In addition to his numerous papers many of them substantial, he has several major works. These are his Textbook of Entomology, a monograph on the sawflies (Dolerinae) of North America, the Evolution and Classification of Mountain Caddisflies and a bulletin on the caddisflies of Illinois (326 pages) and Biological Systematics 1974.

Messrs A.G. McFarlane and Ian McLellan guided Dr Ross in the South Island and Charles Watt and Keith Wise, with Dr Ken Fox helping in Taranaki, were his guides in the North Island.

A.G. McFarlane

REQUESTS FOR INFORMATION

1. Alan Carpenter, Zoology Department, University of Canterbury, would like to know locality records for *Paratya curvirostris* (the freshwater shrimp), particularly if some ecological information could also be supplied.
2. Philip S. Corbet would be grateful to receive notification of:
 - (a) The existence of any collections of New Zealand dragonflies (larvae and/or adults), other than those in the museums in Auckland, Christchurch, Dunedin and Wellington, and in the D.S.I.R. Entomology Division at Mt. Albert. He would like to know also the approximate size of any such collections and to receive confirmation that the specimens bear labels giving the date and place of their capture.
 - (b) Sources of ready supply of animals that would be suitable to use as food (i.e. living prey) for dragonfly larvae being raised in captivity. Such animals should: be easy and inexpensive to maintain; possess high fecundity and a short generation-time; and be about the size of *Daphnia*, *Chironomus*, or *Culex*.

HOSPITALITY EXTENDED

Professor W.D. Williams, of the Zoology Department of the University of Adelaide, would welcome visits and often be prepared to offer working facilities to visiting New Zealand limnologists.

V.M. Stout

INTERNATIONAL SYMPOSIUM ON MICROBIAL ECOLOGY

This symposium is being organized by the Royal Society of New Zealand in conjunction with the New Zealand Microbiological Society and will be sponsored by IAMS, IUBS and UNESCO.

Date: 22-26 August 1977

Place: Dunedin, New Zealand

Papers are invited within the categories of ecology of soil, water and air and the ecology of organisms associated with plants and animals. Papers presenting new approaches to the subject of microbial ecology will be especially welcome.

The programme will be finalised when the organisers have received offers of papers and have assessed the interest expressed in different areas.

Intending contributors are asked to submit a title and if possible, a short precis before 1 December 1975.

Any correspondence should be sent to: The Executive Officer, The Royal Society of New Zealand, P.O. Box 12249, Wellington.

INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH

The 8th Conference will be held in Sydney, Australia, from 17-22 October, 1976.

Papers are being called for and should be received by the organizers by 15 September 1975. This is probably an optimistic closing date.

A range of 27 topics is listed for consideration at the conference including chemical quality standards, biological monitoring, fish studies, stream analysis, eutrophication, wastewater treatment etc.

For further information write to: Conference Secretariat, G.P.O. Box 2609 Sydney, 2001, N.S.W.

TRICHOPTERA NEWSLETTER

A Trichoptera newsletter has been established to improve communication amongst the world's caddisfly workers.

Newsletter 1 appeared in February 1975 and contains an account of the 1st International Symposium on Trichoptera held at Lunz in September 1974. Also included are notes on Trichopterologists and their interests.

The second symposium is planned for Reading in England in 1977 and will be organized to fit in with the SIL congress in Denmark that year. The Organizer will be Dr P. Crichton.

Information for or about the Trichoptera newsletter should be addressed to the Australasian representative Mr A. Neboiss, Curator of Insects, National Museum of Victoria, 285-321 Russell Street, Melbourne 3000, Victoria, Australia.

WORKSHOP/COURSE ON APPLICATION OF IMMUNOFLUORESCENCE IN MICROBIAL ECOLOGY

This course is planned for 18-20 November 1975 and will be held at the Cawthron Institute, Nelson.

VISITING CHAROPHYTOLOGIST

Dr Richard D. Wood, Professor of Botany at Rhode Island University, and the authority on the Charophyta, will be in New Zealand from early September until the middle of January to revise the N.Z. Charophyta. He and Mrs Wood will be stationed at the Botany Division, D.S.I.R., Lincoln.

RECENT PUBLICATIONS

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 IRWIN, J. 1975. Lakes: An Introduction.
 JELLYMAN, D.J. & TODD, P.R. 1974. Freshwater Eels. 2(19).
 LEWIS, M.H. 1975. The Pond. 4(46).
 MCCOLL, R.H.S. The Rotorua Lakes.
 MCLELLAN, I.D. 1975. Aquatic Insects (I). 4(46).
 PENDERGRAST, J.G. 1975. Aquatic Insects (II). 4(47).
 PILGRIM, R.L.C. 1975. Scorpion Flies. 4(47).

CHARTS

- IRWIN, J. in press. Lakes Tutira, Waikopiro and Orakai, 1:4,752. N.Z. Oceanogr. Inst. Chart, Lake Series.
 IRWIN, J. in press. Lake Rotongaio, 1:1,700. N.Z. Oceanogr. Inst. Chart, Lake Series.

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- FINLAYSON, C. 1975. Determination of total dissolved phosphorus in New Zealand fresh waters. New Zealand Journal of Marine and Freshwater Research, 9(1): 113-117.
 ——— 1975. Determination of reactive phosphorus with and without modification for arsenic interference in New Zealand fresh waters. New Zealand Journal of Marine and Freshwater Research, 9(1): 109-112.
 FOWLES, C.R. 1975. Temperature records from a small Canterbury stream. Mauri Ora 3: 89-94.
 GLASBY, G.P. 1975. Geochemistry of superficial lake sediments from the South Island, New Zealand. N.Z.O.I. Record 2(6): 77-82.
 GLASBY, G.P. & EDGERLEY, W.H.L. in press. Enrichment patterns of major elements in marine derived aerosols in the New Zealand lake waters. Pacif. Sci.

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- MCCOLL, R.H.S. 1975. Availability of soil and sediment phosphorus to a planktonic alga. N.Z. Jl. mar. freshwat. Res. 9: 169-182.
- MCCOLL, R.H.S., WHITE, E. & WAUGH, J.R. 1975. Chemical run-off in catchments converted to agricultural use. New Zealand Journal of Science 18: 67-84.
- RYDEN, J.C. & SYERS, J.K. 1975. Use of tephra for the removal of dissolved inorganic phosphate from sewage effluent. N.Z. Journal of Science 18: 3-16.
- SYERS, J.K. 1974. Effect of phosphate fertilizers in relation to agriculture and the environment. N.Z. Agric. Sci. 9: 149-164.
- TAYLOR, F.J. 1974. Chemical analyses of Campbell Island fresh waters. N.Z. Jl. mar. freshwat. Res. 8: 389-402.
- TAYLOR, F.J. 1974. Some freshwater analyses from Auckland Island. N.Z. Jl. mar. freshwat. Res. 8: 709-710.
- TILLMAN, R.D. & SYERS, J.K. 1975. Interference of mercury (II) in the colorimetric determination of inorganic phosphate in waters. Analyst 100: 322-324.
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MICROBIOLOGY AND PROTOZOOLOGY

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NOTIFICATION OF CHANGE OF ADDRESS

Dr U.V. Cassie's address is now: D.S.I.R., Botany Division, Mt. Albert, Private Bag, Auckland.

