FI:DP/CPR/88/077
Field Document 4
December 1990

PEOPLE'S REPUBLIC OF CHINA

A FISHERIES MANAGEMENT PLAN FOR QUINGHAI LAKE

A report prepared for the project
Fisheries Development in Qinghai Province

by

I.G. Dunn
Fisheries Development Consultant

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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This report was prepared during the course of the project identified on the title page. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the United Nations or the Food and Agriculture Organization of the United Nations concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.

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1 INTRODUCTION AND TERMS OF REFERENCE

The Government of the People's Republic of China, assisted by the United Nations Development Programme and the Food and Agriculture Organization of the United Nations, are engaged in project CPR/88/077, Fisheries Development in Qinghai Province.

As part of project operations, FAO assigned Dr I.G. Dunn as Lake Fishery Management Specialist Consultant from 15 August to 30 October 1989 with the following terms of reference:

The consultant in lake fishery management will be responsible for planning and execution of the investigations on Qinghai Lake, leading to production of an informed management plan for the lake. He will work in close cooperation with the NPD (National Project Director) and the DNPD responsible for the Qinghai Lake work, and will coordinate the work of specialist consultants in water chemistry, fishery information system development, etc. He will also be active in the in-service training programme for national project staff. He will prepare a mission report.

2 ITINERARY AND WORK PROGRAMME

14 August 1989	-	Depart UK for briefing in Rome
17 August 1989	-	Depart Rome for Beijing
18 August 1989	-	Arrive Beijing
20 August 1989	-	Depart Beijing arrive Lanzhou
21 August 1989	-	Depart Lanzhou arrive Xining
23 August 1989	-	Depart Xining for Qinghai Lake
24 August 1989	-	Return from Qinghai Lake to Xining
30 August 1989	-	Visit Qinghai Lake
31 August-2 September 1989	-	Initiation and orientation seminar
13-27 September 1989	-	Cooperation with visiting consultant Mr Smith in equipment specification and ordering
20 September 1989	-	Depart Xining for Qinghai Lake and Puha River
21 September 1989	-	Return from Qinghai Lake to Xining
30 September-8 October 1989	-	Cooperation with visiting consultant computer expert Mr Coppola
10 October-24 October 1989	-	Training course
20 October 1989	-	Visit to Qinghai Lake
27 October 1989	-	Depart Xining for Beijing
27 October 1989	-	Debriefing FAO Beijing
28 October 1989	-	Depart Beijing for Rome
30 October 1989	-	Debriefing FAO Rome
31 October 1989	-	Depart FAO Rome for UK
30 September-8 October 1989	-	Cooperation with visiting consultant computer expert Mr Coppola
10 October-24 October 1989	-	Training course

20 October 1989	-	Visit to Qinghai Lake
27 October 1989	-	Depart Xining for Beijing
27 October 1989	-	Debriefing FAO Beijing
28 October 1989	-	Depart Beijing for Rome
30 October 1989	-	Debriefing FAO Rome
31 October 1989	-	Depart FAO Rome for UK

3. PRESENT STATUS OF THE LAKE INVESTIGATION TEAM

3.1 GENERAL COMMENTS

The selection of the Lake Investigation Team has been accomplished and an adequately qualified and motivated team is now in place. From October this team has been seconded to full-time duties with the project.

The technical assistance inputs have been well serviced and the visiting consultants were able to complete their terms of reference.

The provision of Chinese-English translation has been most satisfactory and the interpreters are to be congratulated on the essential assistance that they have given. The bilingual requirement of the project causes delays - especially with respect to the dissemination of written material.

3.2 PERSONNEL

Under the overall direction of the National Project Director (NPD) and Deputy Directory of the Bureau of Aquatic Products, Mr Chu Benchen, and the National Deputy Director, Mr Yin Baichai, a team has been seconded full-time to the Qinghai Lake Inves tigation work. The list of team members is as follows:

Mr Wang Jiling	-	Team Leader/Senior Engineer
Mr Yang Hongzhi	-	Deputy Team Leader/Engineer
Mr Yuan Yuongguo	-	Assistant Engineer
Ms Hu Chueihua	-	Assistant Engineer
Mr Wan Zhenji	-	Technician
Ms Chen Tanging	-	Technician
Mr Yan Zhongshuen	-	Technician

In addition to the technical team members, staff of the Bureau of Aquatic Production are responsible for administration, logistics and transport for the work of the project programme.

3.3 ACCOMMODATION

Adequate accommodation has been provided for the Lake Team and the technical assistance. This comprises a suite of 8 rooms in the building of the General Extension Station of the Bureau. At present these Include:

TA personnel office and adjoining computer room

Meeting room

3 offices for team members

2 store rooms

Before the start of the main programme of work, in the spring of 1990, a laboratory will be constructed and services installed in the General Extension Station. This will be reserved for use by the Lake Team.

At the lakeside facilities of the Qinghai Hu Fisheries Factory, two rooms have been provided for work and safe storage of the equipment of the Lake Team. Living accommodation of a satisfactory standard has also been reserved for visiting team members.

Adequate basic accommodation on the survey vessel is now being refitted. Thi6 will provide survey cruise living quarters for 5 to 6 team members.

3.4 SURVEY VESSEL

One of the present fleet of wooden trawlers has been designated by the Bureau for refitting as a survey vessel. The vessel has recently undergone hull repairs and some interior refitting. It is stated to be in sound condition. The selected vessel will be refitted with a replacement engine and provided with a stand-alone diesel 13 kVh electrical generator.

Some reconstruction of the deck housings and rehabilitation of the present hold space is currently underway. This will provide improved facilities for long survey cruises, including sheltered deck work space and below deck work/laboratory space.

This work is to be completed by the start of the programme of investigations at the ice-break in March/April 1990. (See Appendix 3 for further details.)

3.5 EQUIPMENT

Basic office equipment is now being provided, and the project vehicles have been ordered.

The computers and ancillary equipment are now installed in the office rooms provided to the team.

A full list of specialist equipment has been completed by Consultant Mr Smith (limnology specialist) and is now in the process of being ordered. It is intended that the major part of this equipment will be on site before the start of the season in March/April 1990.

3.6 ADMINISTRATIVE ISSUES

It is still proving necessary to resolve questions of admi nistrative policy with regard to individual executive respon sibility at the level of the Lake Investigation Team. It is proving difficult to obtain timely action on relatively minor matters of programming, services and equipment.

Attention is being given by the NPD to this problem.

No other administrative issues are of immediate concern. Section 7 considers other questions of organization and admi nistration which should be resolved before the main work of the team begins in spring 1990.

4 PROJECT INPUTS

4.1 TEAM START-UP

This has been successfully accomplished with the provision of working space for all team members in an adjoining suite of offices.

The team members are now actively engaged in a literature search and evaluation, and the preparation of an annotated bibliography.

It was hoped to include this bibliography on a computer data base, but this work is delayed until a suitable data base programme is available.

4.2 TRAINING

The Lake Investigation Team has had two periods of training and orientation during the initial 3 months of the project start-up.

An orientation seminar was held from 30 August to 2 September 1989 in order to provide a comprehensive overview of the state of knowledge about the fisheries, limnology and general lake biology of Qinghai Lake. This seminar was led by the senior staff members of the Bureau and the two sub-project team leaders.

From 10 to 24 September a training course was held at the General Extension Station for some 30 Bureau staff members. This group included the members of the project teams* The course included two field visits, to fish farm pond sites and to Qinghai Lake and the Qinghai Fisheries Factory and its facilities. Details of the training course programme are given in Appendix 2.

4.3 EQUIPMENT INSTALLATION, COMMISSIONING AND USE

Apart from some minor items of office equipment, the major equipment items received on site have been the computers and their ancillaries.

The computers have been installed in a suitable room adjacent to the TA office accommodation and function well although they await some final adjustment to the ancillary disc drive which has, apparently, faulty software. This problem is currently being resolved from FAO Headquarters.

Additional software, appropriate to the needs of the project, is also being sent via FAO Headquarters.

5. PRELIMINARY PROJECT WORK PROGRAMME

Appendixes 1 and 4 provide a programme and timetable for the full four-year development of the investigations on the Qinghai Lake. At this stage the programme must be regarded as a pre-liminary framework as changes in working methods and the emphasis of the investigation will be made in the light of the results obtained and the functioning and availability of the equipment.

It 16 assumed that detailed programmes of work will be developed at the beginning of the work on the lake in spring 1990. These detailed programmes will take into account the current state of the equipment provisions, personnel available, etc.

6. CURRENT PROJECT WORK PROGRAMME

The Lake Investigation Team is currently engaged in the preparation of an annotated bibliography. This work will include an assessment of all the literature presently available in Xining and a list of relevant literature available elsewhere (Work Programme Module 1).

This work will also include the identification and assessment of other sources of information available from organizations concerned with work on the Qinghai Lake and its watershed (Work Programme Module A, Task A/1).

