

LAKE KARIBA FISHERIES RESEARCH
INSTITUTE

PROJECT REPORT NUMBER 68⁶⁹

1991 ANNUAL REPORT

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DEPARTMENT OF NATIONAL PARKS AND WILD LIFE MANAGEMENT

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1. ACTING OFFICER-IN-CHARGE'S REPORT

(a) Institute Finances

The financial situation for the year 1990/91 was such that most planned activities were undertaken within the fund. The fund for 1990/91 was \$795 000 and will be \$890 000 for 1991/92 financial year.

(b) Staffing and Staff Training

(i) **Junior Staff**

One of the 4 general hands Paul Mwera who filled vacant posts in June 1990 joined the Natural Resource College at Mushandike as a Cadet Ranger. It is hoped that upon completion, he will be absorbed elsewhere in the Department as LKFRI will not have a Ranger post for him.

The position of the two vacant posts for Scouts (I/II) are frozen in terms of The Treasury Circular No.5 of 1991, Reference A/26/4 dated 20 August, 1991. Scout I Obert Chidamba (EC No. 105542T) resigned from his post with effect from 1 January, 1992 after eleven years with the Department at this station.

Mrs Farai Gapara attended the following computer training courses during the course of the year:

- i) Creative Word Perfect and
- ii) Introduction to Word 5.

Mr Nyaude sat for examinations leading to a Certificate in Administration.

Mr Masireta spent three months at Lake Chibero with National Parks Vehicle Maintenance Unit receiving basic training in Car Maintenance.

(ii) **Senior Staff**

LKFRI has since regained its technician post which Mr. Nyamhanza had transferred with to Mushandike. Mr. Nyamhanza resigned following a failed attempt to come back to LKFRI. His post was advertised in the local press and interviews were carried out with the short listed prospective incumbents. Once in place, the technician has the challenge of maintaining LKFRI's increased fleet of vehicles and vessels which since Mr. Nyamhanza's departure have been left to the care of very expensive garages in Kariba.

Mr Nyaruwa was transferred to Mushandike to take up a lecturing post there while Mr. Wilson Mhlanga filled the post left vacant by Mr. Nyaruwa. Mr Mhlanga is currently in the UK doing an MSc course in Applied Hydrobiology at Cardiff in Wales. Mr Songore, after a successful completion of his nine months Diploma Course in Fisheries Science, took up a MSc course with Humberside College.

Mr Mukome was supposed to sit for Part D, CIS but could not on grounds that he was not ready for the Examinations. Senior Staff Meeting in December expressed concern about such practices and resolved that in future no one should enrol and fail to sit for their examinations on similar excuses.

Miss Sanyanga enrolled for a split PhD programme with the University of Stockholm. Her project is based on the biology of Synodontis species with the aim of including this species among the exploited species. Data collection is underway and Miss Sanyanga spent three months in Sweden completing the necessary registration requirements.

Miss Chifamba completed a MSc course in Fisheries Biology and Management at the University College of North Wales. She is continuing her work on post recruitment studies on kapenta Limnothrissa miodon in Lake Kariba. Her programme of data collection which commenced in 1989 continued through 1991 with the assistance of her colleagues at LKFRI. Since her return in October she resumed conducting that same programme.

The author continued his data collection for his pre-recruitment ecology of kapenta project. This project was registered for a split PhD and the candidate had the opportunity of consulting his supervisor in The Hague during a recent International Ichthyology Congress there.

While not on the LKFRI Senior Staff Mr Karengu spent three months entering data from the Lake Side experimental station into the computer. He is going to analyse these data for his M Phil with the University of Bergen.

Training abroad in Fisheries related topics for lengthy periods comes to an end with Mr. Mhlanga and Mr Songore's completion of their studies. At that stage all senior technical staff would have received training up to MSc level. The quality of work by those who have completed their training reflects that the training has been very valuable. Further training after MSc take the form of split PhD programmes where candidates spend most of their time at LKFRI with short annual visits to their respective colleges. This is the case with Miss Sanyanga and the author.

As expressed in the 1990 report the need for a Fisheries Economist remains a priority. Within the SADCC Fisheries Development project due to our lack of a fisheries Economist only the Zambian counterpart will be able to participate in the forthcoming economic appraisal of the fishery.

(c) Staff Housing

The house at Baobab Ridge was completed and the Fisheries Biologist Mr. Helge Paulsen employed on a two-year contract under the Zambia/Zimbabwe SADCC Fisheries Project moved into the house. There is a dire need for a guest house to accommodate the several visiting project staff who are coming to the Institute under various programmes related more to the SADCC Fisheries Project.

(d) Institute Expansion

There is no indication up to now as to when funds will be made available for the construction of the new Institute at the site above CMED workshops in Kariba.

Tender arrangements for the construction of a pre-fabricated block of offices and laboratory at the present site were not successful. Grounds have been cleared in preparation and funds were made available under the NORAD/DANIDA funded programme but no move could be done pending completion of tender procedures. The main Institute Office block was rehabilitated. Prefabricated divisions between most offices were replaced with brick walls with the exception of one between the Library and the Officer-in-Charge's office. The intention was to remove that division and enlarge the Library with the hope of moving the Officer-in-Charge to the proposed prefabricated offices. All the other offices were also fitted with new ceiling and painted.

Plans are underway for the construction of a sub-station at Binga following the approval by NORAD/DANIDA of \$400,000 for this purpose. The station is meant to comprise a guest house for officers, one for junior staff, an office, a laboratory and storeroom.