REQUEST FOR INFORMATION

Dr Brian Coffey, Ruakura Agricultural Centre, Ministry of Agriculture and Fisheries would like:

- (a) Notification of aquatic weed spread and problems;
- (b) Checklists for Freshwater periphyton.

SOCIETAS INTERNATIONALIS LIMNOLOGIAE (SIL)

The International Association of Theoretical and Applied Limnology (SIL) was founded in 1922 to further the study of all aspects of limnology, mainly through the organisation of triennial congresses and symposia on special topics. The aim of these meetings is to promote scientific exchange among those pursuing purely academic research and those concerned with practical problems relating to fisheries, water supplies and pollution.

At the triennial congresses generally about one week is devoted to contributed papers, exhibits and discussions and a week or more to visits to lakes and rivers, laboratories, fishery institutes, water works and places where pollution problems are being studied. A few authorities are invited to lecture on subjects of particular current interest and other speakers are encouraged to contribute also. Themes are selected for their world-wide interest or for their special relevance to the host country.

The lectures and discussions are published in the Verhandlungen mainly in English although German or French may be used. These publications give readers not only recent views on the major problems and controversies in limnology but also a comprehensive summary of much of the current research in the field of freshwater biology.

Accounts of methods, reviews, and the proceedings of symposia to which a few experts are invited to discuss one particular topic, are published in Mitteilungen according to the funds available.

Membership is open to anyone. Application for membership may be made through the National Representative*. At present (1975) it costs \$US 10.00 (\$NZ 7.60) per year for ordinary members. Institutes and corporate bodies may join the Association at a subscription rate of \$US 20.00 (\$NZ 15.20) per year. Payment in a year in which a congress is held and the following year entitles a member to the Verhandlungen of the Congress. Payment in the third of the three years that intervene between congresses entitles members to the Mitteilungen for that period. (Note: By payment of retroactive membership fees, members can obtain some of the Association's earlier publications.)

* SIL National Representative: Carolyn W. Burns, Department of Zoology, University of Otago, Dunedin.

Membership of the Association now exceeds 2000. The Society is largely self-supporting. The primary source of income is subscriptions; the secondary source is money derived from the sale of publications to non-members who pay more for them than members. A few governments make small contributions and some financial assistance is received from the International Union of Biological Science.

At the beginning of each year the General Secretary sends a circular to members giving them news of the Association's activities and asking for membership fees which are due on 1 February. New Zealand members may pay in N.Z. currency to the National Representative.

During the next 3 years the Association will sponsor or endorse 8 symposia, the topics of which are: palaeolimnology, sediment-water interactions, experimental use of algal cultures in limnology, rotifers, Ephemeroptera, palaeolimnology and palaeoclimate on a global scale, African lakes, lake metabolism and lake management.

Five special working groups were formulated and approved by SIL in August 1974. These are:

- (1) reservoirs and man-made lakes,
- (2) measurement of microbial activities in freshwaters and
standardization of methods,
- (3) comparability of plankton studies,
- (4) international projects on deep coring operations on Lake
Biwa and palaeolimnological work on relict lakes of the
world, and
- (5) to increase liaison between SIL and IUBS-MAB work within COWAR.

The XX International Congress of SIL will be held in Copenhagen, Denmark in August 1977; the XXI Congress will take place in Kyoto and Tokyo, Japan in 1980.

XIX SIL CONGRESS - AUGUST 1974

More than 1000 limnologists from all over the world gathered in Winnipeg, Canada to attend the XIX Congress of SIL, 22-29 August, 1974. Among them were 8 New Zealanders (Ann Chapman, Geoff Fish, Hilary Jolly, Maureen Lewis, Ed White, Stuart Mitchell, Vida Stout and Carolyn Burns) and 5 Australians - an impressively large Australasian contingent.

The presentation of more than 500 papers necessitated 8 concurrent sessions which included: chemical budgets and chemical cycling; phosphorus in inland waters; sediments and sediment chemistry; methods and techniques of measuring primary production including assays; seasonal

changes in primary production and biomass; algal taxonomy, physiology and ecology; benthic algae; periphyton; aquatic macrophytes; zooplankton ecology and metabolism (feeding, respiration and excretion); population dynamics and community studies; benthic invertebrate ecology; microbial ecology and physiology; fish physiology and feeding; eutrophication; pollution by heat, heavy metals, oil and radionuclides; lake restoration; ecosystem modelling; stream communities; meromixis; palaeolimnology; arctic and alpine limnology; physical limnology.

Two mornings were devoted to plenary sessions. The first, on experimental studies of nutrient dynamics, included a resume by Dr David Schindler (Freshwater Institute, Winnipeg) of his team's experiments in enriching whole lakes with P, N and C, and a provocative address by Professor Frank Rigler* (University of Toronto, Canada) on the need for convergence of approaches to the study of phosphorus. The second session, on the effects of human disturbance on large northern watersheds was memorable for the depressing statistics that were presented. The anxiety aroused by this session and other congressional sessions is reflected in two general resolutions which were approved by the General Assembly of SIL:

RESOLUTION: "Because of the critical role of phosphorus in the rapid eutrophication of inland waters, be it resolved that in addition to secondary treatment of sewage it is necessary to control additions of this element to any inland water. This should be done by any means available, including:

- (1) Restrictions on the use of cleaning products that contain phosphates or other potentially harmful substances.
- (2) Removal of phosphate at sewage treatment plants discharging effluents into such waters.
- (3) Control of drainage from feedlots, agricultural areas, septic tanks and other diffuse sources of phosphorus.

Control measures for nitrogen should be considered as well in basins where there is evidence that such controls are appropriate."

RESOLUTION: "Whereas, the increased introduction of man-made pollutants to the atmosphere is seriously contaminating the earth's airsheds, often remote from local sources, and,

whereas, the fallout of these materials is contributing to acidification and other pollution of lakes, rivers, and ground waters of large geographic regions, and

* Professor Rigler will be visiting New Zealand (Dunedin) in 1977.

whereas, the recently observed and projected changes in acidity of waters represent a serious stress for natural aquatic ecosystems, therefore this XIX SIL Congress deplores such degradation of aquatic ecosystems, and urges governments, scientists, engineers and laymen everywhere to investigate thoroughly the ecological magnitude of these changes, and to undertake prompt and ecologically sound remedial action."

Professor W. Rodhe gave the presidential address and was presented afterwards with the Einar Naumann Medal. The Baldi Lecture was given by Professor H.B.N. Hynes who spoke on "The Stream and its Valley".

