

MEDRAP



MEDITERRANEAN REGIONAL AQUACULTURE PROJECT
PROJET REGIONAL MEDITERRANEEN D'AQUACULTURE



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REGIONAL AQUACULTURE TRAINING CENTRE
(FOLICORO - ITALY) *

Aims and field activities (1984 - 1985)

by

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<u>INDEX</u>	p.
1. INTRODUCTION	1
1.1 Training Centre site	2
1.2 The choice of Ittica Valdagri	3
1.3 Short description of Ittica Valdagri's activities	4
2. FAO CAMPUS REALIZED AT THE ITTICA VALDAGRI AT POLICORO	7
2.1 The campus	7
2.2 Personal equipment	7
2.3 Didactic equipment	8
2.4 Bus service	8
3. DIDACTIC METHODOLOGY PROPOSED	9
3.1 Didactic organization	9
3.2 Didactic methodology	9
3.3 Methodology of the basis programme	10
3.4 Methodology of the special programme	11
3.5 Didactic files	11
4. DIDACTIC PROGRAMME	12
4.1 Basis programme	12
4.2 Special programme	12
5. ACTIVITIES CARRIED OUT DURING THE FIRST COURSE 1984-85	13
5.1 Didactic activities	18
5.2 Didactic papers	18
5.3 Didactic reports	18
6. FIELD ACTIVITIES	20
6.1 Phyto- and zooplankton, Artemia nauplii production and cultures in eutrophised ponds	20
6.2 Zooplankton collection in the wild	20
6.3 Capture and selection of broodstock	20
6.4 Artificial reproduction of sea bass and sea bream	21
6.5 Egg collection	21
6.6 Egg incubation and hatching	21
6.7 Larval rearing	22
6.6 Weaning and first fattening	22
6.9 Preparation of a biological filter	22
6.10 Fry capture, transport, stocking, counting and classification	22
6.11 Use of fishing gear, systematics and biometry of the species captured	23
6.12 Building a fish barrier	23

6.13	Intensive, semi-intensive, extensive and polyculture rearing of marine species. Product preparation for trading	24
6.14	Mullet overwintering and first fattening	24
6.15	Rearing ponds management	24
6.16	Feeding techniques	24
6.17	Prophylaxis and sanitary treatments	25
6.18	Shell fish culture	25
6.19	Control of environmental parameters	25
7.	STUDY TOUR	26
8.	GENERAL CONSIDERATIONS	27

1. INTRODUCTION

The FAO Regional Centre for aquaculture training located at the Ittica Valdagri at Policoro (Matera, Italy) is a key factor of the Mediterranean Regional Aquaculture Project (MEDRAP), which regroups all the countries in the region.

The objectives of the Regional Project are to ensure a controlled development of aquaculture in the Mediterranean regions, thanks to the exchange of knowledge and a dynamic cooperation between all the states in the region.

Indeed the Mediterranean shows a good homogeneity as far as the possibilities of development of marine and coastal aquaculture are concerned, and even if there are many environmental and socio-economical differences, we though it possible to articulate a complete training programme, capable of answering the various local needs,

Mediterranean aquaculture has been greatly developed in the last fifteen years with the improval of artificial reproduction techniques and is now concerned by the correct adoption of what was really acquired together with the recovery of a certain number of experiences of production and management techniques that in some countries have very ancient roots.

To reach the development objective, MEDRAP worked out two types of activity:

- training and information, activities at regional level, either by short specialized sessions (2 to 8 weeks) for engineers, biologists and economists, or by long sessions, for technicians and production personnel. These activities are continued and reinforced by on the job training activities which are carried out when consultants and experts visit the site.
- the activities of direct field assistance for the benefit uencfit of pilot projects, in the aim, on one hand, to adapt the suitable technologies to the local conditions and on the other hand, to review the training and popularization reference centre. These diverse projects should create within an average period, a regional network system which permits the development of true cooperation between different states.

In this situation, the training of technicians from different countries plays a primary role, most of it being practical. This is also very important because there is a great lack of documents on traditional methodologies, which certainly have a great impor-tance at productive level, whereas documents on modern technologies are more available.

The aim of this course was to train some technicians who would later work directly on production. The didactic bases of this course were elaborated according to the experiences acquired in the different Mediterranean countries within MEDRAP, in which the primary field and the intervention levels were identified, coward a training that would mark the regional development of Mediterranean aquaculture. The programmes considered these priorities and tried to answer the questions that had been asked at a regional level, with some corrections emerging from the experience on direct interventions by MEDRAP, and evaluating a certain number of potentialities in the various Mediterranean regions which participate in the project.