(e) Vehicles and Vessels

The arrival of three vehicles, a Toyota 5 tonne truck, a Toyota Land Cruiser and a Hilux twin cab has gone a long way in solving the transport problems previously experienced at this station. These were purchased under the NORAD/DANIDA sponsored programme. The other station vehicles ran with regular minor problems except for the Daihatsu pick-up which had starter problems for sometime and had to be off the road for quite sometime.

The Pelican Research Vessel ran well during the period. It had to be taken out of water by the Hudson Brothers for hull painting and repairs on propellor. This follows recommendations by Mr. Brasted after he did a thorough inspection of the Pelican. The second phase of repairs on the Pelican will be done in the first half of 1992.

Construction of the new vessel by Morrison Brothers which was commenced last year is far behind schedule. Several lame excuses have been provided by Morrison Brothers but Mr Brasted is convinced that its a question of workshop mismanagement. The

engine, echo-sounder and radar which were ordered from abroad under the NORAD/DANIDA funded programme arrived in time but were also fitted behind schedule. Up to the end of 1991 the boat had not yet been delivered. This has set back a lot of other programmes that were to be undertaken. The contract for construction includes a clause for a 10% penalty on total cost for late delivery of the vessel. This will have to be instituted. The smaller vessel Mcheni ran satisfactory during the year. It was used mainly for extension work.

Serious delays have also been experienced with the building of two 6m run-about boats by GDI Ltd. At one stage they had completed building the body of one of the boat but because wrong welding rods had been used it was necessary to break up the boat and rebuild. Delivery of two boats is now expected in February 1992 but there is no guarantee that this will be so.

(f) Fisheries Management

Fish poaching has reached unprecedented levels. LKFRI gill-nets were targets for theft. Although a lot of nets were confiscated, a lot of poachers paid deposit fines and more anti-poaching exercises were carried out the problem is far from being solved. Some kapenta fishermen have also resorted to stealing fresh kapenta and selling it before landing. Drying racks have been found in the bush and some people were apprehended. Recordings of tiger fishes as by-catch have dropped tremendously which serves as a clear indication that the fishermen have resorted to selling these fish instead of surrendering the same to their respective companies.

In answer to a call by some hoteliers along the shoreline in Kariba, Leisure Bay was closed to fishing. The noise in the night resulting from fishing operations was the main cause of this. In the past companies had been requested to fish 2 km away from the tourist resort areas or to put silencers on their engines but to no avail. Since the closure of the bay a few fishermen have violated this regulation leading to them paying deposit fines whenever apprehended.

One of the major problems faced by our Department's Management Division in their anti-poaching exercise is lack of equipment such as boats and vehicles. To alleviate this problem LKFRI has made a vehicle, the research vessel Pelican and dinghy available to the Management Division from time to time during the course of the year. Funds to the tune of \$120 000 were also made available for the rehabilitation of a boat at Lake Chivero donated by the Police to National Parks. This boat will be used for carrying out intensive anti-poaching patrols on the Lake. Every patrol in the past that has led to the confiscation of nets resulted in periodic reduction in poaching. So it is hoped that with a boat assigned to anti-poaching only we will curb on poaching drastically, especially in the Sanyathi Basin (Sanyati Gorge, Nyaodza River etc). In addition to these measures there are certain cases where the fishing community is being asked by the Local Authorities to assist in the anti-poaching exercises. This is the case with fishermen operating along the Bumi basin shoreline who are requested by the Nyami Nyami Wild

Life Trust to assist by reporting anybody who is not registered in their respective fishing camp to National parks, Police or Nyami Nyami Wild Life Trust. Nyami Nyami also wishes to reintroduce the issue of tags, so that each net is marked on either end by a tag. The practice did not work in the past because there was no mechanism of replacing lost tags. Their idea now is to let the village committee keep extra tags to replace lost ones. According to this set-up, any net found without a tag will be confiscated by the committee and handed over to the Nyami Nyami Wildlife Trust. This will restrict people from using more than the stipulated number of nets. All tags lost will be recorded and regular checks on all the nets in a fishing ground will ensure that such lost tags do not surface somehow. If they do corrective measures such as confiscating of the said nets and repossessing the tags for destruction or later use. If the Nyami Nyami experience works then the introduction to other areas could go a long way in curbing unlawful fishing on the lake.

g) Cage Culture Project

Due to the rising demand from many quarters to go into cage culture, a proposal to study the potential and environmental impact of cage culture in Lake Kariba was prepared and presented to SAREC for funding in 1990. The results of this study would give the guidelines towards the development of a sustainable aquaculture production system. The study was carried out for three weeks in October, 1991, and the following factors were investigated:

i) Production

-fish growth, feed conversion ratios and production potential

ii) Environmental Impacts

A: Chemistry

-Sedimentation rates of organic materials, phosphorous and nitrogen
-Characteristic of the sediment e.g. oxygen consumption, nutrient content, organic compounds and nutrient exchange between water and sediment phase.

B: Fauna and Flora

-Abundance of demersal fish and megafaunal invertebrates.
-Benthic macrofauna and flora

iii) Ecological - economic

-Provision of technological and economic background information necessary for the development and management of Aquaculture.

At the time of the study, Willards had 15 cages (9 x 35 m³ and 6 x 13 m³) in the Lake and the study was carried out under these cages.

h) The 1991 Kariba International Tigerfish Tournament.