The entire congress was superbly organised at all levels. Highlights of other aspects of the congress were a guided tour through the world-renowned Freshwater Institute which was impressive not only for the expensive equipment and the magnitude of the projects undertaken but also for the enthusiasm and helpfulness of the staff; and a trip to the University Field Station at Delta Marsh where many student research projects are carried out.

The social events were delightful - a pit-roasted barbecue on the banks of the Red River, an evening of song and dance presented by local ethnic groups who reflect the diverse origins of Manitoba's inhabitants, and a banquet followed by a recital by the Manitoba Chamber Orchestra.

The most memorable aspect of this Congress for me was a 3-day excursion to the Experimental Lakes Area (ELA) in Western Ontario where 17 drainage basins and their 46 lakes have been reserved for 20 years exclusively for research on eutrophication. Accommodation was provided for us in the ELA camp on the wooded shore of Lake 240. There were guided tours of the laboratories where studies of water chemistry, bacteria (methane oxidising, nitrogen-fixing and sulphur), benthos, radon gas diffusion and whitefish biology are being carried out; trips to sites of projects relating to forestry and hydrology and a memorable 15-minute flight over part of the ELA project in the helicopter which is used for much of the routine sampling of ELA lakes. Several weeks before our visit fires started by lightning had completely burned 8 experimental lake basins and partially destroyed two others, one of which was the site of extensive hydrological studies. Fortunately, the instruments survived the fire and monitoring has been continued. These data are expected to provide the most comprehensive investigation to date of the chemical and hydrological effects of forest fire.

Carolyn W. Burns

HAMILTON SCIENTIFIC CENTRE

This centre is being developed to house the Water and Soil Division research and survey activities in Hamilton, including the present activities in the area of water quality. The largest water quality project at the moment is our investigation on the Waikato river, with three scientists and five technicians mostly full time on it. Work to date has concentrated on understanding the dissolved oxygen concentration, and has shown that phytoplankton are responsible for both the high and low D.O. levels, and that B.O.D. input is relatively unimportant to the oxygen status of the river. Future work will probably tend towards understanding the sources and processes controlling the changes in the algae, bacteria and nutrients.

A project which was started this year will measure the nutrient input to Lake Rotorua, with measurements of three forms of phosphorus and three forms of nitrogen, on samples collected frequently enough from all major stream and urban inputs that the relative and absolute importance of all sources can be reliably established. The need to sample accurately storm flow dominates the sample collection and analytical procedure.

In addition to these research projects, regular suveys (four or six times per year) are being carried out on major Bay of Plenty rivers and the Waikato river, and these will be extended. These include measurements of nutrients, bacteria, algae and dissolved oxygen.

R.A. Hoare

CONFERENCE 1975

The 1975 conference of the N.Z. Limnological Society was held at Victoria University of Wellington from 21-23 August. Despite cold, damp weather it was a highly successful meeting attended by about 60 members and others. We were particularly pleased to have Dr Ian Bayly of Monash University, Victoria, Australia in attendance and he presented a most interesting talk on Australian inland saline lakes notably Lakes Eyre and Corangamite, on the final morning.

Two innovations, (1) the introduction of a discussion session on water classification into the formal programme on the first day, and (2) the holding of small informal discussion groups on specialist topics on the final morning added variety, interest and stimulation to the programme. A short field trip to the Hutt Valley, Wainuiomata Stream and Moreton Dam in the headwaters of the stream was held on the middle afternoon of the conference. This trip was marred by inclement weather which discouraged members from straying far from the bus. Nevertheless it was an interesting excursion featuring a wide range of clean and polluted waters in a vehicle showing a strong inclination toward mechanical failure.

An excellent Society dinner was held in the Student Union at the University and its side effects were reflected in the somewhat reduced attendance on the final morning.

The 8th General Meeting of the Society was held in the Common Room, Helen Lowry Hall where a high proportion of the members were staying. The meeting was held in an informal atmosphere with the bar open and was notable for a high level of member participation. More important, there was a strong feeling that the Society should concern itself more in environmental issues and after a lengthy discussion a motion stating that "The New Zealand Limnological Society concern itself with providing technical comment on water management", was passed. Following this it was decided that the Constitution should be amended to include the Society's new policy on involvement in environmental matters, implementation of the new policy should be immediate and a procedural policy should be drawn up to enable members' opinions to be gathered. The matter of the procedural policy was considered further at an informal meeting on the final morning of the Conference and it was recommended that action groups be set up to receive and coordinate members' views on issues. The Society's president, Dr John Brown recommended the setting up of groups in 6 centres initially under the guidance of the conveners listed below:

Centre	Convener
Auckland	J.M.A. Brown & M.H. Lewis
Hamilton	M.A. Chapman
Wellington	R.H.S. McColl
Nelson	R.H. Thornton
Christchurch	M.J. Winterbourn & V.M. Stout
Dunedin	D. Scott & C.W. Burns

He suggested also that each group draw up a list of their members' areas of interest, expertise and activity related to water with a view to compiling an Index. It was felt that the opinions of action groups must pass to the N.Z. Limnological Society Committee for forwarding to the appropriate agency as the opinion of the Society.

President's Report: The President reported that he had extended the Society's condolences to Dr U.V. Cassie on the loss of her husband, Prof. R.M. Cassie, a member of the Society since 1968. Members stood in silence for one minute as a token of respect.

Since taking office in April 1975 the President had attended one meeting of the Officials Committee on Eutrophication (OCE) at which eutrophication problems in Lake Rotorua and the visit of the Swedish experts had occupied much of the agenda. He welcomed Dr I.A.E. Bayly, Monash University, Australia, a member of the NZLS as well as of the ASL, and commented on this being the second meeting in succession at which an Australian colleague had been present, Dr P.A. Tyler, University of Tasmania having attended our previous meeting in Hamilton.

The President thanked the outgoing committee especially the outgoing President, Dr M.A. Chapman. On behalf of the meeting he expressed sincere thanks also to Dr R.H.S. McColl, Mrs L.D. Teirney and Mr A.M.R. Burnet for organising the meeting in Wellington and for their chauffeur services. He concluded by extending congratulations on behalf of the Society to Dr M.A. Chapman on her recent promotion to Reader.

Other business transacted included:

1. Adoption of the financial statement (see last page of this issue);
2. Discussion on several Project Aqua sites (Project Aqua was not familiar to a number of members present and a list of the New Zealand lakes incorporated in this project are given elsewhere in this newsletter).
3. Dr Brown reported that the book on New Zealand lakes should be on sale

before the end of 1975. (See page 24 for a table of contents of this book.) He also pointed out that a 20 page booklet on lakes was being prepared by the Ministry of Works and Development and a DSIR bulletin on the Nelson lakes should be appearing soon.

5. Because of the diminishing financial resources of the Society, and the ever increasing costs of producing the Newsletter, the annual subscription for an ordinary member was raised to \$5.00 and that of a student member to \$2.00. This was backdated to 1 April 1975.