This work will be essentially completed by March/April 1990 for the start of the first period of lake fieldwork.

7 ISSUES TO BE RESOLVED

7.1 PROVISION OF SURVEY VESSEL

It is essential that the responsibilities are carefully defined in order that the necessary work on the designated vessel is completed in time for the beginning of the 1990 season of investigation on the lake (March/April 1990). This issue should be urgently resolved in view of the restricted period available for work at the lake between now and spring 1990.

The major renovations and refitting have been agreed to in meetings between the NPD, TA and the engineers and carpenters who will be responsible for carrying out the necessary works. The appropriate workshop personnel should now receive clear orders as to the work to be done and the source of funds should be clarified. It is understood that the NPD currently has these matters in hand.

This work should be carefully supervised by the NPD or designated team members in order to ensure that the requirements of the survey team are met.

7.2 VEHICLE TRAILERS

In order to provide "off-road" carrying capacity it was decided to provide suitable trailers instead of a pick-up truck; these trailers to be constructed to the required specifications in time for the start of the fieldwork season in March/April 1990.

One trailer will be of a size suitable for carrying one of the 5 m aluminium work boats, and its accessories and outboard motor. A second trailer will be required to carry approximately 250 kg of general equipment.

Both of these trailers should be constructed to allow for a high ground clearance and a suspension suitable for travel off the road. The wheels chosen should be the same size and fitting as the wheels of the towing vehicles in order to reduce the need for carrying additional spare wheels.

It is understood that no decision has yet been made as to the construction of these trailers or whether they should be cons tructed in the workshops of the Fisheries Factory or by outside contractors. These orders and the sources of funds should be finalized as soon as possible.

7.3 ADMINISTRATION OF FIELDWORK

A considerable part of the fieldwork activity will be based on the Qinghai Lake Fisheries Factory. In view of the lack of experience of the factory management and personnel in support of such activities it is requested that the requirements and

responsibilities of the Bureau are clearly stated and conveyed to the factory management.

Although it is anticipated that there will be a minimum of disruption to the work of the factory, there will be a need for occasional priority in the use of berthing facilities for the survey vessel; the need for repair and maintenance facilities on an ad hoc basis; the occasional need for the use of vehicles, etc. In all these requirements the full cooperation of the factory management will be essential.

7.4 LABORATORY FACILITIES

In discussions with the NPD it was proposed to provide a new laboratory in the General Extension Station of the Bureau at the same location as the other office and storage accommodation of the Lake Investigation Team. It is understood that the design and modification of existing rooms will take time and will require the allocation of funds. In view of the need to be prepared to receive equipment and apparatus for storage, com missioning and the training of the team members, it should be noted that the existing, extensive laboratory space and equipment are in the adjacent building and can provide an acceptable facility until such time as the new laboratory is available.

7.5 MOVEMENT OF TECHNICAL ASSISTANCE PERSONNEL

The movement of TA personnel engaged in field work has presented no problems. However, it is apparently necessary to receive permission from the authorities for foreign personnel to visit the north shore of the Qinghai Lake. In view of the need to carry out extensive field work along this north shore and the inflow streams it is essential that long-term, multiple-visit permission is granted to the foreign members of the Lake Investigation Team throughout the period of the project.

Representations to the local authorities should therefore be made before the return of the TA inputs next spring.

7.6 RELATIONSHIPS WITH OTHER ORGANIZATIONS AND AUTHORITIES

Much information of importance to the fishery investigations is available in the records of government and academic orga nizations in Xining (e.g., agriculture development records of the lake area; hydraulic records of the lake and the rivers and streams of the catchment; meteorological statistics; and a considerable body of academic scientific work on the lake and its biota).

A formal approach, at a high level, should be made to the institutions and organizations which may be able to provide useful data or contacts with knowledgeable individuals. In this way the investigations of the team may benefit from work already carried out. On the return of the TA personal contacts can be initiated.

Appendix 1

PROJECT WORK PROGRAMME NOTES

WORK PROGRAMME: Module 1

Data Handling

1. Objectives

This module will be concerned with data collection, the processing of the data and the entry of these data on the computer data base.

2. Implementation

2.1 All relevant information from work already published will bemade easily available for future project work. (Task 1/1)

2.2 Data bases will be set up to incorporate new and existingdata, as these become available or are collected in the field.(Task 1/2)

2.2 Data already collected will be reviewed and, wherenecessary, reprocessed. (Task 1/3)

3. Duration

This module will start now with Task 1 and continue indefinitely.

4 Personnel

All team members will be involved and active. Individual team members may be given specific responsibilities.

5 Working methods

These will be detailed in the task sheets. In general all data and information will be handled in a standardized and compatible manner, where appropriate conforming to FAO style. Data will be recorded, entered on the data bases and processed as soon as possible after collection - where this is appropriate.

6. Equipment

This will be mainly a desk exercise with the use of library facilities. Desk and laptop computers with the appropriate data base programmes will be available for use after training.

WORK PROGRAMME: Module 1 Task 1/1

Bibliography

Please note that this will be entered on a computer data base in due course.

1. What is to be done

1.1 List all known relevant references - both published andunpublished material.

1.2 List locations of published material.

1.3 Make photocopies where possible for project library.

1.4 Review all references, where these are available, andproduce brief annotations/summaries.

1.5 List keywords for each reference.

1.6 Enter references, summaries and keywords on computer database.

2. Working methods

Publications should be read by more than one team member and the summaries and keyword list drawn up in cooperative dis cussions. Any problems should be discussed with senior team members.

The presentation will be primarily in Chinese with parallel translation into English in conformity with FAO standards.

Input to the computer will be in English in conformity with FAO standards.

2.1 Additional materia1

A computer search will be made, through the FAO librarv, to provide a list of relevant publications from the world-wide literature. This will be incorporated into the project biblilography.

3. Duration

This task will start now and go on intensively until March 1990. From April 1990 onwards it will continue for an indefinite period to add material as this becomes available.

WORK PROGRAMME: Module 1 Task 1/2

Construction of Data Bases

Note this work will depend upon the data base programmes that are used. At the moment these are not known and these notes will be revised as more information becomes available.

1. What is to be done

1.1 In discussions the team will decide which data should becollected and for what purposes they will be used. These twoissues must be considered together.

1.2 With help from the TA construct data bases appropriate tothe data type and future recovery needs.

1.3 When the data bases are available and checked, data setswill be entered. These will consist of the existing dataavailable to the team and data collected during future inves tigations; for example: the sampling of the catches from thetrawl nets has been done at least three times and this work willbe repeated to detect any changes. All of these data will beaccessible from the same data base once they have been entered.

2 Working methods

The detailing of working methods must wait for the instal lation of the computers, the establishment of the programmes and the training of the team members. The methods of transferring from Chinese to Computer-English and vice versa will have to be worked out later. This section will be updated in a month or two.

3 Personnel

It is important that all team members are capable of carrying out this task. It will be assumed that they will be responsible for entering the data from their own field work. Individuals may be made responsible for the handling of the data from particular parts of the survey work.

4. Duration

This work will start as soon at the computers and the programmes are ready. After training it is assumed that activities can start mid-October 1989.

The work will be intensive during the first 6 months as the past data are located and entered. It will then be continuous as data come in from the field throughout the life of the survey.

WORK PROGRAMME: Module 1 Task 1/3

Data re-evaluation

1 What is to be done

1.1 Identify data, from all sources, that may be relevant to thework currently being carried out.

1.2 Rework these data according to the needs of the presentsurvey and check for the accuracy of the original worker'sconclusions.

1.3 Where appropriate, these data will be analysed again withthe more modern techniques which are at the disposal of the team.

2. Working methods

These will be the standard methods of data base manipulation which will be learned as part of Task 1/2.

3. Personnel

All team members will be expected to carry out this work as appropriate to their responsibilities.

4 Duration

This work will await the development of the survey. It is anticipated that the team will be in a position to re-evaluate past data by the end of the summer season 1990. This work will go on indefinitely throughout the life of the project.

WORK PROGRAMME: Module 2

Equipment

1 Objectives

Jo make available appropriate equipment in order to carry out the required investigations on Qinghai Lake throughout the project period.

2 Imrlementation

2.1 Selection and specification of apparatus and equipmentappropriate to the local conditions: adequate for undertaking thesurvey as planned; available for delivery within the time limitnecessary; and taking into account budgetary considerations ofpurchase and operating costs. (Task. 2/1)

2.2 Selection of suppliers by comparison of specificationsproposed, delivery times and cost tenders. Ordering of goods.(Task 2/2)

2.3 Delivery and acceptance of apparatus and equipment. (Task2/3)

2.4 Commissioning of the equipment and training of the teammembers in its use. (Task 2/4)

3. Duration

This work programme module will start as soon as possible and continue until all equipment is delivered and commissioned. Target date for completion of all tasks will be April 1990. It is realistic to assume that delivery time may exceed this target date and plans must be made to take these delays into account.