While the event took place as planned for 1991 it seemed to be a disappointing year in that complaints of the scarcity of tigerfish were reported. This could be related to the heavy fish poaching in areas like the Sanyathi Gorge which was reported above under Fisheries Management. This 1991, tigerfish tournament event was attended by 360 teams. ULTRA LIGHT CLUB won the trophy for the heaviest catch.

An attempt by the Fisheries Biologist Mr Helge Paulsen (Employed by NORAD under the Zambia/Zimbabwe SADCC Fisheries Project) and Jeppe Kolding (an Associate Researcher from Norway) to estimate predation of kapenta by tigerfish was not successful. Their intention was to examine the composition of stomach contents and estimate the abundance of kapenta preyed upon by tigerfish. They had, however, overlooked the fact that the fishermen "ground baited" tigerfish by throwing in large quantities of kapenta before and during the tournament. Thus from stomach contents one could not work out what had been taken in through a normal hunt (which is what they wanted) or what had been taken from the ground bait.

i) Re-organization of Some Inshore Fishing Camps

Intense discussions took place regarding the relocation of fishermen at King's Camp to another site, preferably in the Gatche Gatche Bay. Presentations were made to both The Committee of Management Meeting in October 1991, and Parks Board meeting of November 1991. This issue could not be resolved easily as the fishermen strongly resisted the move to relocate them. They see no reason why the Irvin and Johnson (Pvt) Ltd lease on the area they are fishing along the Matusadona Parks shoreline cannot be renewed to them following its expiry in December 1990. To complicate the issue further, the fishermen are organized into a co-operative and they view our intention to move them as a move on our part to destroy co-operatives. This is contrary to the Government policy of promoting such enterprises. This very sensitive issue requires the full co-operation from The Ministry of Community and Co-operative Development. LKFRI was advised to proceed with caution as this issue calls for very careful handling.

PROJECT CO-ORDINATOR'S REPORT

ZAMBIA/ZIMBABWE SADCC FISHERIES PROJECT (LAKE KARIBA)

PROGRESS REPORT - JANUARY TO DECEMBER 1991

1. GENERAL

The Project has now been officially running for one year. Considerable achievements have been made during 1991 although there have been a number of setbacks brought about by factors outside the control of the Project Management.

Chief amongst these were the delays in release of funds by the responsible ministries in the Governments of Zambia and Zimbabwe to the executive departments. Funds were transferred from NORAD to both Governments soon after the last Annual Meeting held in March 1991 but they were not released to the Zambian Department of Fisheries until June and LKFRI did not receive funds until October. In the case of Zimbabwe, the delay was attributable to the requirement by the Zimbabwe Ministry of Finance that a constitution had to be drawn up for the administration of the new Project fund and this had to be ratified by parliament. Although the late issue of funds was inconvenient for both the Zambian and Zimbabwean wings of the Project, all formalities have now been attended to and the system for transference of funds from the donors to the responsible ministries and thus to the departmental accounts is operational.

Despite the problems with funds, the Project has made considerable headway in a number of areas and some note-worthy achievements have been made. These include :

- i) The establishment of a joint Zambia/Zimbabwe computerised fisheries data-base and the preparation of a lake-wide catch and effort data recording system (CEDRS) which is scheduled to replace the current systems in January 1992
- ii) The solution, through a series of workshops, of internal problems affecting the kapenta fishing industry in Zimbabwe and the initiation of a programme of dialogue between the commercial kapenta producers and the Department of National Parks which has led to an agreed programme for permit redistribution.
- iii) The training of scientific, administrative and technical staff to a level which will enable them to better fulfil their respective roles in the Project.
- iv) The production of a number of reports on various issues relating to the management of Project and the fisheries of lake Kariba. (10 Project documents have been produced to date)

2. WORKSHOPS AND MEETINGS

A number of workshops and working group meetings have taken place during the course of 1991

Research Meetings

During the first week of September 1991, a meeting was held at LKFRI to discuss the fishery research activities of the Project and to decide upon the priorities of the programme. All available fisheries research staff from both Zambia and Zimbabwe were present together with the Project's fisheries biologist, the management advisor (Zambia), and a fisheries specialist, Dr Erik Ursin from the Danish Institute for Fisheries and Marine Research. A report recommending required activities to the end of 1992 has been prepared. The major recommendations were for the collection and synthesis of all available data on kapenta (length frequency and catch effort) in time for a three week working session in March 1992 (to be directed by stock assessment experts from DIFMAR) and for the collection of all inshore fishery data for a similar exercise in September 1991.

A follow up 2 day meeting was convened on 21 and 22 October with the purpose of putting all the proposed research programmes into a management context. The meeting was chaired by the Assistant Director (Research) from DNPWLM and attended by all members of the Project involved with research. The findings of the above meetings together with the recommendations from the DIFMAR advisor are in the process of being compiled as a single report.

Appraisal and Planning Workshop

Immediately following the September research meeting, the Annual Project Review Workshop was held at the Lake View Inn in Kariba. Dr Hasan Moinuddin was appointed in as facilitator for the workshop. During the first part of the workshop, the Project's performance during the previous year was reviewed and each output was evaluated in turn.

The appraisal revealed that, although good progress had been made in some areas, notably the establishment of a unified data-base and the training programme, many components of the Project were behind the schedule set at the Planning Workshop held in the previous September. This was thought to be attributable largely to the setting of overambitious targets during the previous planning session and to the overestimation of time availability of both senior and junior staff.