6. On the recommendation of the Committee the constitution was amended from "The newly elected officers shall take office on the 1st day of April" to "The newly elected officers shall take office immediately after the General Meeting at which they are elected or at the conclusion of a postal ballot."

7. The question of a joint Australian Society of Limnology/New Zealand Limnological Society meeting was discussed. August 1976 was proposed as the most suitable time and about 30 ASL members could be expected to attend. Although a venue was not finalized at the meeting, a South Island centre, perhaps Christchurch was favoured.

Resume of discussion session on water classification

The timing of this discussion was rather fortuitous since a Supreme Court judgement two weeks previously had resulted in all proposed preliminary and final classifications being cancelled! The question now is to produce a new workable scheme for controlling water quality.

An introductory paper, "Water Classification - a critique" was presented by Dr Donald Scott, Zoology Department, University of Otago. He outlined the purpose of having a water classification, its main features and some of the problems which have arisen in applying it in New Zealand. The procedure involved in developing a final classification was discussed with reference to the Southland classification which was appealed against successfully by the skindivers club and the local Acclimatization Society. The Supreme Court decision with respect to the Southland case led to the decision to reconsider classification in general.

A second address was given by Mr Russell Howie, Soil and Water Division, MWD. He outlined the history of water quality control legislation in New Zealand since the turn of the century and which had culminated in the now defunct classification. He stressed that the question which should be asked now was not "How do we make a classification work?" but, "How should we control water quality?"

A spirited discussion followed.

Report on informal discussion groups

Members split into 3 groups on the final morning of the conference to discuss informally the following topics:

1. What is eutrophication?
2. Waterweed problems
3. Stream invertebrate ecology

Dr Brian Coffey has provided the following resume of the waterweed group's meeting.

Present: Dr Peter Mylechreest (Department of Internal Affairs, Waikaremoana)
 Miss Ruth Mason (ex Botany Division, D.S.I.R.)
 Dr Brian Coffey
 Dr Phyllis Coleman (New Zealand Electricity Department)
 Dr John Brown
 Mrs Helen Hughes
 Mr John Clayton (University of Auckland)

Introduction (Coffey): As relatively intensive data collections have been made on submerged macrophytes since early 1960's and as the position of Scientist (Aquatic Weeds) has now been filled at Ruakura (M.A.F.) it would be of interest to discuss priorities for future research.

Mylechreest: It is essential to resolve the effect that exotic macrophytes have on native benthos if the nuisance value of these species with regard to fisheries in lakes such as Waikaremoana is to be resolved.

Mason: Advised that she is now retired from Botany Division but hopes to publish her considerable data on species distribution throughout N.Z.

Hughes: Advisable to reconvene the 1973 "Conference on Aquatic Weed Problems", Advisory Service Division of Ministry of Agriculture and Fisheries, which was held at Palmerston North.

Brown: All data should be forwarded to F.W. Index, D.S.I.R. Information Service.

Mason: History of N.Z. Water Plants contained in Archives of Botany Division but might be transferred/reproduced at Ruakura.

Hughes: The main attraction of a Symposium at this time is that one might encourage Regional involvement in a problem as was done for *Spartina*.

Coffey: We are at the stage where essentially autecological studies on individual plant species should be replaced by community studies when assessing control measures and/or nuisance value.

Mason: Suitable study areas include L. Haroto, Urawera National Park.

Coleman: With regard to benthos/periphyton, Lake Wanaka appears to be an

ideal experimental area as sample collection is planned by the Dunedin Working Party of Lands and Survey.

Clayton: A survey of all N.Z. lakes is clearly quite impractical.

Hughes: Suggest that the Agricultural Engineers Institute, Lincoln, is approached for comments on mechanical control.

Clayton: Research into application techniques for herbicides desirable.

Mylechreest: Mechanical control is recommended for problems resulting from eutrophication.

Summary (Coffey): It is now essential to secure community descriptions and studies rather than autecological investigations.

Rob Ogilvie reports on the meeting of the stream invertebrate group.

Present: Stella Penny (Victoria University of Wellington)

Trevor Crosby (Entomology Division, D.S.I.R.)

Dave Towns (University of Auckland)

Alan Carpenter (University of Canterbury)

Colin Greig (")

Rob Ogilvie (")

Mike Winterbourn (")

David Campin (Waikato University)

Two topics were discussed by the group: 1. the problem of taxonomy in New Zealand stream work and; 2. aspects of the proposed Waitomo caves research programme.

1. It was agreed that a major and persistent problem faced by New Zealand stream workers is the taxonomic one. Keys to the identification of freshwater taxa are scattered, and in many cases outdated and inadequate. The group felt that it should draw on the combined expertise of Limnological Society members and others to produce a guide to the identification of freshwater animals. This could take the form of an updated and expanded version of the unpublished "Kanzi" keys (= Keys to Aquatic N.Z. Insects... a cyclostyled set of "interim" keys compiled by J. Penniket of the Canterbury Museum in 1964). It could contain a list of major texts and references which provide keys to family level (giving for each a comment on its particular merits or demerits), and a list of published keys, to families and lower taxa, already in existence for the New Zealand fauna. To this we would want to add comments on the adequacies and inadequacies of these keys, where problems on their use arise, and why.

Additional information which members interested in particular groups could contribute include: a) unpublished keys to groups (note, the guide

would be an unpublished, informal document (at least initially) but all contributors would be acknowledged and their rights reserved). b) important features not mentioned in published work, which have been found useful as aids for identification (e.g. the use of exuviae, pupae, subimagos etc.), c) general "hints" for collecting and rearing the various stages useful for identification, d) a list of specialists who can be contacted for identification of particular groups.

It was decided that questionnaires would be sent to members (and appropriate non members) asking them to contribute information on their speciality groups. The compilation of responses to these questionnaires will then provide the basis for the guide. The group hoped the guide would summarise current knowledge on stream invertebrate taxonomy, and provide a useful basis for further work.

2. The second topic of discussion was introduced by Trevor Crosby who told the group of a proposed interdisciplinary study on the geology, hydrology, and ecology of the Waitomo glow worm caves. A major area of concern is the silting up of the river flowing through the caves, and the question of the effects that removal of the silt may have on the glow worm population (the silt being a habitat for midge larvae etc. which form part of the glow worms' food).

The problems of sampling both food species, and the glow worms were discussed in a general way.

ABSTRACTS OF PAPERS PRESENTED AT THE CONFERENCE

NUTRIENT LIMITATION TO PLANT GROWTH IN LAKE TAUPO

E. WHITE

Freshwater Section, Ecology Division, DSIR, Taupo

During the first half of 1975, manganese, nitrogen and phosphorus were all shown to be potential limiting nutrients in the northern part of Lake Taupo. It was suggested that manganese was likely to limit growth more frequently than nitrogen, and that nitrogen would limit growth more frequently than phosphorus. Some concern was expressed that the western diversions of the Tongariro Power Scheme now entering Lake Taupo were relatively rich in biologically available manganese.

