

THE HISTORY AND RESEARCH RESULTS OF THE EAST AFRICAN
FRESHWATER FISHERIES RESEARCH ORGANIZATION FROM
1946 - 1966

Continuous research on the freshwater fisheries industry in East Africa, in common with most other African countries, did not commence until the end of the Second World War in 1945. Before the war some work on the fishes and hydrobiology of the lakes of East Africa had been undertaken by a series of scientific expeditions, which were sent out from Europe, between the years 1896 and 1939. These expeditions usually lasted for only a few months, and the collected data were published by young graduates and undergraduates, including such people as Mr. L. C. Beadle, (lately Professor Beadle of Makerere), Mr. V. E. Fuchs (now Sir Vivian Fuchs) and Mr. E. B. Worthington of Gonville and Caius College, Cambridge. Later Dr. Worthington became Scientific Secretary to the Scientific Council for Africa, Scientific Secretary to the East African High Commission, and played a very large part in the furtherance of fisheries research and management in East Africa.

Whilst subsistence fisheries using traditional gear were well established, the commercial fishing of the Tilapia with gill nets in Lake Victoria first started in 1905 at Port Florence (later called Kisumu) in the Kavirondo Gulf. By the early 1920's a very large commercial fishery based on gill nets had been established in the Kavirondo Gulf, and also at various points along the northern shore of Lake Victoria. The extent of the fishing effort was such that catches in the nets commenced to drop from the high level experienced at first, and concern was being felt as to possible over-fishing of the stocks and the need for control and regulation of the fishery.

Accordingly, in 1927, it was arranged by the Governments of East Africa that a naturalist on the staff of the United Kingdom's Ministry of Agriculture and Fisheries should come to Victoria Nyanza in order to study the problem of the Tilapia fishery and report to the Governments concerned. This naturalist was Mr. M. Graham, afterwards Director of the Fisheries Laboratory at Lowestoft, who came to East Africa in 1927-1928. He spent some six months on the lake using a large tug called the SS. Kavirondo (100 ft long overall, with a beam of 21 ft), chartered from the Kenya and Uganda Railways. Using this vessel, Mr. Graham and his assistant, Mr. Worthington, undertook a complete circumnavigation of the lake and conducted experimental fishing at many points along the coast and also in the centre of the lake. Large numbers of fish specimens, many of them new, were collected for identification and description at the British Museum (Natural History).

Mr. Graham's report, published in 1929, contained a very large quantity of extremely useful data and observations, so much so that his Report is still in general use as a work of reference on the subject to this day. Among other observations, Mr. Graham discovered that the commercial Tilapia were not in fact one species, the Tilapia variabilis of Boulenger, as had previously been supposed, but were in fact two species, one altogether new, to which he gave the name of Tilapia esculenta. He discovered that over-fishing of the Tilapia stocks did, in fact, occur at places where the fishery was of most value, i.e., in those waters adjacent to markets and means of communication, such as the Kavirondo Gulf, the northern shore of the lake, the Sesse Islands, etc. He recommended a number of regulations, notably the prohibition of the use of any nets under a mesh of 5 in. stretched, and also made a number of recommendations in connection with the continuation of research, and the collection of statistics designed at developing and managing, what he then realised was an extremely valuable and important fishery.

These recommendations were accepted in principle by the Governments concerned, but due to the economic depression of the 1930's and later the outbreak of the Second World War, their implementation was delayed. These ideas persisted, however, being kept alive particularly by Dr. Worthington, who, during his experience on the Cambridge expeditions and on Lake Victoria with Mr. Graham, fully appreciated their importance.

In 1944 Dr. Worthington, whilst on duty in the Middle East, was asked by the British Government to prepare a memorandum on the subjects of research and management in the freshwater fisheries, and during that year, and in 1945, paid several visits to East Africa, when ideas were crystallized during discussions with interested parties. In October 1944 a conference of delegates, representing the three Territories, was held to discuss Dr. Worthington's memorandum. This conference strongly supported the formation of firstly a Freshwater Biological Research Station, and secondly, a Lake Victoria Fisheries Board. It was recommended that the research station should be sited at Jinja in Uganda, and that it should be financed by a grant from the newly formed Colonial Development and Welfare (CD & W) Fund, which had been established in 1940 in order to meet the developing needs of the colonies in the post-war era. The proposals were supported by all three Governments and were agreed to by the Secretary of State for the Colonies, so that shortly after the armistice the sum of £115,000 was made available under a CD & W scheme No. R.71 for the construction of a research station at Jinja and its running costs for an initial period of five years. A large area of land on the shore of the Napoleon Gulf was provided by the Uganda Government and building commenced in 1946.