The FAO Mediterranean Aquaculture Training Course, carried out at the Ittica Valda-gri, lasted 7 months, a period that permitted a thorough on the job training within Mediterranean aquaculture frame and is centred off Mediterranean aquaculture. Trainees carried out many direct on the job activities, following the different phases of a

productive fish farm with a wide range of diversification.

A theoretical part was associated to the practical part, in order to give some basic information necessary to the comprehension and the planning of the activities on the field, and also to offer a picture of the aquaculture in the world and in particular in the neighboring Mediterranean countries.

As the first long term training course for technicians who would later operate on the development of productive activities has a pilot and experimental meaning, the didactic methodologies proposed will be completely verified and improved after this first new experience.

In this aim, we have planned to carry out a precise analysis on the trainers' activities, on the didactic methodologies applied, on the optimum ratio between practical and theoretical activities in the different fields, on the advice and claims that emerged every day from the participants attending the course.

The lack of didactic documents on Mediterranean aquaculture is one of the other aspects that this first training course tried to face, to give the trainees some precise points of reference which could be useful in the continuation of their future activities on the field.

1.1 TRAINING CENTRE SITE

The Training Centre is located at the Ittica Valdagri in Policoro, an Italian Mediterranean aquaculture farm.

This choice was made according to the intention to place the trainees in a productive reality, where day by day difficulties and successes can be easily observed. The Centre is autonomous from the plant itself, as it has its own laboratories, classrooms and library; some productive structures of the farm are used for the training.

The trainees live in the FAO campus located within the farm, and are therefore always present on the productive sites.

1.2 THE CHOICE OF ITTICA VALDAGRI

Ittica Valdagri (fig.1) is a fish farm covering a surface of more than 350 ha, it pumps sea water from the Ionian Sea and fresh water from the River Agri.

Its peculiar characteristics is to have in its productive structures a wide range of all the productive patterns used at present in the Mediterranean : hatchery, nursery, intensive rearing ponds, large ponds managed as in "vallicoltura", ponds managed as parts of lagoons, channels for fry capture, ponds that can be emptied for the rearing of euryhaline fish in fresh water, structures for the rearing of shellfish, etc... All this is associated to other structures such as a large workshop for the realization of prototypes, a warehouse, cold stores, a hall for the preparation and the sale of products, laboratories, two rooms for meetings, showers, canteen, etc..

These structures are connected by more than 20 km of all-weather roads, which permit a real utilization of the productive sector for didactic purposes.

The large surface of Valdagri, including wide inner spaces, several free hectares and a beach over 4 km long, permits to welcome many people and to create the activities for the spare time, essential for those young people who stay in Valdagri for a long period of training.

All these potentialities of structures and surface made Valdagri a most suitable plant to carry out the professional training we aimed at.

1.3 SHORT DESCRIPTION OF ITTICA VALDAGRI'S ACTIVITIES

Ittica Valdagri is an aquaculture farm in which different strategies and technologies of fish production are applied. Such activities can be summarized as follows :

1.3.1 INTENSIVE REARING

Intensive rearing of Anguilla anguilla

selection and feeding of wild eels - weaning of wild elvers - improvement of first rearing diets - preparation of artificial food - programmes of preventive and curative prophylaxis - capture and selection of eels - stocking of the product to be sent to the market

Intensive rearing of Dicentrarchus labrax

rearing of wild sea bass - first rearing of artificially reproduced sea bass - preparation of diets integrated with fresh food - selection of the product in the fattening ponds - transport of the product - fattening, feeding , selection and commercial preparation of the market size product - prophylaxis and curative treatments of the fish during the different stages of rearing

Intensive rearing of mullets

(Mugil cephalus, Chelon labrosus, Liza aurata, L.ramada) to produce one-year-old fish to stock in polyculture - first rearing - preparation of artificial food integrated with fresh food - capture and transport of the fish to fattening ponds

Intensive rearing of Sparus aurata

weaning of wild sea bream fry - preparation of diets with fresh food - preparation of integrated artificial food - capture of one-year-old fish (about 60-100 g of weight) to stock in the grow-out ponds - grow-out of the product to market size in intensive ponds, in mono and/or polyculture with mullets - association of sea breams with other species, for an ecological management of the ponds - prophylaxis and curative treatments of the fish during the different stages of rearing