AN INITIAL ASSESSMENT OF A NUTRIENT BUDGET FOR LAKE TAUPO

M.T. DOWNES

Freshwater Section, Ecology Division, DSIR, Taupo

The annual loadings of reactive phosphorus and inorganic nitrogen from aerial, surface run-off and groundwater run-off on to Lake Taupo have been estimated. The major phosphorus loads originate in a different part of the catchment from the major nitrogen loads resulting in substantial variations in nutrient loadings and ratios seasonally, and between sub-catchments. No obvious associations between sub-catchment nutrient loss and vegetation cover were found. The low nitrogen to phosphorus ratio in the loading onto the lake suggests that nitrogen may prove to be an important growth limiting nutrient.

NUTRIENT LEVELS ASSOCIATED WITH SEPTIC TANK OVERFLOW

A PRELIMINARY REPORT

M. GIBBS

Freshwater Section, Ecology Division, DSIR, Taupo

Within the Lake Taupo basin, groundwater nitrogen levels in urban catchments were found to be 3 times higher than those in rural catchments. This report outlines the preliminary work carried out to determine the relationship between these higher nitrogen levels and the septic tank method of sewage disposal. A single lakeside septic tank system situated within a small catchment was chosen for detailed study. Nutrient levels were monitored using a matrix of test holes sunk between the discharge point and the lake, and along the groundwater-lake interface. Evidence is presented which suggests that nutrients from the septic tank are entering the lake through the bed via a discrete band within the aquifer.

LAKES TAUPO AND ROTONGAIO - SOME OBSERVATIONS ON THEIR BIOLOGY

D.J. FORSYTH

Freshwater Section, Ecology Division, DSIR, Taupo

Both lakes were sampled each month from August 1974 to July 1975 in order to establish base-line information on their chemistry and biology.

Values of Secchi disc readings, chlorophyll in the surface waters, and percentage dissolved oxygen in the bottom waters show that Taupo is oligotrophic and Rotongaio highly eutrophic. In Taupo the benthic fauna was sampled at three sites more than 100 m deep in the open parts of the

lake and also along a transect down to a depth of 100 m in Taupo Bay. There were no obvious faunal distribution patterns correlated with depth of water although *Chironomus* sp. was at all depths down to 80 m on the transect but was absent from all the 100 m sites. There were some marked differences between sites. *Potamopyrgus antipodarum*, twice as common at the southern part than in the western parts of the lake, was nearly absent from the northern end. *Chironomus zealandicus*, *Pisidium* sp., and oligochaete worms were at all sites with the latter most common at the northern end of the lake.

The fauna of Lake Rotongaio was similar to that of Taupo although larvae of the chironomids *Polypedilum pavidus* and *Psectrotanypus antarctica*, and larvae of a ceratopogonid midge and the dragonfly *Procordulia grayi* were present in the littoral zone.

Population density decreased with depth in Rotongaio and because of deoxygenation of the hypolimnion animals were excluded from all depths below 2.5 m by mid-summer. Rotongaio supported a heavy bloom of a blue-green alga, *Anabaena subcylindrica* in mid-summer and late autumn. This provided food for a population of *Polypedilum pavidus* larvae which had a peak density of about 1500/m² almost 2 months after the onset of the bloom.

For a eutrophic lake Rotongaio had a small population of oligochaete worms (6% of total animals); chironomids (89.5%) and molluscs (4%) were the other main groups. In Taupo molluscs were the dominant group (46%) followed by oligochaetes (30%) and chironomids (23.75%).

THE SUMMER LIMNOLOGY OF LAKE WAAHI

M.A. CHAPMAN

School of Science, University of Waikato, Hamilton

Some aspects of a study of Lake Waahi, Huntly, financed by the Auckland Acclimatisation Society, were described. The 500 hectare lake is only 2-3 m deep in summer and is best described as a shallow saucer of aquatic macrophytes (mostly *Egeria*) barely covered by an algal soup. Strongly developed patterns of thermal and chemical stratification were found, except after very strong gales. The results of a late January diurnal survey, though not of a December one, suggested that night time mixing might occur at times. The water below 1.0-1.5 m was almost invariably below 5 ppm O₂ and often markedly so, except immediately after gales. Surface waters were heavily supersaturated (up to 250-300%) during

the day time but dropped from around 17 ppm to 7-8 ppm during the night. Surface pHs were high for most of the summer being over 9 or even 10, whereas bottom pHs were around 7. A massive blue-green algal bloom (mainly *Anabaena* and *Microcystis*) developed in late December-early January. Reactive phosphate was detected sporadically in the water but no nitrate was found in surface or bottom samples in mid-summer. However, there were high concentrations of ammonia, until after the gales associated with Cyclone Alison thoroughly mixed the lake. Further work is planned in the coming summer.

SOME ASPECTS OF PRIMARY AND SECONDARY PRODUCTION IN THE
LITTORAL ZONE OF A SUBALPINE LAKE

C.A. GREIG

Zoology Department, University of Canterbury, Christchurch

Primary (epilithic algal) production and the production ecology of *Deleatidium* sp. (Ephemeroptera) were studied in Lake Grasmere, Western Canterbury, from March 1974 to April 1975. Studies on the two trophic levels were interrelated to some extent by carrying out feeding studies with algae and *Deleatidium* sp. in the laboratory.

Primary production, as indicated by chlorophyll biomass, peaked in early summer and late autumn. The species composition of the periphyton did not appear to change seasonally to any extent. The genus *Synedra* was the predominant diatom in the periphyton followed by *Gomphonema*, *Cymbella* and *Cocconeis*.

Deleatidium larvae were present all year round. Peak emergence occurred in January and small instar larvae became abundant in March. Standing crop in terms of both numbers and biomass peaked in October. The annual standing crop was 23.4 g/m^2 dry weight and the mean standing crop was 1.95 g/m^2 dry weight. The growth of the nymphs in terms of weight changes appeared to be approximately exponential from April through winter to late spring. Constructions of size frequency histograms showed that the species was probably univoltine, relatively simple in life history and reasonably amenable to production calculations by various methods. Annual production was calculated by three methods; the "removal summation" method, the "instantaneous growth" method, and the "Hynes-Hamilton" method. Comparable results were obtained using the three techniques. Annual production was approximately 7 g/m^2 dry weight and the turnover ratio, 3.8.

Analysis of gut contents of *Deleatidium* larvae (instantaneous ingestion measurements) carried out over the year showed a close correlation to periphyton composition. This suggests that *Deleatidium* larvae are opportunistic feeders. Assimilation efficiencies of approximately 70% were obtained when periphyton labelled with ^{144}Ce and ^{14}C -bicarbonate was fed to *Deleatidium* larvae, indicating that they are well adapted for algal feeding.