The Lake Victoria Fisheries Board, now known as the Lake Victoria Fisheries Service (LVFS), was initiated in 1947, but the Chief Fisheries Officer was not appointed until 1948 and the Service did not get under way until 1949. Its function was to supplement EAFRO's hydrobiological research by consolidating fisheries development over the whole lake, particularly in the spheres of experimental fishing, processing, the collection of catch statistics, and marketing data. In addition the LVFS was to integrate and enforce any legislation imposed on the industry, but the utter impossibility of enforcing different national fishing regulations over such a wide area finally led to its disbandment in 1960.

During 1947, the first Director arrived in Jinja to take charge of the infant research station, which was called the 'East African Fisheries Research Organization' (EAFRO). The Director was Mr. R. S. A. Beauchamp, who, on coming down from Cambridge, had founded the Freshwater Biological Association (FBA), and also had had previous experience on hydrological surveys on Lakes Nyasa and Tanganyika. Apart from himself, founder members of the EAFRO were Miss R. H. Lowe, who upon graduation had spent two years on Lake Nyasa studying Tilapia, and who came to Jinja in 1947. Mr. S. H. Deathe, who was the first Field Officer, Mr. C. C. Cridland, Mr. G. R. Fish, the Algologist, and Mr. W. W. McDonald, the Entomologist, all of whom joined EAFRO before the end of 1948. In 1950 Mr. P. H. Greenwood, a student obtaining post-graduate experience on a CD & W grant, arrived at Jinja, to assist with taxonomic work on fishes. The final completion of the buildings took place in 1949, and in early 1950 the organization was formally opened by Sir John Hall, Governor of Uganda, but research work had by then been in progress for some eighteen months.

The early work of the Organization had to concern itself with laying a foundation of basic facts, many of which are today so well known that it is difficult to visualize a period when they were completely unknown. Firstly, identifications had to be made of all the fish species, and particularly those of commercial value. Most of these had been described previously on the basis of specimens collected by expeditions during the past half century, but were virtually unknown

in the field, being known only from a few type specimens in various museums. An enormous amount of work had to be done, therefore, in identifying species in the field, finding the local names, collating this information, and making it available so that species could readily be identified. During this period, for example, from the whole of East Africa some 20 species of Tilapia, all of more or less commercial importance, were identified and their habitats listed. A start was also made on the taxonomy of the extremely difficult and almost completely unknown species flock of Haplochromis in Lake Victoria. A considerable amount of work had to be done on the basic life histories of the Tilapia and other indigenous species, and such commonplaces of today as the migrations and breeding habits, the occurrence of mouth brooding, the use of nursery areas by juveniles, fecundity and rate of production, feeding habits and digestion etc., were worked out and made available in a series of papers and annual reports.

Similarly, fundamental work was done and many of today's basic facts discovered, in fields other than fish biology, for instance in invertebrate zoology and limnological and physiological fields. In 1950, as a result of work on the Tilapia nilotica of Lake George, the proposition first appeared that, in the algal-eating Tilapia, only a small proportion of the algae consumed was actually digested and of use to the fish; much of it passing right through the fish unused. Collections of plankton, aquatic insects and molluscs had been made and sent away for identification, so that by 1951 first lists of these members of the fauna and flora were appearing in print. The use by various fish of the flora and fauna for feeding was at the same time being determined, and in particular, work on the important insect groups, the Chironomidae and Chaoborinae, was well advanced, and their prime importance as food for mormyrids and many other species of fish established. Identification of their larval forms continued, their density in the mud ascertained, and the growth rates of larvae and their relative abundance in the stomachs of insectivorous fish determined.

