

RIVER RESEARCH IN EAST AFRICA

By DR. VERNON D. van SOMEREN, M.B.E.

AN important step forward in the conservation and development of the river fisheries in East Africa was taken on September 11, when the Governor of Kenya Colony, His Excellency Sir Philip Mitchell, formally opened the River Research and Development Centre near Nyeri Station in Kenya, in the presence of many people connected with fish and fishery problems.

Financed by grants from the Kenya Government and the Development and Reconstruction Authority of the Colony, this Centre has been built by the Kenya Game Department under the direction of the fish warden, Mr. Hugh Copley. The Centre consists of a research laboratory, a trout hatchery, and an administration centre situated on the banks of the Upper Sagana River, on the lower slopes of Mount Kenya. The staff at present consists of one biologist (Dr. V. D. van Someren), one assistant fish warden (Major D. F. Smith) and a hatchery superintendent, the whole being administered by the head offices of the Game Department in Nairobi.

The function of the Centre is twofold, namely, river fishery research and practical fish breeding, neither of which has hitherto been investigated scientifically in the Colony. On the fishery research side, the first object is to provide a scientific background for developing the trout fishery resources of East Africa. Both rainbow and brown trout were first introduced to Kenya about forty years ago, and since then the trout fisheries have been developed as a considerable sporting and tourist asset, most of the rivers now being stocked. The practical management of these fisheries has so far been run successfully on an *ad hoc* basis; but it has been felt for some time now that any further advance must be based on scientific research into river productivity and fishery management. Deterioration in growth-rate of trout, for example, has taken place in several of the rivers since their initial stocking, and this is but one aspect of the problem which is being investigated. Afterwards, such research will be carried further to investigate fully the indigenous fisheries of the lower reaches of the rivers where trout will not live. In some rivers there exist native fisheries for *Tilapia*, *Barbus*, eels, catfish and the like, and research would undoubtedly improve the yield of such food fish for the African population.

Other research aspects of the Centre's work include the large-scale systematic rearing of aquatic insect nymphs and larvæ, since the majority of such in East African rivers are as yet unnamed. The food productivity per unit area of river bottom is being investigated in relation to the population of fish. The food and growth-rate of the fish themselves are also under study, and the rivers present many interesting ecological features in the distribution of fish and other aquatic life, since they may rise at an altitude up to 14,000 ft. and finally discharge at sea-level.

It is the intention that this Centre should work in close co-operation with the Wray Castle Laboratory of the Freshwater Biological Association in England, and to this end Dr. Winifred Frost, of the Wray Laboratory, has already spent six months working at the Centre on East African river eels and trout fisheries. Close liaison will also be maintained with the East Africa Inland Fishery Research Institute

at Jinja in Uganda, now in course of construction, and it is possible that amalgamation of the two may later take place, with the added advantage of staff interchange.

On the educational side, short vacation courses in freshwater biology will be held for pupils of the Kenya secondary schools and probably also for African biology students from Makerere College in Uganda. The first vacation course for girls of the Kenya High School has already taken place.

The laboratory has accommodation for visiting scientific workers, and it is hoped that students from overseas will take advantage of the facilities to study, not only fishery problems, but also other aspects of the biological, physical and chemical phenomena in East African rivers. Guest-house accommodation has been provided for such visitors at the Centre.

Practical trout breeding will go hand-in-hand with research, the hatchery being designed to accommodate up to 150,000 ova. This is the first such hatchery to be built in East Africa, and will serve the three East African territories and farther afield if required. Some of the first batch of fry reared have already been sent to the Sudan. Biological work in connexion with the proposed Government fish culture farm for indigenous fish will also be undertaken.

The biology, breeding and growth of fish and other aquatic life in these high-altitude regions, with a sub-tropical climate and little variation in seasons, present many interesting problems compared with temperate climates. Over a period of years, the results of research should be not only of practical economic importance but also of fundamental biological interest.