4. Personnel

Selection of specifications and ordering (Tasks 2/1 and 2/2) will be the responsibility of senior project personnel assisted by the CTA and Dr Dunn. Mr Smith (limnology and equipment specialist) will organize these tasks and provide the specialized advice necessary.

Acceptance of the delivery of the equipment (Task 2/3) will be the responsibility of designated team member(s).

Commissioning of the equipment and training in its use (Task 2/4) will involve all team members.

5. Working methods

These will be detailed in the task sheets. In general, care should be taken that the equipment is located where it is required; appropriate arrangements are made for its safe-keeping, care and maintenance; and that it should only be employed by personnel trained in its use.

WORK PROGRAMME: Module 2 Task 2/1

Selection and Specification of Equlpment

1 What is to be done

1.1 Discuss with the Project Director, team members and TA todetermine the equipment needs of the project work programme.

1.2 Investigate the local situation, sampling sites, supportavailable, survey vessel, etc., in order to be aware ofparticular needs and problems.

1.3 In discussions with the Project Director, senior teammembers and TA, finalize item list and specifications.

1.4 Cost estimates will be obtained for the required equipmentto enable specifications to be finalized within budget.

2. Working methods

This work will be mostly administrative and carried out in Xining. Where necessary the field working conditions and practical field needs will be investigated and taken into account. In some cases it will be necessary to obtain specialist expertise, from FAO Rome or elsewhere, before finalizing speci fications .

3 Personnel

This task will be carried out by the senior team members in close liaison with the Project Director and TA (especially Mr Smith).

4 Duration

This work was,for the most part,completed by 15 September 1989, except forspecialized itemsthat required detailed specialist advice.In these cases thework will be completed as soon as possible.

WORK PROGRAMME: Module 2 Task 2/2

Selection of Specifications and Ordering of Items

1. What is to be done

1.1 Suppliers will be requested to provide firm offers againstthe required specifications. These offers will include firmde1ivery times.

1.2 Offers will be compared and specifications scrutinized. Themore appropriate offers will be selected.

1.3 Firm orders will be placed with the suppliers.

2. Working methods

This will be an administrative exercise carried out mainly in xining .

3. Personnel

This work will be carried out in close consultation with the Project Director, the senior teas members and the TA.

4 Duration

This task should be completed by mid-October 1989

WORK PROGRAMME: Module 2 Task 2/3

Delivery and Acceptance of Apparatus and Equipment

1 What is to be done

1.1 Arrangements will be made for delivery of all items to thesites where needed (presumed to be either Xining or thelakeside).

1.2 All items delivered will be checked for damage or dete rioration. Any damages will be immediately notified to theappropriate authorities, agents, suppliers, insurers, etc.

1.3 All items will be unpacked and checked for specifications,agreement with the purchase requests, bills of lading and fitnessfor use.

1.4 Items will be inventoried and securely stored under theappropriate conditions.

1.5 All inventoried items will be notified to the inventoryholder, with location lists.

2. Working methods

This work will be undertaken at the points of delivery from the transport. It will be continued at the site of final delivery for future use.

3. Personnel

It is essential that one individual staff member is made totally responsible for the checking and acceptance of the items. Responsibility for the maintenance of the inventory and the checking out and receipt of equipment in use should be the task of a designated staff member.

4. Duration

This work will begin with the arrival of the equipment. This should start in November 1989 and continue for approximatelv six months. During this time most of the items will be delivered. The task of maintaining an inventory and stock control will continue throughout the life of the proiect.

WORK PROGRAMME: Module 2 Task 2/4

Commissioning of the Equipment and the Training in its Use

1. What is to be done

1.1 All equipment and apparatus will be unpacked and set up for use. This will involve following the manufacturer's instructions and carrying out the appropriate function checks.

1.2 Equipment will be calibrated as necessary.

1.3 Where appropriate, designated personnel will be trained inthe use of the specialist equipment. Care must be taken thatonly trained personnel will use delicate or easily damagedequipment.

1.4 All equipment once calibrated will be sited as needed andfull instructions for use and recalibration will be postedclearly.

2. Working methods

This will be a preparatory and training exercise with which the TA will be closely involved in a supervisory capacity. The work will involve maintaining the inventory.

3. Personnel

Designated personnel under adequate supervision of senior or trained personnel and the TA.

4 Duration

This task will be mainly carried out with the arrival of the main items of equipment. These should be on site before April 1990. The task will continue throughout the period of the project as additional or replacement equipment arrives.

WORK PROGRAMME: Module 3

Commissioning of Survey Vessel

1. Objectives

To ensure the availability of a suitable survey vessel on Qinghai Lake by providing assistance to the counterpart con tribution, from UNDP/FAO project contribution funds, for the installation of items of capital equipment and the commissioning of the vessel. Items of survey equipment *(see* Module 2) will be installed.

2. Implementation

2.1 The capital equipment required will be identified and theappropriate specifications drawn up. These will take intoaccount the specifications of the vessel available, the locationof Qinghai Lake, the requirements of the survey programme, andproject budget constraints. (Task 3/1)

2.2 Selection of suppliers by comparison of specificationsproposed, delivery times and cost tenders. Ordering of goods.(Task 3/2)

2.3 Delivery and acceptance of items ordered. (Task 3/3)

2.4 Installation of equipment and commissioning of vessel. (Task 3/4)

2.5 Counterpart completion of refit, including the fitting of the items of survey equipment. (Task 3/5)

3. Duration

This work module should start as soon as possible and MUST BE COMPLETED BY END OF MARCH 1990.

4. Personnel

The identification of the requirements (Task 3/1) will be the responsibility of senior team members and the TA. Mr Smith will be responsible for detailed specifications in coordination with FAO specialist technical advice from FAO Rome.

Selection of suppliers (Task 3/2) will be the responsibility of senior team members and the TA.

The acceptance of the equipment, fitting, commissioning and the completion of the vessel refit (Tasks 3/3, 3/4 and 3/5) will be the responsibility of the counterpart technical staff.

5. Working methods

In general these will be detailed in the task sheets. The installation of the equipment, completion of the refit and commissioning of the vessel will be undertaken by the Department work force and the work programme be organized by them.

6. Special note

The urgency for the completion of this work and the inter ruption expected during the winter months imply that particular importance must be given to the delivery dates of the major items of capital equipment. Specifications and the selection of suppliers must take thl6 into account.

WORK PROGAMME: Module 3 Task 3/1

1 What is to be done

1.1 Decisions will be made as to the range of specifications for main engine, gearbox and generator set.

1.2 Hull layout and engineering details will be checked and the modifications that may be required will be detailed.

1.3 Cost estimates will be obtained for the required equipment to enable specifications to be finalized within budget.

2. Working methods

This will be a technical exercise mostly based on Xining, and will also demand some technical work at the lake.

3. Personnel

This work will be the responsibility of senior team members, the Department Senior Engineer and the TA. They will liaise directly with the Project Director and cooperate with the lake-based staff.

4 Duration

This work will begin as soon as possible and should have been completed before the end of September 1989.

WORK PROGRAMME: Module 3 Task 3/2

Selection and Ordering of Capital Equipment for Boats

1 What is to be done

1.1 Suppliers (a minimum of 3 if possible) will be requested to supply firm tender offers against the required specifications. These offers will include delivery times.

1.2 Offers will be compared and specifications scrutinized. The more appropriate offers will be selected.

1.3 Firm orders will be dispatched.

2. Working methods

This will be an administrative exercise, carried out mainly in Xining.

3. Personnel

This work will be carried out in close consultation with the Project Director, the senior team members and the TA.

4 Duration

Ordering of equipment was initiated in November 1989.

WORK PROGRAMME: Module 3 Task 3/3

Delivery and Acceptance of Items

1 What is to be done

1.1 On delivery of the ordered items, these will be checked for damage and specifications. On acceptance they will be delivered to the lake site.

2. Working methods

These will be the standard methods of technical checking and handling.

3. Personnel

The responsibility for these tasks will be delegated by the Project Director.

4. Duration

This work will be carried out as soon as possible after the arrival of the goods in order to minimize delays in the instal lation of the equipment.

WORK PROGRAMME: Module 3 Task 3/4

Refitting of Vessel

1. What is to be done

1.1 As soon as practicable the delivered replacement items (especially engine and generator) will be installed on the vessel and tested.

1.2 The required modifications to the accommodation on board will be made as soon as possible. Detailed modifications and the layout of services may await the advice of the TA.

1.3 On delivery of the specialized items, these will be fitted or for particular items of equipment will await the advice of the TA.

2 Working methods

These will be standard workshop and ship-fitting techniques appropriate to the facilities and conditions at the lakeside.

3. Personnel

This work will be carried out by the skilled workman available to the Department, using the workshop facilities of the fish factory. The work will be supervised and checked by a senior staff engineer.