In the hydrological field, by 1951 a great many measurements had been made, and the chemical composition of water samples from Lakes Victoria, Albert, George and Edward determined. Much work was done on the growth of algae in water media of various chemical compositions, together with fertilizing experiments and investigations into the rate of sedimentation of phytoplankton in various lake areas. From all this work developed the well-known theories later propounded on the productivity of tropical waters, the influence of the rate of decay of organic matter on productivity, and the various factors operating to limit productivity and rates of gross biomass growth. Although these theories were to come later there had already (in the Annual Report for 1951) appeared for the first time the oft-quoted observation of the Director that "Lake Victoria is many lakes within a lake".

Such was the position at the end of 1951, when the CD & W Scheme R.71, with its additions and supplements came to an end. From the discussions and negotiations which took place consequent upon this, the principle emerged which has been followed ever since; that while the United Kingdom had, through the Scheme financed EAFRO entirely, from thenceforth it was, and still is, financed by equal contributions from the three East African countries (50%) and the United Kingdom (50%). Throughout the life of the Organization money has always been "tight"; never, in the opinion of its Directors has there been enough to carry on sufficient expansion of its research activities. Nevertheless there has always been enough to keep its complement of scientists going, albeit often with insufficient facilities to carry out their research work. Two examples of inadequate funds for large expansion may be quoted here, both of which had far-reaching consequences upon the Organization's policy for the next decade.

The first was the decision not to establish a sub-station at Kigoma on Lake Tanganyika. The first meeting of the East African Inland Fisheries Research Advisory Committee, held in July 1949, had recommended (mindful of the concept of EAFRO conducting research on all East African waters) that a sub-station should be established at Kigoma in order to carry out research work on Lake Tanganyika and neighbouring waters, and that the sum of £40,000 be allocated from British funds for this purpose. The application for this additional sum was however refused the following year. From then on, the policy of EAFRO, unlike its younger sister the Joint Fisheries Research Organization of Northern Rhodesia and Nyasaland, which adopted the substation system almost from the outset, was to keep its officers solely at the Jinja headquarters. Any research elsewhere was, and still is, done on an expeditionary basis, safaris being undertaken usually by motor vehicle, and the data collected being returned to Jinja to be worked up. Not till a decade later did any officer spend some considerable time away from headquarters, when Mr. E. L. Hamblyn spent six months at Butiaba on Lake Albert to study the Nile Perch in its native habitat.

The second example was the inability of EAFRO, already felt in 1951 and only now being remedied, to purchase a fisheries research vessel large and seaworthy enough to conduct work in the open waters of Lake Victoria. For reasons of economy, the only craft the Organization has ever possessed were two wooden boats, both purchased for the ludicrous sum of £850 for the two from East African war surplus material in 1947. In 1967, these same two craft, built in 1939, were still the only fisheries research vessels in the Organization's possession, though both have been so rebuilt that little if any of the original fabric of either remained. One is an open boat only 26 feet long; the other is a seaplane tender of hard chine, narrow beam, planing design, intended for use in harbours and totally unsuitable, even definitely dangerous, for open water work. Efforts by succeeding Directors to find the money for a seaworthy fisheries vessel (the needed money rose to an estimated £24,000 in 1961) all failed until the era of international aid for developing countries commenced in the 1960's.

The result of these two examples of funds being inadequate for costly expansion was to restrict the Organization's research field to Uganda and particularly the sheltered waters around Jinja, such as the Buvuma channel, the Napoleon Gulf, Pilkington Bay, etc., with an occasional shore-hugging expedition to other sheltered waters such as the Kavirondo Gulf. Although there was no lack of research material, in spite of the restricted area of study, the situation did later earn for EAFRO the unfair gibe of being the "Napoleon Gulf Fisheries Research Organization" rather than one, as was the original intention, for all the inland waters of East Africa.

This, then, was the position in 1951, when the capital cost of constructing the station, equipment and recurrent expenditure had been met wholly from British funds for five years. The next decade, to 1961 when there was a break in the Organization's activities, must now be considered.

The work of EAFRO during these ten years falls into three aspects, all happening concurrently. The first, and in many ways the most productive, was the continuation of the biological and hydrological research, much of it fundamental and "pure" in nature, which had been started with the Organization. The second was experimental fisheries work, mainly on Lake Victoria. While a great deal of valuable data were gathered, the latter project was not very successful. This was partly due to the inadequate research vessels employed to carry out the exploratory survey, although the lack of suitable facilities was to some extent offset by active cooperation with the LVFS. Partly also due to the premature collapse of the two government-backed commercial fisheries for administrative reasons, which discouraged emphasis on further experimental fisheries projects. This third aspect, which took some

time to develop, was the controversy with the Uganda Fisheries Department, over the desirability of removing net mesh size restrictions from the Lake Victoria fishery and the desirability of introducing non-endemic fish species to the lake.