ROAD RESEARCH IN SCOTLAND

AS an initial step in the founding of a Scottish branch at East Kilbride, near Glasgow, of the Road Research Laboratory, were a conference and exhibition held at the Royal Technical College, Glasgow, on September 24, under the auspices of the Road Research Organisation of the Department of Scientific and Industrial Research in association with the Institution of Civil Engineers (Glasgow and District Association), the Institution of Municipal Engineers (Scottish Branch), the County Surveyors' Society (Scottish Branch) and the Scottish Accident Prevention Council. Sir Patrick Dollan presided over the conference; the chair at the morning session was taken by Colonel T. U. Wilson, county surveyor of Lanarkshire, and at the afternoon session by Mr. C. S. Sherriff, chairman of the Scottish Accident Prevention Council.

The conference and exhibition were arranged to make the work of the Road Research Organisation better known to Scottish road engineers, and to obtain from them further information on problems and difficulties peculiar to Scotland. In his opening remarks in the morning session, which was devoted to road materials and methods of road construction, the director of road research, Dr. W. H. Glanville, stressed the need for developing sympathetic understanding and co-operation between the practising engineers, who apply the results of research, and the scientific workers in the laboratory: he explained that the new laboratory would begin as a small organisation; but he hoped it would grow as the problems to be attacked were disclosed and as its

usefulness was proved; it would not be a small-scale replica of the main laboratories near London, but would have a character of its own, developing to meet the special needs of Scotland. On the 'materials' side it would be equipped to carry out the basic tests and measurements relating to the study of soils and to the use of stone, bituminous materials and concrete; but its initial function would be to provide Scottish road engineers with a centre of information about the activities of the Road Research Organisation.

The three papers at the morning session dealt with soils, concrete and bituminous materials, and were given by the officers in charge of these sections of the work of the Organisation, Mr. D. J. Maclean, Mr. F. N. Sparkes and Dr. A. R. Lee. Mr. Maclean dealt with the physical properties of soil and its behaviour as part of the road structure, notably with the performance of different types of roller for compacting soil, with the settlement of embankments, with improvements in soil stability by the use of cement and other materials, and with studies of the structural failure of roads; he gave special attention to peat as being a soil of particular importance in Scotland. Mr. Sparkes described studies made in the laboratory of the materials used in making concrete—aggregates, sands, and cements—and their proportioning to produce concrete mixtures of the desired strength and workability; he dealt also with the testing of concrete both as laboratory specimens and road slabs, the development of suitable joint filling and sealing compounds for concrete roads, and the study of the efficiency and mode of operation of concrete mixers, vibrating equipment and other forms of constructional plant. Both Mr. Maclean and Mr. Sparkes dealt with the Organisation's laboratory and field researches bearing on the problem of the 'design' of road pavements, that is, the determination of the minimum thickness of pavement required on a soil of known bearing-power to carry a given volume and weight of traffic.

As a problem of particular application to Scotland, Dr. Lee dealt with the carrying out of satisfactory surface-dressing work in inclement weather, describing the laboratory work on the adhesion of bituminous binders to roadstones in the presence of water, and the field studies on the determination of the correct rates of application of the binder and on the improvement of binder adhesion by the treatment of the stone. Other investigations dealt with more briefly were concerned with the study of binder oxidation and with the determination of the combination of the constituents—aggregate, sand, filler and binder—in a bituminous surfacing mixture to make the best use of locally occurring materials.

In the discussion, Mr. Burnett, the Ministry of Transport divisional road engineer for Scotland, and Mr. Barry, county surveyor of Ayrshire, laid stress on the importance of studying problems arising in the construction of roads on peat, Mr. Burnett being also interested in the possibility of soil stabilization in the construction of roads in the Highlands. Mr. Robertson, county surveyor of Dumfriesshire, felt that most Scottish problems were the same as for the rest of the country, but desired more information on typical Scottish soils; he supported Dr. Lee in favouring tank spraying of the binder in surface dressing, but wanted smaller units with better manoeuvrability for Scottish conditions. Mr. Murray, county surveyor of Wigtownshire, pointed out that

more local authorities owned their own quarries and plant and used direct labour in Scotland than in England, and he felt that researches on plant would be useful.