SOME EXPERIENCES OF ENVIRONMENTAL MONITORING

A.M.R. BURNET

Fisheries Research Division, Ministry of Agriculture and
Fisheries, Wellington

Several data loggers, designed to record signals from environmental sensors have been constructed at the Fisheries Research Division. The system records the readings in digital form on magnetic tape cassettes. The equipment has been used for monitoring laboratory experiments, and one unit is operating at the Glenariffe Salmon Trap. This unit records light levels (day and night), air and water temperature, and water levels, making 100 sets of observations a day.

Most of the problems of construction and operation of a digital data logger are easily solved. The major problems arise in the construction of sensors suitable for some of the environmental factors we wish to measure (e.g. long-term oxygen measurements). Another problem is protecting the equipment from a hostile environment such as that at Glenariffe, where there are extremes of temperature, humidity, and electrical storms. Most of these we have overcome. The installation has proved worthwhile, in providing data on water temperatures, water levels, and moonlight levels for comparison with the downstream runs of fish at the trap. The design of the field equipment has been kept as simple electrically as possible, with the main emphasis on computer programming to overcome problems. This approach has paid off and has enabled us to consider tackling problems beyond the scope of other facilities.

In our case, and in the case of many other instruments, the data format on the tape is non-standard and is not directly acceptable to a computer. Our system uses a mini computer to read the tapes, translate the data into actual readings, and then to control storage of that data in standard file format. These stages require staff with knowledge of computer hardware, and skill in assembler programming. The system creates

a file of data which can be examined by a high level language. However, while we have arrived at this point without any need for manual recording or calculating, the system provides a great mass of data and planning its organisation for processing is vital. A one month record from the Glenariffe instrument will create a 250 000 word computer file. Thus serious use of digital data logging (i.e. to improve on the results from a chart recorder) requires good mini computer facilities. The equipment we are using has a Disk operating system, 20K of core, two cassette tape readers, and a full-scale tape deck.

BLUE-GREEN ALGAE IN THE WAIKATO CATCHMENT

CATHERINE LAM

Botany Department, University of Auckland

The paper presented a picture of the growth of blue-green algae in the Waikato catchment, their distribution patterns at various sites, and seasonal cycles of growth at three sites of the lower Waikato River. Attempts are being made to correlate the pattern of distribution and seasonal cycles with ecological factors. Results from bioassay experiments were discussed to determine the growth conditions of blue-green algae in the Waikato waters.

THE RESTORATION AND MANAGEMENT OF LAKE TUTIRA

LAUREL TEIRNEY¹ and R.H.S. McCOLL²

1 Fisheries Management Division, Ministry of Agriculture and Fisheries, Wellington

2 Soil Bureau, D.S.I.R., Lower Hutt

Mrs Teirney first outlined the problems to be overcome in Lake Tutira and described the short term treatment methods being used to improve the water quality. Lake Tutira has an area of 174 ha and is situated about 48 km north of Napier. It is an important recreational asset to the Hawkes Bay region. Changes associated with increasing eutrophication became apparent during the 1950's and have culminated in prolific weed growth, the seasonal occurrence of blue-green algal blooms and a deterioration of summer angling successes. These changes have proved detrimental to the users of the lake who are requesting that the situation be reversed. The source of the continual nutrient input to the lake is the purely agricultural use of the 3200 ha catchment area.

In October 1973 a monthly sampling programme was started to determine the present condition of the lake. Once stratified, hypolimnetic deoxygenation occurs resulting in an increased concentration of soluble nutrients and hydrogen sulphide which reduces the habitable zone to 35% of the total lake volume. This restricts trout distribution to the epilimnetic waters and results in a decline in growth rate from November until April. Changes in the biomass of the weed banks appear to be correlated with seasonal temperature fluctuations.

The deterioration in both water quality and sports fisheries overseas has resulted in the investigation of a number of lake rehabilitation programmes. All manipulation techniques used have aimed at adding extra oxygen to the water to meet the increased oxygen demand associated with eutrophication. The principle behind Artificial Destratification, the method selected for Lake Tutira, involves adding energy to disrupt the thermocline and move hypolimnetic water to the surface where oxygen can be absorbed from the air. The use of this technique was justified by the results of overseas experiments published prior to 1973. Both the type and amount of equipment required was determined from costing and efficiency estimates. The installation and operation of the compressor and six Aerohydraulic Guns was explained.

Following this introduction Dr McColl presented data on the nutrient status of the lake and suggested possible long-term solutions to the eutrophication problem. Monthly measurements of total phosphorus, soluble phosphorus, nitrate and ammonia at 0, 1, 5, 10, 15, 25 and 35 metres depth were used to calculate the total quantities of these chemicals in the lake waters between October 1973 and November 1974. From the pattern of seasonal variation it was estimated that during the summer the sediment contributed up to 1430 kg of P and 5500 kg of $\text{NH}_4\text{-N}$ to the lake water. Much of the phosphorus was apparently reabsorbed by the sediments within two months after autumn turnover but it was estimated from the soluble phosphorus that up to 500 kg was available for algal growth during the late winter and spring.

Although artificial destratification and aeration might reduce the phosphorus loading from sediments, it was suggested that the reduction would be insufficient to convert the lake from eutrophic to mesotrophic condition. Vollenweider's (1973) loading curves suggest that up to 3500 kg of P would have to be excluded from the lake if oligotrophic conditions are to be achieved.

Based on estimates of the size of various phosphorus sources in

the lake catchment a possible management scheme involving stream diversion and afforestation was suggested.

Reference:

Vollenweider, R.A. and Dillon, P.J. 1974. The application of the phosphorus loading concept to eutrophication research. National Research Council of Canada, Report 13690; 42 pp.

SOME EXPERIMENTS ON THE IMPACT OF GRAZING INSECT LARVAE
ON THE PERIPHYTON IN A CHALK STREAM

G.W. GIBBS

Zoology Department, Victoria University of Wellington

A 12-week field study in a Dorset chalk stream was made to determine the effect of reduced grazing pressure by stream insect larvae on periphyton. Chlorophyll was extracted to measure the accumulation of periphyton on artificial, unglazed ceramic substrates placed either on the stream bed, or suspended clear of the bottom. Treatment of suspended substrates with 10 ppm pyrethrum was used three times a week to reduce the numbers of grazing insects. Trials showed that this treatment had no significant effect on periphyton growth and probably cleared the substrate of grazing animals for about 24 hours each time treatment was carried out. In spite of the difficulty of keeping grazers off the substrates, very marked differences occurred in the quantity of algal matter in the different situations. At the height of the spring bloom of algal growth, substrates available for continuous grazing accumulated only 19 mg chlorophyll a/m² after two weeks exposure, whereas when clear of the bottom and treated with insecticide for the same period, the accumulation was 114 mg/m². By early summer, however, algal growth on treated substrates was no greater than on grazed substrates. Of the two hypotheses put forward to explain this, i.e. decrease in algal growth *per se*, or increased grazing pressure, the latter is favoured because of a change in the population structure of grazers from small sedentary chironomids to large, active swimming mayflies.