To discuss these three in order, it can be said that the ten years, 1951-61, saw the EAFRO establish its reputation as the premier hydrobiological research centre in the whole of tropical Africa, and well known in hydrobiological circles all over the world. This was due to a series of very fine pieces of work by successive research officers and visiting scientists, together with the analytical mind and flair for descriptive writing of its first Director presiding over all, during his office tenure from 1947 to 1960.

To the early work of Fish (1948-1955) on fish digestion and respiration and also limnology, was added the limnological work of Mr. B. S. Newell (1956-57) and Dr. J. F. Talling of the FBA (1960-61). Fish had shown how Lake Victoria annually becomes thermally stratified into two layers and that the lower layer becomes depleted of oxygen; moreover, these two layers are not static but at certain times oscillate. Newell enlarged on these observations with an excellent paper in 1960 on the hydrology of Lake Victoria, including work on currents and drifts. Talling, who first visited Jinja in 1954, and later with Mrs. I. Talling, stayed a whole year in 1960/61, published a series of papers on hydrology and phytoplankton, which are standard works of reference.

With regards to fish biologists, the doyenne of these was Mrs. Rosemary McConnell (née Lowe) (1948-1953), whose papers on the ecology and distribution of Tilapia form so much of the basis of our knowledge of this, the most important genus of fish in tropical Africa; even now no study on Tilapia is ever published without reference to her work. Greenwood (1950-1957) provided another indispensable work of reference in his "Fishes of Uganda" first published in 1955, but is better known to the world for his brilliant series of papers on the taxonomy, anatomy and evolution of fishes. Mr. D. J. Garrod (1956-1961) as well as working on the ageing and scales of fishes, provided the first studies on the population dynamics, recruitment and mortality of the heavily fished Tilapia stocks of the Pilkington Bay and Kavirondo Gulf areas. Cridland (1948-1962), the longest serving of all EAFRO staff, while working mainly on molluscs, contributed very valuable work on the young of Tilapia. Dr. G. Fryer (1956-1959) made valuable contributions on the biology and life histories of Tilapia variabilis, T. zillii and the anadromous Labeo victorinus; though better known for his excellent work on freshwater crustacea, both free-living and parasitic. Finally, Dr. P. S. Corbet (1954-1956), though primarily a freshwater entomologist, with an interest in dragonflies and mayflies, made very fine studies on the feeding habits and foods of various local fish species.

Invertebrate work was undertaken, as previously mentioned, by Cridland, Corbet and Fryer in their own fields, following on the early work of MacDonald (1945-1952). Many important contributions were also made by visiting scientists, such as Dr. N. E. Hickin (1954) with valuable work on the immature stages of Trichoptera, and Prof. A. Tjonneland (1955, 1957-1959) on rhythmic emergence of aquatic insects, as well as the biology of Chaoborus and other aquatic Diptera. Papers on material collected by the Organization included those on Trypanosomes and dactylosomes, molluscs, Ephemeroptera, Gyrimidae, Lepidoptera, etc.

Three visiting scientists made outstanding contributions to African hydrobiology at this time. These were Dr. G. S. Carter (1952-1953), who afterwards published a paper on papyrus swamps, now a standard work; Dr. H. B. Cott (1952, 1954), who published another standard work on the biology and natural history of crocodiles; and Dr. P. R. Hesse (1951, 1955). Dr. Hesse studied the bottom muds of Lake Victoria, following suggestions made earlier by the Director that sulphates were a factor limiting algal

growth in Lake Victoria and hence lake fertility. His results show that there are only traces of sulphur in the water, although there are large quantities in the protein-rich bottom muds, where it is not, as was expected, present as sulphides, but in organic combination. In its natural state, this mud decomposes very slowly, but on boiling or drying it is soon attacked by bacteria and decomposes rapidly. The mud is sufficiently high in protein content to form an acceptable animal food, but the cause of protection against bacterial attack is as yet unknown, although it is thought that it might possibly be an unknown type of antibiotic secreted by an alga rather than a fungus. Dr. Hesse's work, combined with the hydrological evidence, was a great step forward in the knowledge of the basic fertility of tropical lakes.