4. Duration

This work will be undertaken between October 1989 and March 1990 as working conditions at the lakeside allow. It is essential that the vessel is ready for sailing by the break of the lake ice in March/April 1990.

5. Equipment

It is expected that the standard workshop equipment available at the lakeside factory site will be adequate for the proposed works.

WORK PROGRAMME: Module 4

Survey of Fish Breeding Sites and Evaluation of Breeding Success

1. Objectives

1.1 To obtain quantitative information on the breeding of the naked carp and to estimate the quantities of young fish that are produced and recruited to the fishery each year.

1.2 To identify the areas important for the production of young fish.

1.3 To identify the ecological parameters most important to breeding success.

1.4 To contribute to the understanding of the reproductive cycle and migration movements of the adult fish.

1.5 To identify constraints to future breeding success in order to propose mitigating actions.

2. Implementation

2.1 From available records prepare an evaluation of the changes that have taken place on the lake watershed and their possible ecological effects of importance to the fish populations. (Task 4/1)

2.2 From an assessment of the information available, select a number of spawning areas and describe each site in detail. Map the available spawning sites and estimate their extent around the lake. (Task 4/2)

2.3 Monitor the seasonal changes that take place at the spawning sites selected for observation. This description to include seasonal water flow changes; change in water quality; stream biota and meteorological changes. (Task 4/3)

2.4 By visual observation and test fishing record the arrival of the adult fish on the spawning grounds and estimate fish density. Extrapolate this quantitative assessment for the total of the unknown spawning areas. Determine the biological changes, associated with the spawning period that take place in the adult fish. (Task 4/4)

2.5 Evaluation of spawning success will be made by assessing the numbers of eggs/larvae/post-larvae on the selected spawning sites. The effects of predation and the rate of return of the young fish to the lake will be assessed. (Task 4/5)

3. Duration

This work programme module will start in March 1990 and continue throughout the breeding seasons of 1991, 1992 and 1993. It is essential to start these investigations at the beginning of the 1990 breeding season as failure to do so will effectively lose one year's data.

4. Personnel

The whole of the lake team will be involved in this work. Individual responsibilities will be detailed in the separate task notes and as the development of the work progresses.

5. Working methods

These will be detailed in the individual task notes. The scope of the work and the emphasis and priorities may change as the data are evaluated. Working methods and programmes may be adjusted to take into account the overall needs of the project.

6. Equipment

Fishing equipment (small hand nets, beach seines, small-mesh gill-nets, small purse seines, electrofishing equipment). Biological assessment apparatus (microscopes, dissecting equip ment, weighing scales, measuring boards). Water testing apparatus. River and stream fauna and flora investigation apparatus (grab6, dredges, net6, sieves, sedimentation trays, etc). Survey and mapping equipment (rangefinders, tapes, compasses).

WORK PROGRAMME: Module 4 Task 4/1

Identify and Evaluate Important Ecological Changes that have Taken Place on the Lake Watershed

1. What is to be done

1.1 In discussions with the team members a list of important environmental parameters, that will have a direct influence on the spawning sites, reproductive success and recruitment, will be compiled. The list of these parameters will include, but possibly not be limited to:

climatic changes;

change in the river and stream bed patterns;

changes in seasonal flow rates;

changes in the water quality of the inflow streams and rivers;

changes in the land use that may have an effect on run-off and erosion patterns;

changes in the use of fertilizers on the watershed farms; changes in the use of pesticides on the watershed farms;

the effects of any building works, road construction, etc., on the inflow streams;

changes in the population and the construction of farms, villages, factories, etc.

1.2 Identify the sources of the information compiled in 1.1 above. Establish contact and develop a cooperative relationship with the individuals and organizations that maintain this historical information. Extract the data and collate and record in a way that makes it accessible to the team throughout the survey period.

1.3 Identify sources of maps of the lake area and draw an accurate "master map" of the lake and the surrounding watershed. This map, or maps, should be drawn at the appropriate scale so that many duplicates can be made to be used in the field work.

Note: The physical accuracy of the map of the lake must be checked as this will be used for navigation and identification of survey sample locations.

2 Working methods

Initial contacts with the sources of information will be made by senior project or department officers. After these contacts have been made the work will involve all team personnel. It is recommended that one individual is made responsible for the collection and collation of the Information as researched by the other team members.

Where appropriate the information will be entered on the computer data bases.

3. Personnel

All team personnel will be involved. Special tasks will be delegated to individuals by the team leader.

4. Duration

The work will start as soon as possible and should be essentially completed by end of March 1990.

Mapping should be considered the first priority as these maps will be needed at the collation of other data.

5. Equipment

Standard drawing equipment will be needed. Planimeter and pantograph may also be required. The project computer will be available for entering the data.

WORK PROGRAMME: Module 4 Task 4/2

Identification and Description of Spawning Areas

1. What is to be done

1.1 Typical spawning areas for naked carp will be identified in the field: one on the Buha He, one on the Ganzhi He on the north shore, and a site situated on a small inflow stream.

1.2 Each of the selected areas will be mapped and described in detail. This description will include but possibly not be limited to :

- a description of the area adjacent to and upstream of the site:
- a note of any activity (rural or urban) on the area that drains into the site;
- a physical description of the site, stream bed, flow rates, areas of silt deposit, etc.

1.3 A survey will be made of the inflow rivers and streams to identify and locate all the spawning areas. These will be mapped and their total area estimated.

2. Working methods

This work will be carried out by small teams who will spend sufficient time at each site to carry out the work. In order to identify seasonal changes these visits will be repeated at appropriate intervals throughout the year. It will be necessary to investigate for considerable distances upstream from the lake on foot or by available transport. The field work will be integrated with the other parts of the overall work programme.

3. Personnel

All team members, as designated, will be involved in the field work, the drafting of maps and writing up of the data.

4. Duration

This work will start with the opening of the season in March/April 1990 and continue until the end of the spawning season and the migration of the adults and young fish each year. The investigations will be repeated in 1991, 1992 and 1993.

5. Equipment

Standard field survey equipment will be needed: silt trays and sieves. Compasses, measuring tapes, theodolite, range-finders, etc. A four-wheel drive vehicle and trail motorcycles. Camping kit if required.

WORK PROGRAMME: Module 4 Task 4/3

Monitoring of Seasonal Changes at the Spawning Areas

1. What is to be done

1.1 At 3 chosen sites (with supplementary sites if this is required) the seasonal changes in important ecological parameters will be monitored. These seasonal changes will include, but possibly not be limited to:

changes in the rate of water flow;

changes in the water quality and physical and chemical parameters;

physical changes in the substrate;

a record of seasonal changes of meteorological parameters will be kept.

1.2 The seasonal changes in the river and stream biota will be monitored.This will involve a qualitative and quantitative assessment of the drift biota, the benthos and the aufwuchs. Seasonal changes in the rooted aquatic plants will be quantified. The contribution made to the food supplies from the drift of allochtonous material will also be monitored.

2. Working methods

Standard field methods will be used, supported by laboratory work where required. Where possible self-recording units or recordings and observations made by auxiliaries (e.g., the resident police officers) should be used to supplement the team's observations. Team members will have to visit the sites regularly and every effort will be made to timetable these activities with other activities of the overall work programme.

The data obtained will be collated and entered into the computer data bases where appropriate.

Where possible data derived from other authorities (e.g., Water Conservancy Department) will be incorporated.

The work of this task will be coordinated with that of Module 6 "Investigation of benthic fauna and flora".

3. Personnel

All team members will be involved as detailed.

4 Duration

This work will start as soon as the rivers begin to flow at the beginning of the season in March/April 1990. This monitoring will be continuous throughout the project duration.

5. Equipment

Standard river survey equipment: field water analysis kits, nets, benthos trays, sediment trays, benthos sieves, meteo rological station(s), field microscopes, etc.

WORK PROGRAMME: Module A Task 4/4

Monitoring Changes in the Population of Adult and Young Fish

1. What is to_be_done

1.1 Observations will be made on the adult fish at the spawning areas. These observations will include, but possibly not be limited to:

- visual count of the spawners on the spawning grounds;
- test fishing of samples of the adults to determine physical condition, breeding scale and fecundity of females;
- determine seasonal changes in the numbers of fish and dates of migration.

1.3 These data will be extrapolated to the total area of spawning grounds, with check observations at sites other than the three selected for detailed investigation.

2. Working methods

Visual estimates will be supported by test fishing with large and small mesh seine nets, gillnets, cast nets and electro-fishing. Standard field and laboratory procedures will be used to investigate the fish and estimate fecundity, etc.

3 Personnel

All team members will be involved in this work, carrying out the field work in small teams as detailed.

4. Duration

This work will commence as soon as the adults begin migration upstream (April/May 1990). It will be repeated as necessary each season throughout the life of the project.

5. Equipment

The standard range of fishing gear (see 2 above) will be used. Investigations of the fish will use the standard field and laboratory equipment: scales, measuring boards, field micro scopes, etc.