However, slow delivery of essential equipment, failure of contracted boat builders to complete their contracts on time and the delays in issue of Project funds to the executive departments were also contributory factors.

The second part of the workshop concentrated on the preparation of workplans and for the 18 month period from January 1991. The workplans were finalised after the workshop and budgets relating to the workplans have been drawn up.

Kapenta Producers Workshops

In the week following the Planning and Appraisal Workshop, the Project organised a workshop on conflicts within the kapenta industry. Selected operators from large and small companies, district councils and cooperatives within the industry were invited and the workshop was facilitated by Dr Hasan Moinuddin. The report on the workshop with recommendations for a follow up programme was prepared and circulated to all participants and to other interested parties.

The feedback from the workshop was so positive that the Project organised a follow-up series of meetings in November, again using Dr Moinuddin as facilitator and negotiator, which culminated in a meeting between the members of the Kapenta Producers Association and DNPWLM to discuss the issue of permit reallocation. Despite the different priorities and perspectives of the two sides, an amicable agreement was reached and agreed minutes were drawn up which are to be submitted by DNPWLM to the Minister for Environment and Tourism for adoption and implementation.

3. LAKE-SHORE PLANNING STUDIES

The complete set of reports on the Zimbabwe Lake-Shore Planning Study conducted by J.M. Hutton Ltd were submitted to the Project at the end of October 1991. This was later than had been agreed but the consultants pointed out that the dynamic nature of development in the lake-shore area resulted in additional work in order to ensure that the reports were as up to date as possible. An evaluation of the report will be made in early 1992.

6. FISHERIES DATA-BASE

Considerable progress in this project output was made during the third quarter of 1991. The data-base consultant, Villi Thorsteinsson was based at LKFRI from the beginning of July to the end of September 1991 and during this period he worked closely with the data-base managers, Rudo Sanyanga (LKFRI) and Justin Lupikisha (DoF).

A computerised data-base has been set up at both LKFRI and DoF and a large amount of data has been installed. At DoF all catch/effort data from the Zambian artisanal fishery from the present back to the early 1980s has been entered. At LKFRI all catch effort data from the kapenta fishery from the present back to 1985 has been entered. A number of scouts have been taught how to enter data and the transfer of data from forms to data-base is continuing.

Two reports have been prepared to date :

1. A report on the evaluation of catch and effort data recording systems for LKFRI (Zimbabwe), DoF (Zambia) and the Frame Survey of Lake Kariba.
2. The proposed catch and effort data recording system for LKFRI (Zimbabwe) and DoF (Zambia) for the inshore fishery of Lake Kariba.

5. CONSTRUCTION OF NEW VESSELS

The construction / rehabilitation programme for research vessels and workboats is about six months behind schedule and this has had a negative effect on the progress of a number of Project activities.

The new LKFRI research vessel "Aquarius" should have been ready for launching and sea trials at the beginning of July but the latest communication from the builders (Morrison Bros of Kwekwe) is that the vessel will not be completed until January 1992. The delays are attributable entirely to poor planning and time management by the yard, as all the equipment and fittings were supplied in good time by the Project.

The boat-building supervisor, Robert Brasted, was scheduled to conduct the final land inspection and sea trials on the vessel in October 1991 but, because of the construction programme is still behind schedule, his visit has been delayed until January 1992.

GDI Ltd in Harare was contracted to construct and fit out 2 aluminium work boats for the Project. Construction was delayed for a number of months because of a lack of argon gas in the country. The latest news is that one of the hulls has been constructed but incorrect welding rods have been used. GDI have been instructed to cut back all the welds to the parent metal and reweld with the correct grade of welding rod. A welding expert from Oxyco or Aluminium Industries is to be called in to certify this remedial work.

6. SOCIO-ECONOMIC COMPONENT

Both Jeremy Jackson from CASS and Dolf Noppen from the Nordic Consulting Group attended the September Appraisal and Planning workshop.

Agreement has been reached on both the content and timetable of the CASS input and a draft contract and terms of reference has been drawn up. As the nature of the association between CASS and the Project is complex some difficulties have been encountered with the preparation of the contract and NORAD have requested some amendments to the draft. These are currently being attended to.

It has been agreed that CASS shall be responsible for 5 activities, namely:

Advise the Project on socio-economic issues

Conduct a base-line study

Supervise in-depth studies

Monitor socio-economic change in the Project area

Establish a socio-economic data-base

A proposal that the Nordic Consulting Group be appointed to serve as a backstop to CASS was rejected by the Steering Committee, partly because of the high cost and partly because it was felt that the level of participation envisaged by NCG was inappropriate.

7. TECHNICAL ASSISTANCE

Mr Helge Paulsen from the Danish Institute for Fisheries and Marine Research joined the Project in January 1991 as Fisheries Biologist. He has been working with Project staff in a number of research areas and has also undertaken some individual studies which were considered to be of immediate relevance. These include studies on the contribution of predation to total mortality of kapenta and the relationship between kapenta and zooplankton distribution. He has also been given the responsibility of liaising with Zimbabwean and Zambian staff to ensure that data is processed in time for the two technical workshops scheduled for 1992.