Lack of space prevents mention of the work of other visiting scientists, though their fields were many and varied. The above account, however, gives an idea of the work done to the end of 1961, and it remains only to consider briefly the new ideas, and new basic concepts, brought forward and mentioned for the first time by the Director and his staff as a result of this work.

Some of these new concepts have already been mentioned, e.g., the selective digestion of algae by Tilapia; the phenomenon of the highly fertile, undecomposable, protein-rich deep layers of flocculent mud covering much of the bottom of Lake Victoria, and the Director's observation that "Lake Victoria was many lakes within a lake." But there are many more. Another aphorism of the Director, that "Lake Victoria may be likened to a miser hoarding up his gold"; referred to the ceaseless rain of dead algal, plant and animal material, falling to the lake bottom, there to remain undecomposed. All this living matter had grown and therefore extracted nutrient from the lake waters, but as it does not readily decompose the nutrients are in effect lost to the lake. The work of Fish, Newell, Hesse and Talling had shown that little nutrient is added by rainfall and river inflow, so the general picture is one of declining fertility. Later this concept was enlarged to include the proposition that in tropical lakes the fertility and productivity is governed by a cycle of growth, death, decay and return into circulation of the nutrient substances, and that in the tropics this cycle is a relatively rapid process. However, plant material is broken down by decay more slowly than animal material, so the more phytophagous animals (Tilapia, hippotomai, Chironomidae, etc) to convert plants into animal products, the better the rate of turnover.

It was Beauchamp who first pointed out that the factor limiting the production of Tilapia in Lake Victoria was not food, nor living space, but the limited areas available for nursery grounds for the young fish in the lake littoral; much suitable habitat was overgrown with papyrus and other swamp vegetation. If this vegetation could be cleared the natural production of Tilapia should increase. Greenwood, who provided much of our basic knowledge of evolution, studied the "species flocks", describing aggregations of closely related, recently evolved fish species discovered amongst the Cichlidae in Lake Victoria and in other waters, amongst the Clariidae in Lake Nyasa, amongst the Mastacembelidae of Lake Tanganyika, and elsewhere. It was Lowe (McConnell) who, also in 1954, first put forward the proposition, later developed by Fryer and others, that fish are isolated in the same water body by reason of their very strict adherence to a particular habitat, thus clearing up much of the controversy as to whether sympatric or allopatric evolution took place in these lakes. Fryer also contributed much to modern evolutionary thought, and vigorously defended his theory that, so far from the presence of the active predators Lates and Hydrocynus retarding evolution, as first propounded by Worthington and supported by Lowe and others, the presence of predators in general, these two no less than any other, actually accelerated the evolutionary process.

This short account of the achievements of EAFRO up to 1961 in the

hydrobiological aspect of its work, must be left there and two other aspects considered. These were, on the whole, less fortunate and rewarding and can be dismissed more briefly.

During the whole of the period under review, active experimental fishing had been continued with the two available boats, mainly using gill nets but also trawls, firstly under Deathe and later under Mr. J. D. Roberts. These experimental fishings, while providing material for research in the laboratory, also indicated where profitable fishing could be carried out. However to the disappointment of many, the whereabouts of vast new stocks of Tilapia could not be demonstrated; for the simple reason that these did not exist. On the contrary, it was the Organization's duty to point out that existing stocks were being heavily overfished. For this, like all harbingers of bad news, EAFRO received little thanks and much criticism, but was soon able to demonstrate, as a result of its preliminary experimental fishing, the existence of other potentially valuable fisheries in deeper waters based on Bagrus docmac and Mormyrus kannume. Perhaps, possibly because of criticism, EAFRO released its results too early and before adequate experimental fishing had been undertaken. But be this as it may, two government supported commercial ventures were started, based largely on catch-data made available by the Organization, and also from Government sources outside EAFRO control. Both ventures came to grief.