Artificial reproduction of Dicentrarchus labrax

capture and stocking of broodstock - preparation of suitable pre- and post-reproduction diets - handling and transport of broodstock - artificial reproduction - collection and selection of eggs - egg transport to short/-long distances - parallel culture of phyto- and zoo-plankton - weaning,

prophylaxis, selection and transport of fry

1.3.2 SEMI-INTENSIVE REARING IN EMPTIABLE PONDS

Polyculture sea-bream + mullets

programmes of restocking and associations of different species, " using fish captured in the wild or fattened for one year - integrated diets - management of natural pastures by integrated manuring - sample collection and control of the population dynamics in the ponds - collection, selection and commercial preparation of the product

Polyculture mullets + carps

in euryhaline ponds, which can be filled with fresh water, association programmes among M.cephalus, Liza ramada and Cyprinus carpio - integrated diets - management of the natural substrate - selective capture of the species reared - prophylaxis and curative treatments

1.3.3 EXTENSIVE REARING IN PARTIALLY EMPTIABLE PONDS

Aquaculture activities

restocking programmes, with or without predators - control of predators which are naturally present in the ponds - management of the inlet and outlet gates according to the different rearing stages - collection of samples and control of the population dynamics , to estimate the capture of the market size fish for the different species

Fisheries in extensive ponds

selective capture of predators with hooks - capture of eels with baskets fishing with trammels and *mono*-filament nets of different size and shape - nets setting - handling and commercial preparation of the product - selective fisheries for mullets and sea bream - purse seine fishing - settling and management of fish barriers for seasonal fish capture

1.3.4 ACTIVITIES CONNECTED TO AQUACULTURE MANAGEMENT

Environment control

hydraulic control of ponds - management of water levels and quality (sea or fresh water) - continuous control of the basic physico - chemical parameters, eventual additional control in emergencies - control of bird predation, through noises, nets, etc.. - analyses in the farm's biological and chemical laboratory - control, removal and utilization of sea weeds in the ponds

Fry and juvenile capture

seasonal capture of fry in the plant's inlet and outlet channels - use of suitable fishing gear - count and selection of the product - transport and stocking - juvenile collection in the farm's channels - removal of predators from the channels - digging of suitable structures (channels, water falls) for the grouping and capture of juveniles

Construction and maintenance

small earth movements - dikes and channels maintenance - construction of gates for fish barriers and monks - construction of structures for

feeding -maintenance and control of electric power lines, pumps, generators, tractors and lorries, boats, kneading machine and mincing mill - assembling of fishing nets (from raw material) and construction of fishing gear prototypes

Administration and fish culture management

relationships with suppliers and dealers - stocking of raw material in the warehouse - administration on computer - planning of the workers' and technicians 'time table - programmes of activities - presence files - organization of the guard service - administrative relationships with public administrations and ministries dealing with such activities

Stocking and handling of the product for commercialisation

selection of product - washing - storage in ice-flakes and cold stores technical and hygienic management of cold stores - preparation of the product for the different national and foreign markets

The outline of the activities carried out at the Ittica Valdagri is very useful to plan the didactic "on-the-job" training, which is an essential element to associate to the trainers' work, both practical and theoretical. All activities listed above are carried out and are being consolidated at the plant, and represent its productive nucleus. We must also add that there are several other collateral research activities, both as parts of wider programmes, or as particular research which is or was carried out, such as:

- reproduction and rearing of Penaeus japonicus
- trials of artificial reproduction of mullets and sea bream
- white bream rearing
- mussel production

2. FAO CAMPUS. REALISED AT THE ITTICA VALDAGRI AT POLICORO

2.1 THE CAMPUS

The trainees live in a campus, placed in the Mediterranean shrub inside the Ittica Valdagri, built especially for the FAO Training course.

The campus (fig.2) covers a surface of about 5 000 m², and includes:

- 6 prefabricated houses, with all comforts. Their measures are 2.91 x 12.27 m x h 2.39 m., divided in two compartements, with two separate entries. Each compartment is composed of two rooms and a bath room (fig.3). The rooms contain a bed, a cupboard, a table, a chair and a heater. The bath room is fitted out with a shower.
- a canteen of 50 m², that can be used also as lounge; a kitchen and a table-tennis room. The canteen has the following time table:

-breakfast	8.00 - 8.30 a.m.
-lunch	12.30 - 1.30 p.m.
-dinner	6.30 - 7.30 p.m.

Meals are prepared by a group of cooks, and in accordance to the different alimentary needs of the students, in respect of age, nationality and religion.