In opening the afternoon session, which was devoted to road safety and traffic flow, Sir Patrick Dollan quoted figures showing the serious nature of road accidents and welcomed the present attack upon this problem by the Road Research Organisation. Dr. Glanville explained that whereas the Materials Group had been in being more than fifteen years, road safety research was quite a new venture; much of the subject was complicated and statistical in character, and the great need was for facts instead of opinions. The laboratory at East Kilbride would at first add to the information obtained by the parent laboratory but would deal with problems peculiar to Scotland as they emerged.

The three papers at the afternoon session dealt with road layout and traffic problems, with vehicles and skidding, and with statistical aspects; they were given respectively by Dr. R. J. Smeed, deputy director (Road Safety), Mr. G. Grime and Dr. F. Garwood. Dr. Smeed pointed out that a proper understanding of road safety must necessarily involve a detailed study of traffic behaviour in relation to road layout. He described the various forms of traffic counter and vehicle-speed measuring device the Laboratory was developing, and summarized some of the results obtained by parties of observers working in and near London. As a smaller investigation which had already yielded results of practical value, he instanced the work with models on pedestrian crossings; this had shown the superiority of longitudinal alternate black and white stripes 1 ft. in width over various other ways of marking the road surface.

In discussing vehicles, Mr. Grime dealt in detail with the problem of dazzle in night-driving as a major cause of accidents: field investigations had shown that low-mounted pass lamps could illuminate an adequate length of road only if they were tilted upwards in such a way as to cause dazzle to oncoming drivers. As a consequence of a survey conducted by the Laboratory with the help of police authorities, new regulations dealing with the mounting of pass lamps would be introduced by the Ministry of Transport next year. In dealing with skidding, Mr. Grime described the apparatus and method used for making routine road tests for local authorities, and summarized briefly the more fundamental work being carried out on the mechanism of skidding and on the influence of road slipperiness on road accidents.

Dr. Garwood dealt largely with methods proposed for studying the statistics of personal injury accidents to be supplied by the police according to the scheme outlined in the final report of the Ministry of Transport's Road Safety Committee. He appealed to local authorities for their co-operation in obtaining additional statistical material.

In the discussion, Mr. Bruce, city engineer of Glasgow, suggested that parked vehicles were often a contributory cause of accidents. Mr. Whyte, of Stirling Highways Committee, suggested that figures might show that certain types of bus were more accident-prone than others, due to causes inherent in the design. Dr. Fiddes, of the Department of Forensic Medicine, University of Edinburgh, stressed the importance of the personal factor in accidents, and felt that an inquiry would be useful into the value of various types of propaganda.

At the conclusion of the conference, the members inspected the exhibition of work in progress at the Road Research Laboratory. The impression left by the proceedings was that a useful step had been taken towards an objective which is regarded as a vital one in all branches of industry at the present time, and which was stated by Sir Henry Tizard at the British Association meeting at Brighton as being that of "applying what is already known". It was evident also that the characteristics of soil and climate peculiar to Scotland would provide many interesting problems for the Scottish branch of the Laboratory.

RADIOACTIVE AND STABLE ISOTOPES FOR RESEARCH PURPOSES

AFTER the announcement of the starting up in August 1947 of the British low-energy pile, known as G.L.E.E.P., at the Atomic Energy Research Establishment at Harwell, numerous inquiries were received regarding the availability of radioactive isotopes for research purposes. The Ministry of Supply has now issued a statement showing the present position, both with regard to radioactive isotopes already produced at Harwell or now available in Great Britain from American sources, and also with regard to separated stable isotopes and mass-spectrometer facilities at present available for research purposes in Great Britain.