The first enterprise started in 1949 and was essentially a deep-water gill-net fishery, based on Dagusi island, and planned to exploit the open-water Mormyrus stocks which EAFRO had shown to exist on an economic scale, but, at the end of 1951 the scheme was closed down as an uneconomic proposition. It was discovered that the catches were only one fifth of those expected, partly due to the migration of fish out of the area at certain times. The loss of weight during drying was very high, and in addition the marketing of the fish was inefficiently organized. It also proved expensive to set up a base camp on Dagusi due to transport difficulties and, to crown all, it was found that a taboo concerning female fertility prevented Buganda and Busoga women from eating the Mormyrus products.

In 1953 the Uganda Development Company attempted to set up a viable industry in the same area. The plan in this case was to trawl particularly for Bagrus and Mormyrus and to process these two species by kippering, while the Haplochromis in the catches were to be converted into fishmeal. A suitable trawler, together with dryers, ice plants, workshops, etc., were purchased for installation on Dagusi and a manager (Mr. Deathe, late of EAFRO) appointed. But there were long delays in the delivery of equipment. Catches of the principal species were also not as high as expected, and the quantities of processed product required for economic success were higher than calculated, so that at the end of two years it was decided to close this second enterprise.

These two failures were characteristic of many schemes started with high hopes in the immediate post-war period, the prime example being the Tanganyika groundnut scheme. All the failures had two common basic causes; firstly, enthusiasm and eagerness to make up for the years of depression and war leading to schemes being started on a grand scale with insufficient background work being undertaken. And secondly, failure to take into account in costing, that shortages caused by the war would rapidly be made up. In nearly every case, more of the end product would have to be sold than at first considered necessary, at a relatively lower price (prices of everything were rising exponentially during this period of boom and inflation), whereas necessary imports of materials for the scheme would have to be bought at relatively higher prices.

In common with other parts of Africa, where similar schemes had been tried and had failed, there was no further attempt to start other large

commercial enterprises and fishing was entirely in the hands of the small private fisherman, who had no high overheads and who was being armed with ever improving fishing gear and facilities: firstly with synthetic twine nets, taking larger catches and lasting longer; secondly with ever improving marketing and other facilities enabling the catch to be sold more speedily; and thirdly with motorised fishing vessels, allowing fishing further afield and quicker transport to market.

The result of these improvements was to boost catches enormously, and to increase the attractiveness of fishing as a trade, so that the number of individual fishermen increased greatly. By 1955 the over-fishing of Tilapia stocks was serious in the traditional areas of Pilkington Bay, Kavirondo Gulf, etc., and fishermen began to undercut each other by using smaller meshed nets.

Thus began the third aspect of EAFRO activity in this decade. Its attempts at maintaining minimum mesh regulations on the Lake Victoria fishery and at discouraging the introduction of non-endemic fish, resulted in years of controversy, partly with the Tanganyika Fisheries Department, but more particularly with the Uganda Fisheries Department. Basically, this arose from the totally different viewpoints of both EAFRO and those of the Chief Fisheries Officers with regard to the exploitation and management of the natural resources. EAFRO favoured a careful approach, proposing limitation of a mesh size ensuring that the only fish caught were old enough to have spawned once, and suggesting that the preservation of local species should be paramount to the advantages of the introduction of exotics. To the Fisheries Departments, however, the need to catch as many tons of fish as possible was paramount, overriding all other considerations; thus if an exotic was thought to be edible or productive, it should be introduced, regardless of the claim of the endemic species for protection against competition.

The latter view has in the history of mankind always been the popular one, so it is not surprising that EAFRO, despite vigorous and often acrimonious argument, lost its battles one by one. The work of Garrod and the experimental fishing had shown dangerous diminution of adult Tilapia stocks. EAFRO, the Kenya Fisheries Department and the LVFS were against abolition of mesh restrictions, but the Uganda and Tanganyika Fisheries Departments were both in favour and were aided also by the political state of East Africa in the late 1950's, when the Colonial Governments, under constant attack from nationalists, were disinclined to enforce laws which might prove unpopular. The head of the LVFS, whose duty it was to enforce fishing legislation, was in an impossible position; in law the use of small mesh nets was forbidden, but nets of any mesh could still freely be imported and sold. So the minimum legal size was progressively reduced and finally abolished, and immediately the catches of small-sized Tilapia began to flood the markets. EAFRO warned that such action would lead to an eventual diminution of the Tilapia breeding stocks and would bring the industry to the point of collapse.