- a prefabricated unit used as store-room and equipped with a washing machine.
- a parking area for the trainees' bicycles

2.2 PERSONAL EQUIPMENT

Personal equipment , given to the trainees at their arrival, includes:

- stationery
- fishing equipment : 1 pair of long boots
1 pair of short boots
1 rainproof suit
- clothes : 1 sport suit
1 pair of sport shoes
2 pairs of worsted socks
1 pair of wollen tights
1 wollen jumper
1 wollen hat

Each trainee has a bicycle that permits to go as-he-pleases around the farm. The use of the bicycle outside the farm is not allowed, unless if authorised. The bicycles belong to the FAO Centre.

2.3 DIDACTIC EQUIPMENT

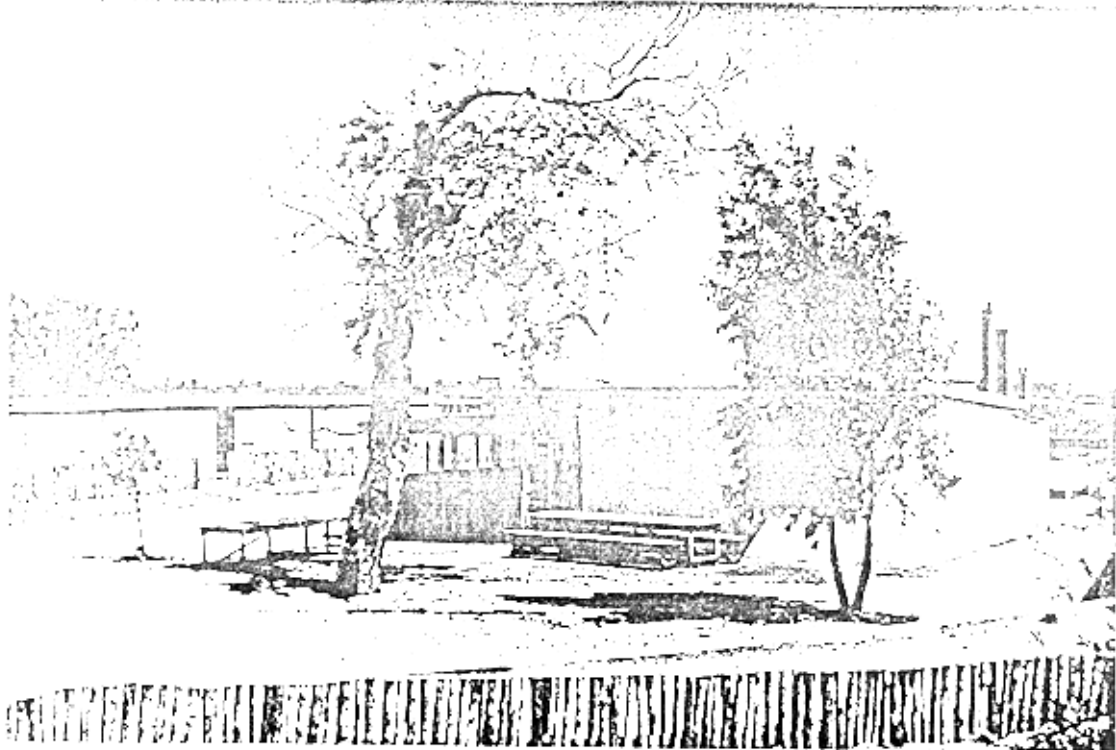
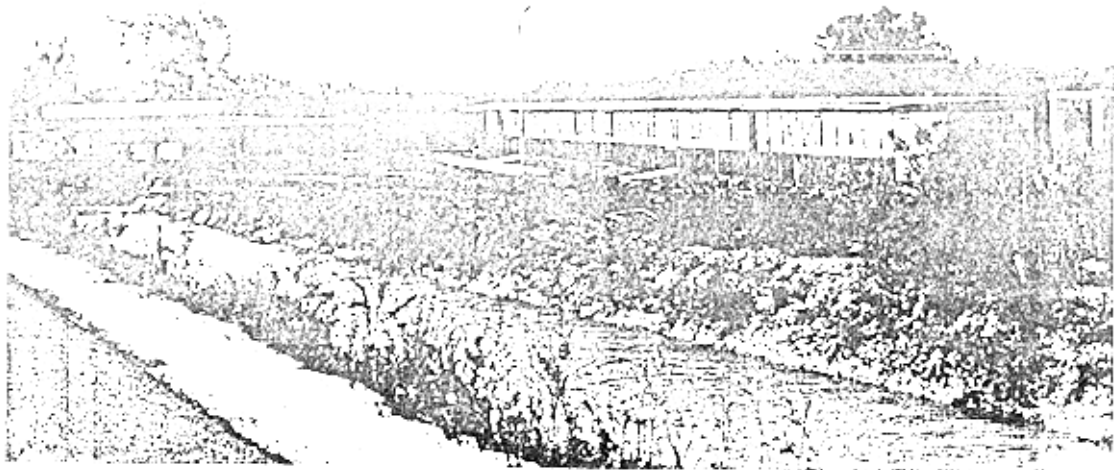
- class-room for 24 students, equipped with blackboard, slide projector and screen, over head projector.
- library equipped with photocopying machine, type-writer, collection of F.A.O. papers and books on aquaculture and small scale fisheries, desks and tables for 8 students to read and study.
- laboratory equipped with one compound microscope and one stereoscope, pH meter, salino meter, oxymeter, dissection tools, various material for analyses (glass and plastic vials and containers, basic chemical equipment, photography equipment) and for phyto and zooplankton production.
- for field activities, the Centre has a collection of fishing gear and equipment for the produce selection (nets for market size fish, for fry, for plankton etc..).