Mr Jeppe Kolding from the University of Bergen joined the Project in September as a research associate. He was based in Kariba up until the end of November during which time he worked with Laurence Karengé (his research student) on the entering and analysis of over 25 years of experimental gill net data from Lake Kariba.

Mr Kolding's skills in the fields of population dynamics and stock assessment have enabled him to provide valuable assistance and advice to Project staff and it is hoped that his association with the Project will continue.

Mr Villi Thorsteinsson (data-base consultant) was based in Kariba from the beginning of July to the end of September 1991. During this period he worked closely with the data-base managers, providing on the spot training and assisting with the preparation of a report on the current CEDRS and 1990 frame survey and the preparation of a proposal for the new CEDRS.

Dr Erik Ursin visited Kariba for two weeks in September as part of the contract between the Project and DIFMAR. Dr Ursin took part in a 5 day working meeting to clarify the research needs and priorities of the Project and also participated in the appraisal and planning workshop. He prepared a report which includes recommendations for research activities which should be carried out during the forthcoming year.

8. PROCUREMENT OF EQUIPMENT

Project equipment such as vehicles, boat engines and fittings, computer and office equipment etc has continued to arrive though there have frequently been long periods between placement of an order and receipt of the goods and this has held up Project activities in a number of cases.

The procurement agents Techpro were selected from a shortlist of three partly because of their low tender and partly because they had offices in Zimbabwe, Zambia and the UK. It was assumed that all procurement from Europe would be attended to by the UK office and that the Zambian office would attend to orders for Zambia. In practice all sourcing and procurement has been handled by the Zimbabwe Office. This has meant that Techpro has not been able to offer any great advantage, in terms of time or access to suppliers, over the Project undertaking its own sourcing from Europe.

Most equipment orders have been made through local agents, thus the Project has had to pay both local agent's fees plus Techpro's own fees. All boat fittings etc have been sourced directly by the Project's boat building consultant Robert Brasted and the Project has paid for the time he has spent doing so. In most instances Techpro have been perceived by the Project Management to have merely arranged for transport and clearance (through a separate Zimbabwe company) and to have served as a channel for payment of invoices.

As Techpro recently wrote to the Project proposing a fourfold increase in fees, the Steering Committee decided that it was not in the interests of the Project to renew the contract. The Committee felt that as the Project can use the DNPWLM clearing officer to clear all Project equipment into Zimbabwe and to arrange for "Removal in Transit" documents for equipment to be transshipped to Zambia Techpro's primary role as a clearing agent was redundant.

Serious delays have been encountered in obtaining letters of duty exemption (for importation into Zimbabwe) through MFEPD. Recent requests have been submitted through the Ministry of Environment & Tourism which in an attempt to speed up the process. There is, however, still some confusion as to the correct procedure to be adopted by the Project for obtaining duty exemption on equipment entering Zimbabwe. The matter has been referred to the Office of the President and Cabinet for resolution.

9. STAFF ACTIVITIES

Two LKFRI staff members (Portia Chifamba and Newman Songore) and two members of DoF staff (Peter Kasangula and Vivian Kanondo) were attending overseas courses for much of 1991.

Morris Mtsambiwa has continued with his larval kapenta field sampling programme and has paid a visit to Europe to deliver a paper at an international symposium and meet with

his supervisor. The microscopes and accessories required for his planned otolith studies have been dispatched and he plans to start this component of his work very soon.

The Project Manager (Dr Cecil Machena) has been heavily committed with duties both within and outside the Project. He was appointed as acting Chief Ecologist in September and for the last part of the year has had to spend a considerable amount of time fulfilling this role in Harare.

Dr Machena, together with his Zambian counterpart, made a two week visit to various Scandinavian research institutions during August 1991. Their findings and proposals for the establishment of linkages were presented in a report.

Rudo Sanyanga has spent a lot of time working on the setting up of the data base and has been supervising data entry on the Zimbabwean side. She has also been involved with the supervision of the gillnet programme for the study of Synodontis and comparison of catches from fished and unfished areas.

10. PROPOSED ACTIVITIES FOR 1992

i) Hydro-acoustic survey of Lake Kariba

Torfin Lindem from the University of Oslo has been contracted to set up a long-term hydro-acoustic monitoring system of Lake Kariba's kapenta stocks. He will visit Kariba for a two week period in January 1992 during which he will set up and test equipment, install the HADAS system on the computers in Zimbabwe and Zambia, run a preliminary survey and train selected staff to conduct the surveys, enter the data and interpret the results.

Following this installation and training programme the Project will conduct lake-wide surveys throughout 1992 with the objective of mapping changes in distribution pattern and measuring seasonal variation in the biomass of the standing stock of Kapenta.

ii) Detailed economic survey of the Kapenta Industry

Mr Andrew Palfreman of the Humberside International Fisheries Institute and Mr Jarle Løvland of the Norwegian Institute for Fisheries and Aquaculture have been appointed to conduct an in-depth analysis of the economics of the kapenta industry of both Zambia and Zimbabwe. They will start their 6 week consultancy in January 1992.

iii) Socio-economic research and monitoring programme

It is hoped that the contract between the Project and CASS can be approved and signed early in 1992. Amendments are currently being made to the draft contract and CASS are

in the process of amending their budget to cover a three year period. As the recruitment of research fellows will take some time, it is likely that the in-depth research studies will not be able to commence until the middle of 1992 but it is hoped that the socio-economic monitoring exercise, which is to be integrated with the new catch/effort data collection programme, can start early in the new year.

iv) Working Group on analysis of all available catch/effort and length/frequency data on Lake Kariba's kapenta stocks

Preparation is underway for conducting a two week working group in March 1992 to amalgamate all available scientific work on Kapenta and to facilitate the production of more reliable predictions of the effects of management procedures on the Kapenta fishery.