Fisheries circles outside East Africa, who had viewed the combat with keen interest in view of their own similar problems, now waited for events to show which of the two antagonists was right. What did happen, however, was totally unexpected by everyone. The climate of tropical Africa entered a wetter cycle. The level of all lakes rose many feet higher than previously recorded so that, by the end of 1961, Lake Victoria was more than seven feet higher than previously ever known. This rise had the effect of providing a natural conservation of Tilapia stocks, which immediately responded. The flooding of the marginal regions firstly provided new and larger areas of suitable spawning and nursery grounds, resulting in a greatly increased spawning and survival rate. Secondly, these areas amongst trees and other flooded vegetation were naturally protected against seine netting, thus spawning could proceed unmolested. Catches, which had been falling, immediately rose, so that the years 1961-1965 were characterised by extremely high catches. There is evidence to indicate, however, that this pluvial cycle will be

of comparatively short duration, making it likely that in the future the lake level will fall again and the old problems will be reimposed upon the fishery.

With the introduction of exotic Tilapia species from 1953 onwards, EAFRO, with some misgivings, observed the effects of T. zillii, T. nilotica, T. leucosticta and T. melanopleura upon the environment, but made no protest until it was proposed by the Uganda Fisheries Department in 1955 to stock lakes Kyoga and Victoria with Nile Perch (Lates), a project which had been mooted from time to time in the past. The argument submitted was that these large predators would feed upon the economically valueless Haplochromis species, converting them into more easily usable protein, and that a sport-fishery industry might develop. EAFRO opposed the introduction firstly, on the grounds that there was a danger that the Nile Perch might feed on Tilapia and thus adversely affect the stocks of these valuable fish, and secondly that the impact of a predator of this stature on a complex aggregation of species that had evolved in the absence of a voracious predator might threaten some of the endemic species with extinction.

In this materialist age, however, the threat of extinction of "non-commercial" species was not considered of much importance and so the controversy rested on whether or not the commercial valuable Tilapia stocks would be adversely affected. In 1959 it was decided that EAFRO should study the Nile Perch in relation to its proposed introduction into Lake Victoria, paying particular attention to the fish in its native habitat of Lake Albert, and comparing this with the situation in Lakes Kyoga and other non-endemic waters, where Nile Perch had already been stocked. In 1960-1961 a temporary substation was set up at Butiaba, where Hambllyn concentrated on Nile Perch. However, before his investigation was completed, one Nile Perch was caught in Lake Victoria just above the Ripon Falls in May 1960 and another in Hannington Bay in November of the same year, but how Lates gained entry into Lake Victoria is still a matter for speculation. Shortly after 1960 the Uganda Fisheries Department stocked a large number of Nile Perch in the lake at Entebbe.

So the decade 1951-1961 ended. In May 1960 the first Director, Mr. Beauchamp retired and was replaced in September by Dr. V. D. van Someren, previously Senior Fisheries Research Officer in Kenya. In general, the subsequent period was one of change. The LVFS, after its years of sterling work, was disbanded in 1960 and, soon after, the same fate very nearly overtook EAFRO. (The title was changed to the "East African Freshwater Fisheries Research Organization" in 1960 to avoid further confusion with the Marine unit "EAMFRO" based in Zanzibar).

The new era was one of great political change; colonial rule ended and the three East African countries embarked on Independence. These developments had inevitable repercussions on the research institutions. There was much social and political unrest, there were many burglaries of houses, net thefts and so on at Jinja (so much so that we find EAFRO working on net theft prevention devices), and travelling also became difficult. As a result of these difficulties the new Director was increasingly led to believe that research on a regional basis was becoming unfeasible, and that research should be concentrated even more than before in the Jinja locality. Thus more fish culture and experimental work on cross breeding and physiology of Tilapia was initiated. A number of large aquarium tanks were ordered, and van Someren made strenuous efforts to change the name from "Fisheries Research Organization" to "Fisheries Research Laboratory", to indicate his change in policy.

Consequent upon Independence the research staff left one by one on retirement, no replacements were recruited and the Director died unexpectedly in March 1962, an event the more tragic as he was due to leave on retirement in June. The Organization, left in charge of field

officers, ran on a care and maintenance basis, and for some time its continued existence was a matter of some doubt. During these dark days, one particularly regrettable event took place, and that was the destruction of many of the old files and records of the Organization.