DRIFT AND *DELEATIDIUM*

R.W. OGILVIE

Zoology Department, University of Canterbury, Christchurch

The importance of interpreting drift as a "chronobiological" phenomenon when considering its role in the ecosystem (as stressed by Muller 1974, Ann. Rev. Ecol. Syst. 5, 309-324) was emphasised using drift data for *Deleatidium* sp. from the Glentui River.

This night active genus shows both bigeminus and alternans periodicity patterns. The bigeminus pattern predominated between January 1973 and June 1974, however, a seasonal alteration in periodicity was apparent. A strongly bigeminus rhythmicity in summer (Jan. 1973) weakened into virtual aperiodicity in winter (May, June 1973). An intermediate pattern (with both behavioural peaks equal) occurred in spring (Sept. 1973) and preceded the return to a marked bigeminus pattern in January 1974.

The loss of periodicity noted again in June 1974 may have been simply a reflection of the very low drift densities found in winter. Therefore it may not have resulted from the absence of a definite light/dark phase setting mechanism which has been used to explain aperiodicity in summer drift at high Northern latitudes.

The relationships between mean benthic population numbers, mean current velocities and drift densities were discussed. Benthic population densities showed a decline in winter (August 1973) with an increase in spring and summer being interrupted by three sudden declines. Drift densities, which were relatively constant during the winter, increased steadily towards summer peaking in January, and showing two sudden declines after this. In general, mean monthly current velocities were inversely related to benthic population densities but showed no consistent relationship to drift densities. Rather, drift densities were more strongly dependent on the phenology of the animal involved.

An as yet incomplete life history diagram for *Deleatidium* supported the possibility of 2 generations per year. The overlapping emergence times of two generations facilitates an explanation for the sudden declines noted in both benthic numbers and drift densities. The mean size of animals drifting at night (as indicated by measurements of head capsule width) was larger than that of day drifting animals. Also the mean size of day and night drifting animals combined was larger than for animals from benthic samples. This applied not only in summer, when individuals were emerging, but also in winter and spring. This emphasises the importance of studying drift in a chronobiological context both on a

short term (24 hourly) and a long term (seasonal) basis.

COLONIZATION TRAY EXPERIMENTS IN A SMALL, BEECH FOREST STREAM

M.J. WINTERBOURN

Zoology Department, University of Canterbury, Christchurch

Twenty nylon mesh trays (1 mm mesh; area 625 cm²) were used to obtain data on densities of larval *Zelandopsycha ingens* (Trichoptera) and to measure beech litter (*Nothofagus*) accumulation in Middle Bush Stream, Cass. Trays were filled with different amounts and sizes of stones and placed in riffles and pools for 2-3 months at a time. They were harvested successfully on 3 occasions (September, November 1974; February 1975), but a fourth series was disturbed severely by heavy flooding. Litter and larvae were found in trays placed in all situations and not predominantly in pools as had been expected. A weak positive correlation was found between larval numbers and weight of coarse litter in trays but this correlation was significant only in September when larval densities were highest. Densities of *Z. ingens* larvae ranged from 61-97/m² in the three experimental series. Using litter input data obtained by field sampling and laboratory estimates of larval feeding rates, it was calculated that the *Z. ingens* population in Middle Bush Stream should process about 10% of the beech litter input. *Z. ingens* is the only important large particle detritivore in Middle Bush Stream and therefore this value of 10% can be compared directly with values of around 25% estimated for North American, deciduous forest streams.

SUBMERGED VEGETATION STRUCTURE IN THE WAIKATO RIVER

BRIAN T. COFFEY

New Zealand Electricity Department, Hamilton

Seven botanical regions are recognised in the Waikato River System. Repetitive vegetation surveys (1966-1975) have revealed that native and exotic species have yet to establish a competitive equilibrium. A scheme of vegetational structure which results when native species, and the most aggressive submerged exotics (*Elodea*, *Lagarosiphon*, *Egeria* and *Ceratophyllum*) are competing in oligotrophic (Lakes Taupo - Aratiatia), mesotrophic (Lakes Rotoaira and Ohakuri), and eutrophic (Lake Atiamuri to Waikato Heads) waters, was presented. The superior competitive ability

of exotics is leading to the displacement of native species in each water type. A bibliography of vegetational studies, and a provisional species list for larger aquatic plants, was shown.

LONGITUDINAL ZONATION OF BENTHIC INVERTEBRATE FAUNAS IN
THE WAITAKERE CATCHMENT

D.R. TOWNS

Department of Zoology, University of Auckland

Surveys of the Waitakere River and Cascade Stream in the Waitakere Ranges northwest of Auckland have shown that over 130 invertebrate taxa are present. These are organised in "communities" which show marked differences between the Cascade and Waitakere sites, and a gradual change along the Waitakere River. The gradual changes can be explained partly by the tendency for algal blooms to form in some areas. The effect of algae on the fauna has been demonstrated by placing an artificial canopy over the stream for an extended period of time.

Shaded areas in the Waitakere River had a lower summer standing crop, and a smaller summer-winter standing crop variation than areas susceptible to algal blooms. The smallest standing crop variation occurred in the Cascade Stream, where algal blooms do not form. Differences between the Cascade and Waitakere invertebrate communities can be attributed to differences in water temperature, gradient, and the form of detrital processing.

SOME EFFECTS OF ORGANIC POLLUTION ON ORGANISMS IN THE
WAINUIOMATA RIVER

STELLA F. PENNY

Zoology Department, Victoria University of Wellington

An extensive survey of the chemistry and ecology of the Wainui-o-mata River was made in 1971 and 1972. The physical and chemical properties of the river, presented in detail at the Limnological Conference at Turangi in 1972 were summarised. These provided a background to a discussion of changes in abundance of specified groups of animals and changes in species composition in response to pollution from a sewage outfall.

The technique of cluster analysis as a method of comparing species composition at different stations on different occasions was outlined. Reference was made to the limitations of the method. Chief among these were:

- (a) its use in the analysis of presence/absence data only and the consequent omission of abundance information;
- (b) the distorted representation of the data in the resultant dendrogram. The amount of distortion can be measured but not corrected for.

Cluster analysis provided evidence of the formation of three distinct zones within the river during the low flow, maximum weed growth period in autumn. The zones were dominated by Chironomidae and leptophlebiid mayflies; *Potamopyrgus*, *Physa* and *Oxyethira*; and *Pycnocentroides* and Elmidae respectively. However, it was difficult to assess the relative importance of the chemistry, the substrate and the current and the abundance and type of vegetation in determining these zones. Furthermore the most noticeable change in species composition occurred above the sewage outfall in response to intermittent silting. The chief impact of sewage pollution was to produce an increase in abundance of plant growth, particularly green filamentous algae and *Elodea canadensis*. This increase in plant growth produced great increases in the numbers of several species, particularly snails which were already dominant above the sewage outfall.