WORK PROGRAMME: Module A Task 4/5

Monitor and Investigate the Return of the Adult Fish to the Lake and the Success of Juvenile Migration

1. What is to be done

1.1 Investigate the return of adults and post-1arvae/fingerlings to the lake by visual observation and test fishing downstream of the spawning areas and in the river estuaries.

1.2 Observe predation on the returning adults and young fish, especially by birds, and obtain a quantitative estimate of the importance of this predation.

2 Working methods

More than one method of sampling will be used where appropriate (e.g., fishing with gillnets. e1ectrofishing, mosquito seine nets to obtain fish samples).

Use will be made of the information obtained in Task 4/1.

3. Personnel

All team members will be involved both in the field and in processing the data in the laboratory.

4. Duration

This work will begin with the return of the first fish to the lake and will continue throughout the season of downstream migra tion. This will start in the season 1990 and continue throughout the project duration.

5. Equipment

Standard range of fishing equipment will be used (see previous tasks). Visual counting of predatory birds will be supplemented by photography and the evaluation of the photographs.

WORK PROGRAMME: Module 5

Limnological Investigations

1 Objectives

1.1 In order to provide information of value for determining the critical factors in the life cycle of the fish, the primary purpose of a limnological sampling programme is to identify the seasonal changes in the water masses throughout the lake and the effect of the river inflow on these water masses.

1.2 In addition, by identifying changes in the microflora and microfauna, the part played by the planktonic primary and secondary producers in the biology of the fish will be assessed.

2. Implementation

2.1 Water samples will be taken from selected sites on selected inflow streams. These will be analysed for the basic chemical and physical parameters and microfauna and flora. (Task 5/1 and see Module A).

2.2 A number of survey cruises will be undertaken to complete a series of depth profile samples taken on a pattern of transects which will cover the main lake area. These samples will be analysed for the basic physical and chemical parameters and microfauna and flora. (Task 5/2)

2.3 Areas identified as of particular importance will be sampled (e.g., shallows, coves, river estuaries, etc.) in order to provide Information of value to the understanding of the biology of the fish.(Task 5/3)

3. Duration

The work on the inflowing streams will begin with the spring thaw and the recommencement of the river flows, i.e., March 1990. The open lake limnological work will be accomplished in a series of cruises (at least four) that will cover the full period when the lake is not ice-covered. Supporting samples will be taken in mid-winter through the ice cover. This work will be carried out through each of the seasons 1990, 1991, 1992 and 1993.

4 Personnel

All team members will be involved in this work.

5 Equipment

Limnological survey equipment (depth profiler for tempe rature, pH, DO, conductivity and light penetration). Phyto-plankton and zooplankton nets, sorting equipment and microscopes. Field and laboratory analytical equipment, sample bottles, and cold storage for samples.

WORK PROGRAMME: Module 5 Task 5/1

Water Sampling on Inflow Streams/Rivers

1. What is to be done

1.1 A number of inflows will be selected as representative of the inflow streams all round the lake . This selection will include those inflows that have been selected for the inves tigation of the breeding sites (see Module 4). Each of the selected inflows will be investigated for ecologically important influences (habitation, abattoir or factory waste input, cattle watering sites, etc.) and for ease of access. Sampling sites will be established and identified for repeat sampling.

1.2 A programme of site visits will be drawn up. This programme will coordinate with the other aspects of the project work programme to make the most efficient use of personnel, equipment and time.

1.3 The inflow water will be sampled for standard limnological parameters using field measuring kits. Where appropriate, samples will be returned to the laboratory for additional analyses. Flow rates will be assessed.

2. Working methods

This field work will be integrated with other project work and field teams will undertake the sampling wherever possible in conjunction with the work of other nodules. Wherever possible field methods will be used and data will be entered and collated in the field for later revision in the laboratory.

3. Personne1

All team members will be involved in this work as designated to the field teams

4 Duration

This work will begin with the commencement of the stream flows of the season 1990. It will continue throughout project duration.

5. Equipment

Major reliance will be on the field analysis kits for standard limnological parameters. These parameters will include light penetration and estimations of silt load where these are seen to be necessary.

WORK PROGRAMME: Module 5 Task 5/2

Main Lake Limnological Survey

1 What is to be done

1.1 A comprehensive series of transects will be mapped and navigated by the survey vessel to cover the main areas of the lake. Each cruise will last between 5 and 7 days.

1.2 At regular stations on each transect a depth profile of standard limnological parameters will be taken.

1.3 At each station phytoplankton and zooplankton samples will be taken for analysis either on board or for return to the laboratory.

1.4 A bathymetric survey will be carried out to update the charts already available.

1.5 During the period of ice cover additional limnological sampling should take place to supplement the data obtained from the open water cruises.

2 Working methods

Teams of between two and five members will carry out this work on the survey vessel. Stations will be identified by navigational fixes using the RT/DF equipment and plotted care fully on the best available chart. This limnological work will be integrated with the work of Module 6 (Bottom fauna and flora Investigations) and Module 7 (Experimental fishing).

Most of the parameters will be investigated by submersible probes with backup analyses of water samples in the laboratory as appropriate. Data will be collated in the field when possible.

3 Personnel

Team members will be expected to take part in this survey as nominated.

4 Duration

The survey cruises will be made throughout the period of open water for each year of project duration. Timetabling and inte gration with the needs of Modules 6 and 7 will probably allow A or 5 cruises to be undertaken each season.

5 Equipment

Major items of equipment will be the lake profiler which produces rapid readings of the standard limnological parameters with depth. Water samplers and plankton nets will also be used.

WORK PROGRAMME: Module 5 Task 5/3

Shallow Water Limnological Sampling

1. What is to be done

1.1 From an evaluation of the data derived from other elementsof the work programme, identify shallow water areas (riverestuaries, shallow coves, shoals, etc.) which are thought to beof importance to the life cycles of the fish. Select a number ofstations at which limnological investigations can be carried outparallel to other lake-wide investigations.

1.2 Carry out standard limnological investigations to identifysignificant changes in the water masses.

1.3 Carry out investigations of the changes in the phytoplanktonand zooplankton populations and the benthic fauna and flora.These investigations will be integrated with other similarinvestigations (particularly Modules 6 and 7).

2. Working methods

Standard methods will be used to assess the limno1ogica 1 parameters. These will be modified as appropriate to take into account the shallow water depths at the sampling stations and thehigh salinity of the lake water.

3. Personnel

All team members will be involved as nominated to the field survey teams.

4. Duration

It is anticipated that this work programme will not begin until late in the season of the first year of the project inves tigations. Identification of the areas that need to be inves tigated will await the preliminary results of other work (particularly the work to be carried out in Modules A and 7).

5. Equipment

The standard limnological field equipment will be used.

WORK PROGRAMME: Module 6

Bottom Fauna and Flora Investigations

1. Objectives

The bottom fauna and flora will be investigated both qualitatively and quantitatively in order to understand the part these play in the overall food supply of the

fish and the spatial distribution of the fish stocks. The distribution of bottom types will be (re)mapped.

2. Implementation

2.1 Combined with the seasonal limnological transects (Task 5/1) lakewide bottom samples will be taken and analysed. Museum reference specimens will be conserved where these are required. (Task 6/1)

2.2 Combined with the work of Task A/1 bottom samples will be taken from the spawning areas and adjacent stream beds.(Task 6/2)

2.3 Estimates of biomass and food energy value will be made for the major food species.(Task 6/3)

2.4 A map of the distribution of bottom types will be prepared. (Task 6/4)

3. Duration

This work will begin in the spring of 1990 and continue throughout the survey seasons of 1990, 1991, 1992 and 1993.

4. Personnel

All lake team personnel will be involved in this work module. This involvement will include field and laboratory work.

5. Equipment

Bottom investigations using grabs, dredges, corers, sedi mentation and biobenthos trays, will be undertaken as a component of the lakewide limnological survey cruises. Laboratory assess ments of biomass, etc., will require precision balances, drying ovens, protein analysis apparatus.

WORK PROGRAMME: Module 6 Task 6/1

Sampling of Benthos Lakewide

1. What is to be done

1.1 This task will be carried out at the same time as thelakewide limnological sampling programme (Task 5/2).The samestations will be used for sampling the substrate.

1.2 Grabs will be used to raise qualitative (and where possiblequantitative) samples to the surface. Special sampling methodsfor aquatic plants may be applied, if required.

1.3 These samples will be analysed to provide information on thebottom type and the animals and plants supported by it.

2. Working methods

Bottom grabs and corers will be used as appropriate. Sorting through sieves and the removal of organisms by flotation will be used to determine the bottom type and to obtain a qualitative and quantitative assessment of the biota. Plants will be identified with their associated fauna.

3. Personnel

All personnel will be involved in the nominated field teams. This work will form part of the work programme of the lakewide survey cruises.