That the Organization survived at all was due in large measure to the energy of Professor C. M. Yonge, of Glasgow University, who stimulated an urgent programme of recruitment of new scientists. As an interim measure in September 1962, he sent out from Glasgow Mr. D.B.C. Scott, to hold the fort for one year. Four research officers were recruited in the subsequent 12 months, and the new Director, Mr. P.B.N. Jackson arrived on secondment from Zambia in March 1963. Thus the Organization and its research programme began to get under way once more.

The work of EAFFRO for the next four years, mid 1963 to mid 1967, was concentrated in the field of applied biological research on fishes of economic importance. This policy partly resulted from the previous arguments that EAFFRO had been criticised for being too "academic" in its research approach, and partly because none of the research officers at the time were specialists in other hydrobiological fields.

The fishery work itself fell into three parts. Firstly, continuation of the work started in the previous era on commercially important fishes, including Tilapia, Haplochromis, the Mormyridae and Labeo victorinus, and secondly a full-time watching brief of the biology and effect on endemic species of the introduced populations of Tilapia and Nile Perch (Lates). The third part involved research into fisheries far removed from Lake Victoria. For the first time since 1954, EAFFRO acquired a new motor vehicle in 1964, and safaris were started to investigate and report on the remote fisheries of Lakes Rudolf, Rukwa, Kitangiri and the Tana river.

In addition an attempt was made to enlist the support of international aid in order to strengthen the work of EAFFRO. Two items were urgently needed. Firstly a modern seaworthy trawler/purse seiner to explore the fishery potential of Lake Victoria, which was not possible with the two old boats. Secondly, it was necessary to have a statistical and economics research service, partly to make good the gap caused by the disbandment of the LVFS, and partly to integrate the economics and marketing of the freshwater fishery industry over the whole of East Africa. In theory the national Fisheries Departments were now to collect statistical data and send them to EAFFRO for processing. But in practice this did not work well since no additional staff were provided, and with the exception of Tanzania, they forwarded data irregularly. In addition when Garrod departed, EAFFRO had no staff with the necessary mathematical experience to process the data.

By this time the Lake Victoria fishery had become, though large, one of the lesser known and more unmanaged fisheries and it was necessary to try to put this right. Similarly the entire freshwater fishing industry of East Africa, though very much larger than its marine counterpart, had grown up haphazardly, so that there was great lack of coordination and uniformity in marketing, distribution, cost structure, etc.

For these reasons the Director, towards the end of 1963, initiated negotiations towards the formation of a United Nations Special Fund project to strengthen freshwater fisheries research in East Africa. A working party, comprising representatives from all three countries and EACSO personnel, met in Nairobi in September 1963. As a result of this meeting a detailed project was drawn up with the agreement of all concerned, embodying the desirability of strengthening of research in the biological and statistical fields. By the end of the year, the project was in a form suitable for submission to the United Nations,

and by October 1964 approval had been obtained from each of the three Governments for the additional expenditure required. The Project was ratified by the Governing Council of the Special Fund in January 1965. The construction of a new wing to the laboratory building, one of the scheduled East African counterpart contributions to the Project, started in mid 1965 and was completed in early 1966. There was, however, some delay in the final agreement to the Plan of Operations. This document was the subject of much discussion and negotiation between the three national governments, EACSO, the UN Development Program (as the Special Fund was now called) and the Food and Agriculture Organization (FAO). The Plan of Operations was finally signed by all members in January 1967.

The Director completed his period of secondment from Zambia in February 1965, but returned to Jinja in May 1965 having been appointed Project Manager Designate of the UNDP Lake Victoria Fisheries Research Project. In January 1967, Dr. J. C. D. Watts was appointed EAFFRO's fourth Director to lead a full complement of Research Officers.

His arrival marked the 20th anniversary of the Organization's establishment, which, as well as being one of the best known tropical Africa fisheries research institutions, was one of the very few to survive the political stresses and strains of the early 1960's. Other centres in former British administered territories, such as the Joint Fisheries Research Organization and the West African Fisheries Research Institute, were disbanded by the colonial governments concerned (not by the independent governments), while only few centres in the Belgian and French administered territories have survived. However, for EAFFRO, by 1967 such upheavals seemed happily a thing of the past, and it is on the traditions and research foundations which have been built up during the past 20 years that it continues with its task.

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