Production of Radioactive Isotopes at Harwell. Radioactive isotopes have now been produced at Harwell for some months in the low-power pile in order to provide for the immediate needs of research workers in science and industry. The average number of samples of radioactive material made in the last few months has been about 120 per month, of which about two-thirds have been for users outside the Establishment, and the production from the small pile is now nearing its maximum.

The slow neutron flux available in the pile for isotope production is of the order of 10^{10} neutrons/sq. cm./sec., and the pile is run continuously at high power for about sixty hours each week. Standard irradiations are made in the core of the pile, where there is a mixture of fast and slow neutrons. The thermal column is also available and provides nearly pure thermal-neutron fluxes of about 10^7 – 10^8 neutrons/sq. cm./sec., with some gamma background. The specific activities of isotopes produced by (n, γ) reactions can be calculated approximately from the published tables of activation cross-sections¹. At the present early stage, it is not possible, however, to guarantee the exact specific activity of any individual sample irradiated, since the neutron flux varies considerably according to the position of the sample in the pile during irradiation.

As an example of the specific activities attained, samples of sodium-24, potassium-42 and bromine-82 have been prepared having specific activities of the order of 2.0, 0.3 and 2.5 mc. per gm. of element. These isotopes have up to the present been the most useful to biological workers in Great Britain, particularly since the short half-lives preclude their import from the United States. A much greater variety of elements has been irradiated for physicists

and chemists. Isotopes resulting from (n, p) reactions or from β -decay chains, particularly phosphorus-32 and iodine-131, are also prepared in small quantities, either carrier-free or with high specific activities. At present, however, the demand for these separated isotopes far exceeds the supply.

In order to make the best use of the limited slow-neutron fluxes in this low-power pile, users are encouraged to have preliminary discussions of any unusual problem with the Isotope Information Office at Harwell. All allocations of radioactive isotopes are made subject to the approval of the Isotope Allocation Committee (see below).

For irradiations of any material in the low-power pile, a standard handling charge of £3 3s. (or £2 2s. for repeat orders) is made for each four-week period or part thereof, and there is no charge based upon activity. For separated isotopes, which are nearly carrier-free, it has been found convenient to fix charges equivalent to those made for the same material by the United States Atomic Energy Commission, except that when the quantity available is limited some reduction of the handling charge is made.

When the larger pile at Harwell begins to operate at full power, ten to twenty times higher neutron fluxes will be available, and the conditions in the pile will be such that the specifications of the materials available will be very similar to those published by the U.S. Atomic Energy Commission². It is expected that the quantities of isotopes produced will be sufficient to meet all expected demands for scientific, industrial and medical purposes in Great Britain.

Some radioactive isotopes, particularly when they are short-lived, will be distributed directly from the Establishment at Harwell. Where, however, production involves chemical extraction or where subsequent processing or synthetic work is necessary, the processing, packaging and distribution will ultimately be undertaken by the Ministry of Supply Radiochemical Centre at Amersham; a statement on the services to be provided by the Radiochemical Centre in the distribution of both natural and artificial radioactive substances will be issued in the near future.

Facilities for Neutron Irradiations at Harwell. It is possible to irradiate small quantities of material in the pile, including some biological materials. Particulars of the neutron flux available and other relevant details are given above. These irradiations are usually carried out along with the preparation of isotopes.

Availability of Radioactive Isotopes from the United States and Canada. The U.S. Atomic Energy Commission announced in September 1947 that radioactive isotopes were being made available for medical, biological and scientific research purposes in foreign countries. Arrangements were accordingly made by the British Government under which the Ministry of Supply is able to purchase certain isotopes to supplement those being produced at Harwell. Small quantities may also be purchased from the Canadian National Research Council.

In order to comply with Treasury requirements on expenditure of dollars and with the arrangements made with the American authorities, requests for these isotopes must be sponsored by an appropriate authority: for medical and biological research, and for therapeutic uses, the Medical Research Council (inquiries to the Secretary, Medical Research Council,