In the period following a severe flood which completely scoured the river bed it was difficult to find any clear response in terms of relative abundance and species composition to the great increases in concentration of nutrients below the sewage outfall. Thus sewage pollution in this river appeared to have a cumulative rather than an instantaneous effect on the ecology of benthic invertebrates. Changes in the species composition appeared to be related to changes in physical and botanical factors rather than being a direct response to changes in water chemistry.

Other Papers Presented

FACTORS AFFECTING MIGRATION OF JUVENILE WHITEBAIT - R.M. McDOWALL

Fisheries Research Division, Ministry of Agriculture and Fisheries,
Wellington

FACTORS CONTROLLING PLANT DISTRIBUTION AND DENSITIES IN THE ROTORUA LAKES

J.M.A. BROWN and F. DROMGOOLE, Botany Department, University of
Auckland.

THE PROJECT AQUA SITES IN NEW ZEALAND

At the final assembly of the XIV Congress of SIL in Salzburg, Austria, in 1959, the following recommendation was proposed by Dr E.B. Worthington and unanimously accepted:

"SIL should prepare a list of lakes and rivers whose preservation and protection is particularly desirable and ask the United Nations Organisation to recognise them."

This was the beginning of Project Aqua which subsequently was developed by Section PF (Production Freshwaters) of IBP. A provisional list of sites was made in 1969 and a revised and enlarged list was published in 1971 as IBP Handbook No. 21 "Project Aqua a source book of inland waters proposed for conservation" (compiled by H. Luther and J. Rzóśka; sponsored by IBP, SIL and IUCN; and published by Blackwells).

The bulletin includes 12 sites from New Zealand all belonging to category AII meaning the habitats are in a natural state or only slightly modified, and are important as either they have been used for past or current research, or extensive research is planned, or they are regarded as having high potential research value. Each entry includes information on locality, physiography, trophic status, scientific interest and research, conservation status, present usage and details of special features.

The New Zealand Project Aqua sites are:

1. Lake Rotokawau - near Awanui, Northland (sand dune lake)
2. Lake D - near Ngaruawahia, south Auckland (peat lake in raised bog)
3. Lake Rotowhero - Waiotapu district, central North Island (thermal lake in explosion crater)
4. Lake Rotomahana - adjacent to Lake Tarawera, central North Island (crater lake)
5. Waimangu Thermal Reserve - south of Rotorua, central North Island (thermal area)
6. Lake Okataina - near Rotorua, central North Island (oligotrophic lake in bush catchment)
7. Lake Rotopounamu - between lakes Taupo and Rotoaira, central North Island (oligotrophic lake in fairly undisturbed native forest)
8. Waikoropupu Twin Springs - near Takaka, Nelson Province, South Island (cold spring with highest flow rate in Southern Hemisphere)
9. Lake Marion - near Lake Sumner, Canterbury, South Island (oligotrophic lake in undisturbed native bush)

10. Vagabonds Inn - near Cass, Canterbury, South Island (highly oligotrophic pond in glacial moraine)
11. Lake Christabel - near Lewis Pass, Westland, South Island (oligotrophic lake in undisturbed native bush)
12. Lake Mueller - near Fox Glacier, Westland, South Island (dystrophic lake in virgin, native bush)

The 1971 edition of the Bulletin is now being revised by J. Rzóska and new sites can be added to the list if this is felt desirable. Other revisions of information in the present volume would also be welcomed. If members have comments and criticisms, could they forward them to Dr C.W. Burns, Secretary, N.Z. Limnological Society, Zoology Department, University of Otago, Dunedin.

M.J. Winterbourn

BOOK REVIEW

Inland Waters and their Ecology - by I.A.E. Bayly and W.D. Williams; Longman, Australia; 1973; 316 pp; \$NZ17.50.

This book is a general limnological text written specifically for an Australian and New Zealand audience. Australasian examples are drawn on wherever possible to illustrate particular points and the authors have drawn on their own wide experience, particularly in Australia to good effect. The result is a very worthwhile book. The volume is organised in six main sections covering general features of inland waters, lakes, running waters, other bodies of freshwater, non-marine or athalassic saline waters, and man and inland waters respectively. The chapter on athalassic saline waters considers a topic which is peculiarly Australian and which the authors have researched in detail themselves. It is rightly considered in considerable detail and gives this text a distinct Australian flavour. By contrast, the section on running waters is rather pedestrian, partly reflecting the paucity of detailed information on Australian streams and rivers and lack of published studies on their New Zealand counterparts. I found it startling to find that McLay's study of drift in the Kakanui River, a brief report in Tane by John McLean and Hirsch's survey of river pollution represented the bulk of the published work on stream invertebrates in New Zealand! Likewise, only two papers are quoted which focus on aquatic insects, stonefly papers by Wisely and Illies. Since the publication of "Inland Waters and their Ecology" the New Zealand limnological literature has escalated sharply and from a New Zealander's point of view it can be argued that

this volume appeared a few years too early! Thus Bayly and Williams quote about 56 New Zealand works published before 1971 whereas the titles of 259 papers in the general field of N.Z. limnology appear in the N.Z. Limnological Society Newsletters for the years 1971-75.

Similarly the very active field of stream ecosystem dynamics has developed substantially since the text was written and unfortunately less than a page has been devoted to this topic.

The book is illustrated by many clear, interesting and pertinent photographs, diagrams and graphs while many real data are presented in tabular fashion. An extensive bibliography completes the book along with indices to lakes, reservoirs and organisms mentioned in the text, and a general index.

A disappointing feature reflected by so many texts these days is the high price which hopefully will not deter many persons with limnological interests from buying this important work.

M.J. Winterbourn

NEW ZEALAND LIMNOLOGICAL SOCIETYIncome and Expenditure Account for the year ended 31.3.75

EXPENDITURE	\$	INCOME	\$
Postage	6.85	Subscriptions	242.03
Newsletter -		Sale of Newsletters	11.11
Printing 324.84		Interest	14.71
Postage 8.65	333.49	Excess of Expenditure	
Receipt book	1.77	over Income	98.44
Exchange	37		
Conference loss	23.81		
	366.29		366.29

Conference Account

Hire Hall	533.58	Fees	785.90
Hire Coach	156.00	Sale Liquor and	
Lunches	30.00	Meals Tickets	80.00
Liquor 230.00		Excess of Expenditure	
Less Returns 71.59	158.41	over Income	23.81
Sundry Expenses	11.72		
	889.71		889.71

BALANCE SHEET AS AT 31.3.75

<u>Liabilities</u>	\$	<u>Assets</u>	\$
Creditors	241.72	Cash at P.O.S.B.	568.51
Accumulated Fund 436.17		Petty Cash	10.94
Less excess of			
Expenditure over			
Income 98.44	337.73		
	579.45		579.45

Audited and found correct

N. Tilly
10.8.75