The group will be chaired by a specialist from DIFMAR with experience in conducting such working groups and will be attended by all Zimbabwean and Zambian research staff working on Lake Kariba.

A programme for the entry of all available catch/effort data length/frequency data and age data based on otolith studies into computerised spreadsheets and databases in preparation for the working group meeting is currently underway.

v) Bio-economics workshop

A workshop on the bio-economics of the Lake Kariba kapenta fishery which is to be organised in conjunction with the FAO/IFIP project was planned for early November in Kariba. A preliminary survey of the economics of the industry was conducted by IFIP staff in March 1991 and the data collected during the survey was to have been used as a basis for the workshop.

However, in October, IFIP notified the Project that the key presenter was not available and it was therefore necessary to postpone the workshop. It is now proposed to hold the workshop in 1992 after the workshop for analysis of kapenta data and after the completion of the economic appraisal of the fishery.

vi) Working Group on analysis of all available catch/effort and length/frequency data on Lake Kariba's inshore stocks

A workshop for the analysis of all available quantitative data on the inshore stocks of Lake Kariba is scheduled for the second half of 1992. As with the Kapenta data analysis workshop, it will be attended by all Project biologists and will be facilitated by a consultant from DIFMAR. The objective of the workshop is to assess the value for management purposes of available data and identify the areas in which further research is required.

vii) Biological studies

The individual research activities (which have been described in the workplans drawn up at the appraisal and planning workshop) will be conducted as specified in the workshop report.

viii) Re-modelling of the Zimbabwean Kapenta Industry and addressing the problems within the Zambian Kapenta Industry

Following the very successful workshop on 'Conflicts within the Kapenta Industry' and the follow-up negotiations between the KPA and DNPWLM organised by the Project, it is proposed to take advantage of the momentum generated and to encourage the various factions within the industry to cooperate with one another. By providing advisory support when necessary, the Project plans to convene a series of meetings which will lay the foundation for the establishment of single producer's association to which all operators will belong.

In view of the great divergence of views within the industry, the Project will make available a professional negotiator (Dr Hasan Moinuddin) to oversee the negotiations.

ix) Completion of research vessels and work boats

The boat construction supervisor appointed by the Project, Robert Brasted, will visit the Project in January 1992 to complete the inspection of all construction and rehabilitation work, to conduct sea trials and to provide advise on the setting up of workshops and maintenance schedules.

P C CHIFAMBA

TITLE: Evaluation of some components of the Lake Kariba 'Kapenta fishing Unit'

WORK ACCOMPLISHED

An MSc. in Fisheries Biology and Management was attended from 1/10/90 to 30/9/91 at the University of Wales, Bangor in United Kingdom and a project with the above title was carried out.

The objectives of the project were;

1. update information on vessels
2. map out changes in vessel characteristics since the beginning of the fishery
3. determine the importance of gear attributes in determining fishing power
4. determine the change in effective fishing effort between the fishing period 1980 to 1982 and 1988 to 1990.
5. correct historical fishing effort of the fleet for changes in fishing power.
6. predict fishing power of new vessels or modified vessels joining the fishery.

SUMMARY OF THESIS

The role of some vessel attributes in the kapenta sardine, (*Limnothrissa miodon*) fishery on Lake Kariba was determined. The focus was on the size of vessel and nets, the type, wattage and number of lights used to attract fish, use of echo sounder, radio and powered winch, presence of engine, crew size and their experience and method of pay was also obtained. The information was collected using questionnaires distributed to fishing companies.

The importance of each vessel attribute was assessed on data from the major fishing area of the lake, the Kariba basin, for the periods 1980 to 1982 and 1988 to 1990. Comparisons were carried out using fishing power which was the catch of each vessel relative to that of 5 selected standard vessels. Standard vessels were chosen as those which had been fishing in both periods and had not changed their gear.

Three methods were used to examine the relationship between fishing power and vessel attributes. Analysis of variance was carried out for each component to compare the mean fishing power at all levels within each variable. A regression analysis was performed to determine the relationship between each vessel attribute and fishing power. Multiple regression analysis was also carried out to build predictive models and to determine the factors which best predict fishing power. Factors analysis was used to ordinate vessel types and examine any vessel groupings in relation to fishing power.

Factor analysis showed that the most important factor is multivariate and is linked to variables which could be summarized as vessel and bet size. Non mobile vessels of low value, without radios had less fishing power than the other vessels in the fleet. Vessels from the same company clustered on the ordinate plot and had similar values of fishing power suggesting that some unmeasured variable linked to fishing company had a significant effect on catch.

From the ANOVA and Regression analysis the factors which were important in determine catch were length of vessel, height of the net, echo sounder, mobility, the type, number and wattage of the underwater lighting in the 1988 to 1990 fishing period. Though vessel length and net category were most important in the period 1980 to 1982. The models explained between 37.6 % (1981) and 61.2 % (1988) of the variation in fishing power. The high degree of correlation among factors reduced the number of useful variables.