4. Duration

This work will commence at the break of the ice in 1990 and follow the pattern of survey cruises programmed.

5 Equipment

Bottom grabs and corere operated by messenger and hauled by hand winch will be the major equipment necessary. This may be supplemented by scoop nets. Sorting equipment will consist: of the standard trays, microscopes, etc.

WORK PROGRAMME: Module 6 Task 6/2

Mapping Distribution of Bottom Types 1

1. What is to be done

1.1 By collating the data derived from the bottom sampling carried out as Task 6/1 a bathymetric map indicating the bottom substrate types and benthic biota will be drawn

2 Working methods

This work will be a desk exercise using the data from Task 6/1 above. It may be possible to use computer graphics and final hand drafting.

3. Personnel

This task will probably be efficiently accomplished by one or two designated team members.

4. Duration

This work can be carried out at the end of the first season of field work (winter 1990) and updated as necessary as additional Information becomes available from further field work.

5. Equipment

This is effectively a drafting exercise, involving a computer graphics programme if available.

WORK PROGRAMME: Module 6 Task 6/3

Bottom Sampling on the Breeding Areas 1

1. What is to be done

1.1 Identification of the types of substrate considered suitable for the breeding activities of the adult fish.

1.2 Undertake a qualitative and quantitative assessment of the biota of these substrates and the seasonal changes that these undergo.

2. Working methods

Note that this work may be adequately covered by the acti vities of Module 4 which concentrates on the breeding sites. Standard benthos sampling methods will be used as in Module 4.

3 Personnel

All team members will be involved as designated to the field teams.

4. Duration

This work should begin as coon as possible in the season after the rivers commence flowing in 1990. The results can be checked occasionally throughout the rest of the project period.

5. Equipment

Standard benthic sampling equipment will be needed (grabs, corers, sieves, sorting appartus, microscopes, etc.).

WORK PROGAMME: Module 6 Task 6/4

Estimate of Food Biomass

1. What is to be done

1.1 Samples of identified fish food organisms will be weighedand average weights calculated.

1.2 Food component analyses will be made for important items inthe fish diet.

1.3 Using the data from the bottom fauna and flora investi gations and estimates of the biomass of individual foodorganisms, total available food biomass will be estimated forspecific areas of ecological importance for the fish populations.

2. Working methods

This task is effectively a laboratory exercise using samples brought back from the field investigations. Weighing and component analysis will be carried out by standard laboratory methods.

3 Personne1

A group of 2 or 3 team members will be formed and trained to carry out this task.

4. Duration

This work will be undertaken in the winter of 1990 or later as the samples become available from the field investigations.

5. Equipment

Standard laboratory drying and precision weighing equipment is required. Standard apparatus for food component analyses will be available.

WORK PROGRAMME: Module 7

Experimental Fishing

1. Objectives

In order to obtain a better understanding of the recruitment, migration and growth rates of the fish stocks, it is necessary to supplement the data already obtained from investigations of catches taken by the commercial fishery. By experimental fishing, samples of all size groups in the population will be taken, in particular from areas where the commercial fishing is not active.

2. Implementation

2.1 Experimental fishing will be undertaken with a variety of suitable gears (seine nets, purse seines, gillnets, traps, etc.) to sample the stocks of fish migrating up the

rivers to spawn. Samples of the fish caught will be investigated by standard biological techniques. (Task 7/1)

2.2 Selected habitats will be fished frequently by appropriate gears to establish the part that inshore areas play in the biology of the fish stocks. Particular attention will be paid to the areas around Bird Island, river estuaries, coves and shallows. (Task 7/2)

2.3 Gear with low selectivity (e.g., purse seines and experimental trawls) will be fished in the open water to obtain fish samples not subject to selective commercial catch methods. (Task 7/3)

2.4 Tagging and marking experiments will be carried out using fish caught in the experimental gear and expected to be returned from the commercial catches. (Task 7/4)

2.5 Echosounder trials will be undertaken to determine lakewide fish concentrations and an estimation of the total fish biomass. (Task 7/5)

3. Duration

This work will begin in spring 1990 and continue throughout 1990, 1991, 1992 and 1993.

4. Personne1

All the lake team members will be involved in this work, both in the field and in the laboratory.

5. Equipment

Test fishing will be carried out with a selection of small nets (beach seines, purse seines, gillnets, experimental trawls, etc.). Biological investigations will require standard field equipment (measuring boards, scales, microscopes, dissecting materials, etc.). Mark/tag and recapture exercises will require field kits (tags, applicators, marking dyes/latex, injectors).

WORK PROGRAMME: Module 7 Task 7/1

Experimental Fishing of Migrating Stocks

1. What is to be done

1.1 In coordination with the work of Module A areas of inflowstreams and rivers important to the migrating adult fishpopulations will be identified. A number of representativestations will be selected for intensive fishing at intervalsthroughout the breeding season.

1.2 The selected stations will be fished with a variety ofappropriate gears to obtain a representative sample of themigrating population.

1.3 The fish sampled will be assessed to give an indication ofoverall numbers and biomass and in coordination with the work ofModule 4 will be evaluated by standard techniques to definecondition, fecundity, age, etc.

2. Working methods

These will involve standard methods of test and experimental fishing and field evaluation of the catch.

3. Personnel

All team members will be involved in this work as designated to the field work teams.

4. Duration

The test fishing will begin in early 1990 when the adult breeding fish begin to migrate.

5. Equipment

The fishing equipment will consist of a variety of gears used as suitable for the particular fishing station and physical conditions. This will include gillnets, seines, cast nets, surround nets, hooks and lines, traps, etc. The measurement of the fish will utilize standard field methods.

WORK PROGRAMME: Module 7 Task 7/2

Experimental Fishing in Selected Areas of the Lake

1 What is to be done

1.1 Areas of the lake edges, river mouths/estuaries, shoals, etc., will be identified as having an important part to play in the life cycle and production of the fish populations.

1.2 These areas will be fished by appropriate methods to obtain representative samples of the fish present and an estimate of their populations.

1.3 Samples of fish will be investigated by standard methods.

2. Working methods

The selected areas will be fished from the survey vessel and by shore-based teams, using the selection of methods available as judged appropriate.

3. Personnel

All team members will be involved as nominated to field work teams.

A. Duration

It is anticipated that this work will begin in July/August of 1990 in response to the information derived from the other elements of the survey programme. As necessary this work will be continued at intervals throughout the full period of the project field work.

5. Equipment

The full range of shallow water fishing techniques will be employed (beach seines, cast nets, small mesh gillnets, electro-fishing, etc.). The fish samples will be analysed by standard techniques of weighing and measurement.

WORK PROGRAMME: Module 7 Task 7/3

Experimental Fishing in the Openwater Areas of the Lake

1. What is to be done

1.1 The data on the raid-lake fish populations derived from the commercial fishing samples will be supplemented by experimental fishing in order to obtain relatively unbiased samples of the open water fish populations.

1.2 Samples of the fish will be analysed by standard methods in order to indicate the part that these populations play in the overall biology of the fish production.

2 Working methods

The experimental fishing will be carried out as an integral part of the open water survey programme. Standard methods of sampling the catches will be used.

3. Personnel

This work will be carried out by the team personnel involved in the work of the programmed survey cruises.

4. Duration

This work will begin with the regular survey cruises in spring 1990, and continue throughout the period of project as an integral element of the project survey cruise programme.

5. Equipment

Graded gillnet fleets, experimental small-scale trawl nets, small scale purse seines will be used as appropriate.

WORK PROGRAMME: Module 7 Task 7/4

Marking and Tagging Experiments

1 What is to be done

1.1 From the information derived from other experimental fishingexercises (in the open water and lake edges), populations of fishthat are important for the understanding of the overall biologyof the fish populations will be identified. Of these populationsthose easily accessible and easily caught will be selected forexperimental fishing to obtain live and healthy specimens.

1.2 Samples of fish will be taken for recording and markingand/or tagging.

1.3 A lakewide information campaign will be undertaken to notifyfishermen, the factory staff and the lakeside populations of thesignificance of tagged fish and their recovery.

2. Working methods

The samples will be fished by methods not damaging to the individual fish. Purse seines and electrofishlng will probably prove to be the most efficient and practical. Recovery will be encouraged by offering rewards for returned tags and tagged fi6h.

3. Personne1

All team personnel will be involved with the task which will be carried out by those nominated to the field work.

4. Duration

It is anticipated that this work will start during the first season of fishing in order to have the maximum period for recoveries of marked fish during the lifetime of the project.

5. Equipment

Apart from the standard techniques for catching the fish (netting and electrofishing), the standard apparatus for marking by injection and for tagging will be employed.

WORK PROGRAMME: Module 7 Task 7/5

Estimation of Fish Biomass and Distribution by Echosounding Techniques

1. What is to be done

1.1 Echosounding equipment will be mounted on the research vessel and calibrated.

1.2 As a component of the survey cruises, frequent observations of the fish present will be made and recordings kept for future evaluation.