Measured against the 1980 baseline the fishing power of the vessels appear to have been increasing although an alternative but unlikely explanation would be an increase in kapenta stock size. This increase could not be attributed entirely to improvement of the measured gear attributes, since there was also an increase in the power of the standard vessels whose gear did not alter. The fishing power of the standard vessel in 1980 to 1982 had increase in fishing power may have been due to a combination of experience of three companies in kapenta fishing and the use of production incentives in the form of commission pay, bonuses and prizes.

It was recommended to keep an eye on the changes in fishing power of vessels since such changes camouflage any decrease in catches due to excessive effort. Change in gear could be recorded at the time of renewal of fishing permit.

P C CHIFAMBA

TITLE: Comparative study of growth of Limnothrissa miodon (Boulenger) in Lake Kariba

WORK ACCOMPLISHED

Collection of kapenta monthly sampling program has been carried out throughout the year. Most of the data and samples required for this project have so far been collected. Some otoliths have been mounted in preparation for age determination.

Some fish cages for the trials were constructed for growth rate studies and validation of daily growth rate. A site for anchoring the cages has also been identified.

WORK TO BE DONE

Ages of samples of fish from all stations will be determine to enable comparisons of growth rate between sampling stations. This work has been slowed down by the lack of microscope for counting of rings. In addition a microscope with a video monitor which was on order for more than a year that I was hoping to use to facilitate the counting of the otolith had not arrived. It is hoped that it will be delivered soon so that the counting is done more rapidly.

Length based methods will be tried on the length frequency data in order to determine growth rate and other population parameters. The results will then be compared with those from age determination from daily ring count and cage trials.

M.Z. MTSAMBIWA

TITLE: The pre-recruitment ecology of the freshwater sardine Limnothrissa miodon (Boulenger) in Lake Kariba.

OBJECTIVES:

- a) To determine the stage in the development of larvae when ring deposition in the kapenta otolith commences.
- b) To validate periodicity of the increment deposition.
- c) To identify spawning grounds and time for kapenta.
- d) To evaluate the life history parameters (e.g. growth and mortality rates, age at recruitment) for larval and juvenile kapenta.
- e) To undergo training towards a PhD degree during the course of this study.

WORK ACCOMPLISHED:

- i) From February 1991, sampling in the Sibilobilo Lagoon was carried out using a plankton lift net 1.4m diameter at the entrance and 4m deep. The larvae and juveniles were attracted to the net by the use of light just as the adults in the commercial catch are also attracted by light. The use of lights was resorted to after several attempts to capture larvae by towing the same net at different depths of the water column had yielded no results. This indicated that they respond to light the same way the adults do. Throughout the sampling period, i.e. February to December, 1991, larvae were captured proving that kapenta have a long spawning time. Sampling was done at 5 meter depth intervals (i.e. 0-5, 5-10m, 10-15m) and the mean site of fish was found to increase with increase in depth. This was reported in a paper presented to the seventh International Ichthyology Congress in The Hague in August 1991. The captured larvae and juveniles were measured for length only and otolith for age determination were removed from some of the specimens and mounted on slides. The equipment to count otoliths increments has not yet arrived and as a result processing of the specimens ends with the preservation of otoliths on slides pending the arrival of the necessary equipment.

WORK TO BE DONE

- i) The determination of the stage of ring initiation and the periodicity of ring deposition are still outstanding issues requiring further work. One major requirement is keeping kapenta larvae alive in aquarium for at least 2 weeks. This has been the most difficult

part, since in most cases I have not been able to keep them alive for long enough to treat with tetracycline. Tetracycline is supposed to be absorbed in the otolith on the day of treatment. If the fish is sacrificed after a known number of days and the rings that are deposited during that period correspond with the number of days after treatment then deposition takes place daily. Thus there is still need to evaluate various ways of keeping kapenta alive until validation is achieved.

- ii) While the spawning time of kapenta has been observed to occur throughout the year, the spawning grounds have not yet been identified. From the occurrence of small larvae in the very shallow margins one is persuaded to believe that hatching takes place there. Whether the eggs are spawned there or elsewhere is a matter that required sorting out. Does kapenta lay dermesal eggs or are the eggs laid in the open water?
- iii) Age determination from otolith daily increments will be the main thrust of work following the arrival of the equipment comprising mainly of a compound microscope, 12" black/white monitor, video camera, digitizer and a Mackintosh Computer. In addition to age determination the width of daily rings will be measured to determine the instantaneous growth rates. Wide rings imply high growth rates while the opposite is true for thin rings.
- iv) So far all sampling has been geared to provide what could be considered as qualitative aspects of the study. Work to commence the quantitative investigations will begin in 1992. Sampling will be based on the use of devices that can filter known volumes of water such as towed plankton nets or plankton traps. It has already been stated that lights were used to attract the fish during the qualitative stage of the study following unsuccessfully use of towing nets. To get around this problem in addition to the use of a towed net known as a GULF III sampler (which has been used broadly in the North Sea for quantitative larval surveys) I intend to continue using a lift net and lights but this time with the addition of a hydroacoustic survey. For this purpose, a high frequency (200 kh₂) echo sounder will be required.
- v) As far as the PhD programme is concerned 1991, was spent in the field collecting data. A short consultation with my supervisor was made during the visit to the Hague where he was also presenting a paper. It was agreed that he visits me in the field in January 1992, and I travel to UK in March to June 1992. The purpose of my visit would be to carry out the initial analysis of the length frequency data for the larval and juvenile stages. That visit will also be fulfilling the requirement that I spent 3 months in attendance at Imperial College during my second year.

R.A. SANYANGA

TITLE: The Ecology of The Inshore Fishery of Lake Kariba; The Biology of Synodontis zambezensis.

OBJECTIVES:

- a) To determine the effect of fishing intensity on fish populations by comparing fished and protected areas.
- b) To study biological aspects of Synodontis zambezensis in relation to fecundity, growth rates, feeding habits, natural mortality etc.

WORK ACCOMPLISHED:

Background

This study started in 1989 with the aim of comparing fishing intensity in fished and reserved areas. Explosives were used for sampling the areas. Eight transects were carried out that year before the use of explosives was abandoned. Explosive use was stopped because of the following reasons;

- a) Explosives were expensive
- b) A licensed (in explosives) army diver had to accompany the crew every time they went out which resulted in the sampling being irregular in order to accommodate him.
- c) Furthermore the work of collecting fish after the explosion proved to be a mammoth. Floating fish scattered over a large radius and was worse when it was windy. Birds would also flock to the area to compete with humans. Collecting fish which landed at the bottom was more difficult especially in silty areas. Visibility was often poor and some fish would be covered by silt. For these reasons one would not be sure whether all the fish were collected.
- d) Worse still the method tended to underestimate some of the benthic species i.e the barbel and the bottlenose. This was proved by laying gill-nets in the same area which would be later on exploded.

For all the above reasons a alternative method was sought.

That year 1989 the author left for a one year study leave. An Msc project was done to compare two areas one an unfished and another a fished area (1990 LKFRI annual report). From the results obtained from that short study it became apparent that the Synodontis zambezensis occurred in large numbers at least in those two areas. It also dominated in terms of catch per

unit effort. This prompted interest in the study of the species as a component of the inshore study.

Sampling strategy

The sampling was designed to be in two phases:-

- a) A whole Lake Survey in which Transacts would be Laid along the whole lake shore covering both reserved and fishing areas.
- b) Specialized studies on chosen areas concentrating on the Biology of S. zambezensis.

Multi-mesh monofilament gill-nets are used in all the sampling. The whole catch is used in the Analyses and also in

RESULTS.

12 stations were sampled in 1990. Much of the analysis on this year's data is in progress. However it is obvious that the S. zambezensis is the most abundant of the species caught so far. There are also some indications that fish move from the marginal zones seasonally. This has been linked to breeding seasons.

Another observation is that no juveniles were caught in the samples so far.

WORK TO BE DONE

Next year the sampling would be confined to one area were the seasonality pattern would be followed . Three areas of study are planned for next year

- a) to study the distribution within the water column.
- b) To use traps to study distribution further into the pelagic water.
- c) To sample two areas monthly to try and capture seasonality patterns.

A comparison between multi-filament gill-net catches and the Lundigren catches needs to be done. The data have already been computerized. Also analysis of the depth distribution will be done.

R.A. SANYANGA

TITLE: DATABASE

A: REPORT ON THE COURSE ON INTERNATIONAL DATA HANDLING FOR TROPICAL FISHERIES MANAGEMENT HELD IN THE NETHERLANDS.

This course ran from the 7th of January, 1991 to the 15th of February, 1991.

The course included elements of collection, processing and presentation of catch, effort and biological data. The first week of the course comprised of the introduction to PC use and application programs which were going to be used during the course. These were:-

- a) Lotus 123.
- b) PC-Cardbox
- c) Slide graphics
- d) Dbase III and
- e) Statistix (sx) ver.3.1.

The second element of the course dealt with spatial and temporal variation on catch and effort data. Concepts in remote sensing and aerial surveys were included as a way of mapping out a fishery. Exercises were carried out to calculate variation and uncertainty in catch and effort data. Examples from participants own situations were used. I regarded this part of the course relevant to our situation and the methods of mapping likely to be used in the long term.

The third element covered catchability and gear selectivity. Emphasis was made on gear selectivity of gill nets and trawls. This element was interesting and easily applicable to Lake Kariba where gill nets are used. Lectures to reconstruct a population structure given length frequency and gear selectivity data, were given.

The fourth element involved aspects of sampling statistics (i.e. descriptive statistics, anova, regression and, random and stratified sampling). This was again familiar. Also covered was the sampling of boats and catches, catch assessment survey and frame surveys. Socio-economics of a fishery and how to acquire key information characterizing a fishery was also covered.

The 5th element given was the analysis of catch and effort data. In this section surplus production and growth models were examined. A lot of exercises were carried out, however we felt that the time allocated was too little such that several issues were not covered in detail. A few length based methods such as Bhattacharya and ELEFAN were practiced. However little was done in this area as it was not directly related to the theme of the course.

The final element dealt with catch/effort data recording systems (CEDRS). The data flow from landing sites The management for each country was examined and the inventory of systematic errors were compiled for each participants" own situation. Also covered were the organization of time, manpower and budgeting for CEDRS. Emphasis in this element was that information flow should be two way between management and fisheries officers.

The course was concluded by presentation of posters by participants to invited fisheries workers. This was the highlight the course. The participant was among the five people asked to present cases to the invited guests.

B: A database has been installed and is in operation at the institute. The program chosen was OA3 (Open Access Version III). The author is in charge of the database. About 20% of the data has been computerized so far. This was done with the help of 4 Hands recruited for the purpose. One of the Hands will stay on as database assistant. Managing the database requires a full-time person.

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