1.3 A lakewide map of fish distribution will be made to indicate spatial and seasonal distribution patterns of the fish popu- lations.

1.4 Particular areas, identified as important to the biology of the fish stocks, will be surveyed in detail.

1.5 Estimates of total lake standing crop will be produced.

2. Working methods

The work will be undertaken as an integral part of the programme of survey cruises. Trained observers will analyse the recordings with the final results and mapping will be completed in the laboratory.

3. Personnel

All team members will be involved and trained in this technique.

4. Duration

The equipment should be installed on the survey vessel by the start of the season in spring 1990. After calibration and training of the operators, the programme of observations should be started later in the season. This work will continue through out the project period.

5. Equipment

An echosounder, appropriate to the lake and the species of target fish, will be fitted to the survey vessel. A recorder will be mounted on the bridge to be used for depth sounding as well as fish-finding.

WORK PROGRAMME: Module 8

Commercial Catch Investigations

1. Objectives

1.1 To compare the present state of the fishery with thatdescribed from the historical run of data from samples taken fromthe commercial catches.

1.2 To update the fishery resource models that have already beenformulated.

2. Implementation

2.1 At intervals throughout the fishing season, observers willbe present on the commercial fishing vessels in order to monitorthe fishing effort and to investigate random samples from thecommercial trawl hauls. (Task. 8/1)

2.2 An analysis of the fishing vessel logbooks will be under taken to provide a historical survey of the behaviour of thecommercial fishery. (Task 8/2)

3. Duration

This work will begin with the commencement of the fishing season 1990, and continue throughout the fishing seasons of 1991, 1992 and 1993.

4. Personnel

All lake team personnel will be involved in this work as detailed in the overall timetable.

5. Equipment

Standard fisheries investigation equipment will be required (measuring boards, scales, sample bottles, etc.).

Appendix 2

PROGRAMME OF LECTURES FOR THE TRAINING COURSE IN TROUT CULTURE AND LAKE MANAGEMENT HELD IN XINING,

QINGHAI PROVINCE (10-31 October 1989)

Tuesday, 10 October

Trainees travel to Xining. Allocation of accommodation

Wednesday, 11 October

Mr Chou Ban Chan, Dr David Edwards, Dr Ian Dunn

Introduction to the Training Course

Dr Edwards

Trout Culture I: The salmonid fishes; classification, geographic distribution, environmental requirements, natural life cycles

Thursday, 12 October

Dr Dunn

Limnology of inland waters and the relevance of limnological investigations to the fishery of Qinghai Hu

Friday , 13 0ctober Dr Edwards

Trout culture II: Water and site requirements for trout farms. Farm design and construction. Selection of broodstock. Production cycles

Saturday, 14 October

Dr Dunn

The investigation of the lake animals and plants and a discussion of production and food webs

Monday, 16 October

Dr Edwards

Trout culture III: Stripping and fertilization of eggs.

Egg incubation and development. Hatching and rearing of fry

Tuesday, 17 October

Dr Dunn

Investigation of the fish populations and the relevance of these investigations to the Qinghai Hu fishery

Wednesday, 18 October

Dr Dunn

Introduction to fishing techniques, processing, marketing, etc.

Thursday, 19 October

Dr Dunn

(Provisional) Course visit to Qinghai Hu to see the fish factory, fishing vessels, inflow streams, etc.

Friday, 20 October

Dr Edwards

Trout Culture IV: Production of trout fingerlings, use of tanks and ponds, grading, stocking, densities, etc.

Saturday, 21 October

Dr Dunn

Regarding the importance of and the handling of scientific data. Introduction to the use of computers

Monday , 23 October

Dr Edwards

Trout Culture V: On-growing of trout to market size in earth ponds, concrete raceways and floating cages

Tuesday, 24 October

Dr Dunn

Objectives of the project. What is meant by Fisheries Management and its relevance to the Qinghai Hu Fishery. Discussions of Qinghai Hu Fishery Investigation Sub-project of CPR/88/077.

Wednesday, 25 October Dr Edwards

Trout Culture VI: Harvest, slaughter, packaging, processing and marketing of trout. Transport of eggs, live and slaughtered fish

Thursday, 26 October Dr Edwards

Trout Culture VII: Trout feeds and feeding. Formulation, production and storage of feeds. Feeding rates, practices and machinery. Conversion efficiency

Friday, 27 October Dr Edwards

Trout Culture VIII: Genetics and disease factors in trout farming

Saturday, 28 October

Dr Edwards

(Provisional) Course visit to fish culture pond sites

Monday, 30 October

Mr Chou Ban Chan and Dr Edwards

Explanation of the objectives of Project CPR/88/077: Fisheries Development in Qinghai Province, in the light of the knowledge gained from the course. Discussion

Tuesday, 31 October

Trainees return home

Appendix 3

SURVEY VESSEL REQUIREMENTS

1. SUITABILITY OF AVAILABLE BOAT

The hull that has been made available by the Bureau of Aquatic Products is one of the wooden trawlers that originally composed the fleet of four boats (pair trawling). Two of these boats have been replaced recently by more powerful steel boats and two boats are therefore surplus to fishing requirements. One of the surplus boats is employed as a collecting boat servicing the four trawlers. The remaining boat is therefore available full-time for the use of the lake investigation team.

In September 1989 this hull was slipped for minor repairs and servicing. The accommodation forward was reconstructed. Since then, the engine has been serviced and the vessel is currently in use as a temporary collecting boat during the routine slipping and maintenance of the regular collecting vessel.

This boat therefore appears to be seaworthy and, with relatively minor modifications, suitable for use as a survey vessel. The technical staff responsible for the boats have confirmed this.

2. MODIFICATIONS REQUIRED

The modifications that will be necessary to convert this fishing boat into a suitable research vessel equipped for cruises of up to one week's duration, have been discussed with NPD and the technical staff of the Bureau and the Fish Factory. The following modifications have been agreed to as a compromise that takes into account the limited time available for the work (due to the closure of the fishing enterprise during the winter months).

2.1 Engine Replacement

Due to the age of the engine and the replacement that will be required during the life of the project, it is proposed to replace the present engine with locally purchased equipment of similar specifications. This proposal currently awaits clearance from UNDP/FAO.

2.2 Electric Power Supply

In order to provide adequate power supply for lighting, equipment and safe heating it is proposed to install a stand-alone diesel powered 13 kVh 3-phase generator in the engine room. This proposal is currently await ing clearance from UNDP/FAO.

2.3 Living Accommodation

The accommodation forward is adequate for 4 to 5 workers and additional accommodation, if required, can be easily found in the proposed work spaces. Covered toilet/washing facilities will be provided at the stern. Kitchen accommodation is adequate in its present configuration. With the reduced crew anticipated in its role as a survey vessel, there is ample crew living space available aft.

2.4 Working Accommodation

It is proposed to convert the present fish holds (each approximately 4.5 x 2.5 m in plan) into 2 work spaces. These will be fitted with ample electrical outlets for equipment, lighting and heating. They should also be lined with an insulating wall. Access should be through a weather protected hatchway. For the safety of the vessel it

is important that the integrity of the hold bulkheads is not breached. The height of the working deck above the work spaces should be raised to give a comfortable working headroom. The work spaces will be equipped with work benches. Working accommodation on deck will consist of a small weather-protected structure, fitted with electrical services, immediately adjacent to the working deck.

2.5 Boat Accommodation

With one exception, no major changes are foreseen to the structure of the boat, although minor repairs and maintenance may be considered necessary. The captain's bridge accommodation needs some rebuilding. It is essential that the bridge structure is raised to give adequate headroom to bridge crew and any working scientists. This will involve raising the roof and the windscreen. It is not foreseen that this modification will have any significant impact on vessel stability or safety. The interior of the bridge must also be renovated to allow for the replacement of navigation instruments and other equipment. The present upper bunk will be removed to provide a working chart table and location for items of equipment.

2.6 Other Modifications Required

Other modifications to the boat are mainly for considerations of safety. This is particularly important since it will carry a complement of working scientists who are not necessarily used to working on a boat and are therefore at increased risk to accidents. This applies to visiting scientists as well as the lake investigation team.

It is requested that space is found as a locker for the anchor warp and chain. At present this lies loose on the bowpeak and there is a danger of catching the legs of those on deck when the anchor is released.

Demountable bulwark guard rails should be manufactured and fitted.

2.7 Equipment Proposed

Apart from the standard laboratory equipment in the work spaces, the following equipment will be fitted to the boat:

Navigation equipment - satellite receiving equipment is being considered as the most economic alternative for precise positioning on the lake.

Ship-to-shore radio telephone

Echosounder/fishfinder - specifications not finalized

Ships compass

Deck work/navigation lights

Powerblock/winch

Life-raft, and other emergency equipment (extinguishers, lifejackets, flares, etc.)

3 TIMETABLES

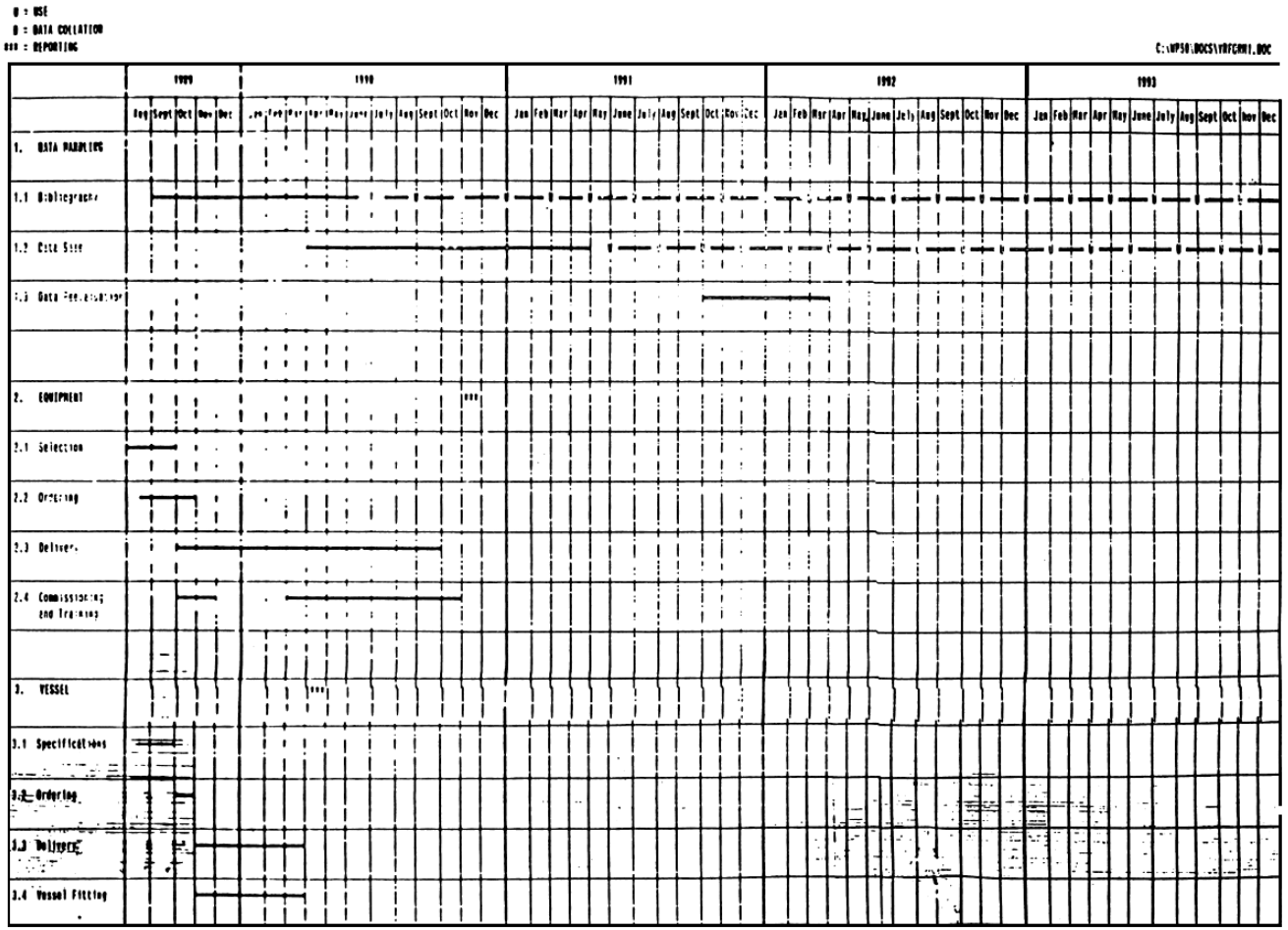
It has been emphasized to the NPD that this vessel must be ready for trials and commissioning by the beginning of the work season in spring 1990. This timetabling will depend upon the ability of the technical staff at the Fish Factory to complete the refit, and the minimum delays in the delivery and acceptance of the items of specialized equipment.

If this vessel is not ready for the start of the work season, it is possible that major elements of the work programme could be delayed by a whole year, due to the annual seasonality of many of the parameters to be studied.

Appendix 4

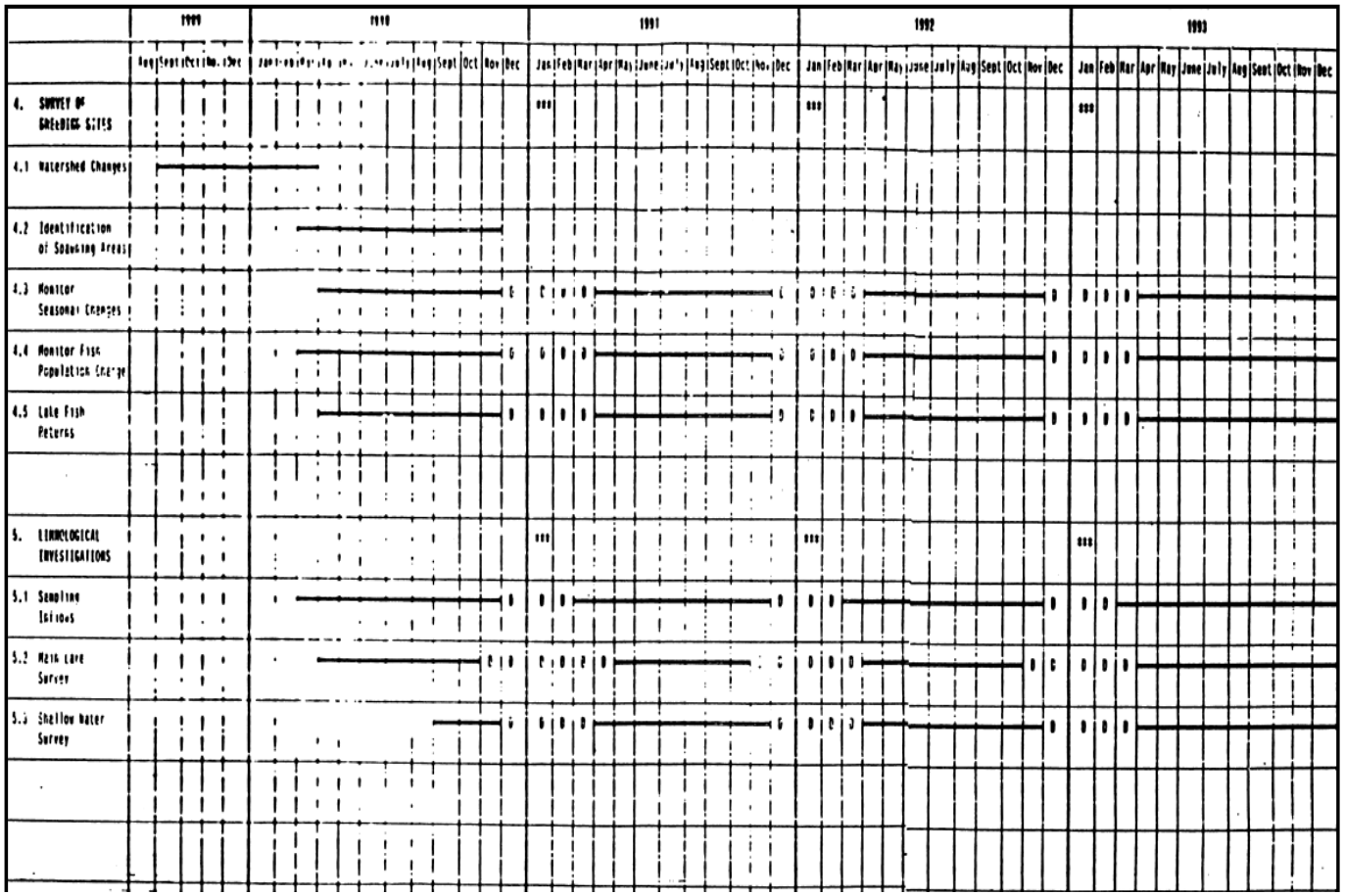
CPR/88/077 QINGHAI LAKE FISHERIES INVESTIGATION

PROVISIONAL PROJECT WORK PROGRAMME (OCTOBER 15/1989)



CPR/88/077 QINGHAI LAKE FISHERIES INVESTIGATION
PROVISIONAL PROJECT WORK PROGRAMME (OCTOBER 15/89)

U : USE
D : DATA COLLATION
ooo : REPORTING



CPR/88/077 QINGHAI LAKE FISHERIES INVESTIGATION
PROVISIONAL PROJECT WORK PROGRAMME (OCTOBER 15/89)

D : FSE
D : DATA COLLATION
ooo : REPORTING

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