2.4 BUS SERVICE

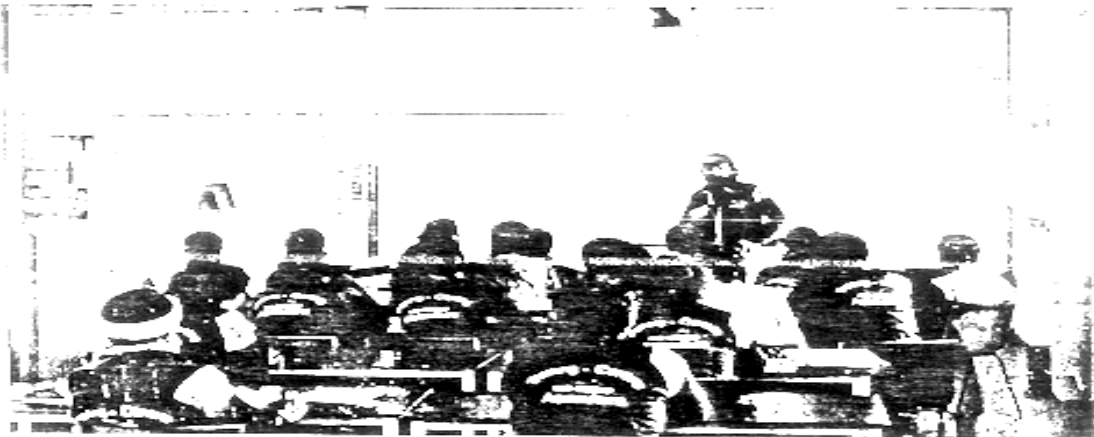
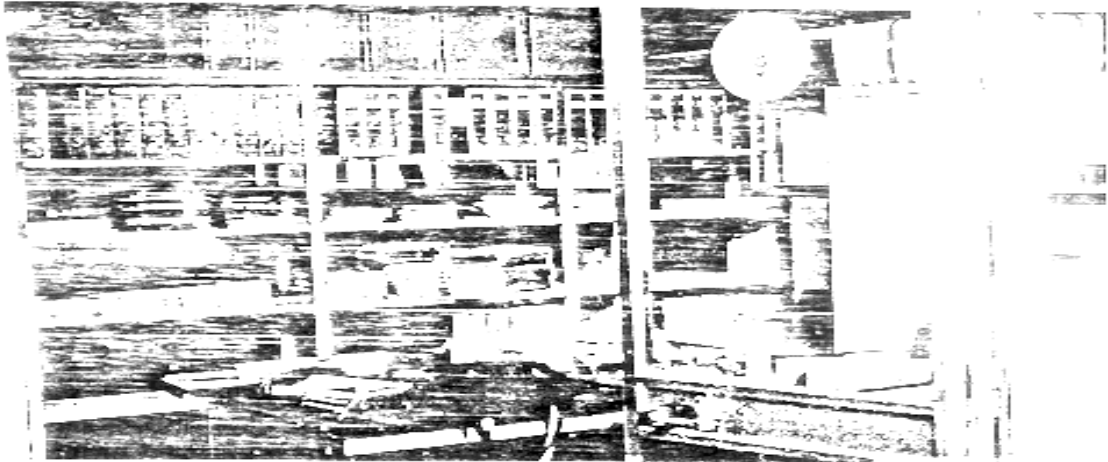
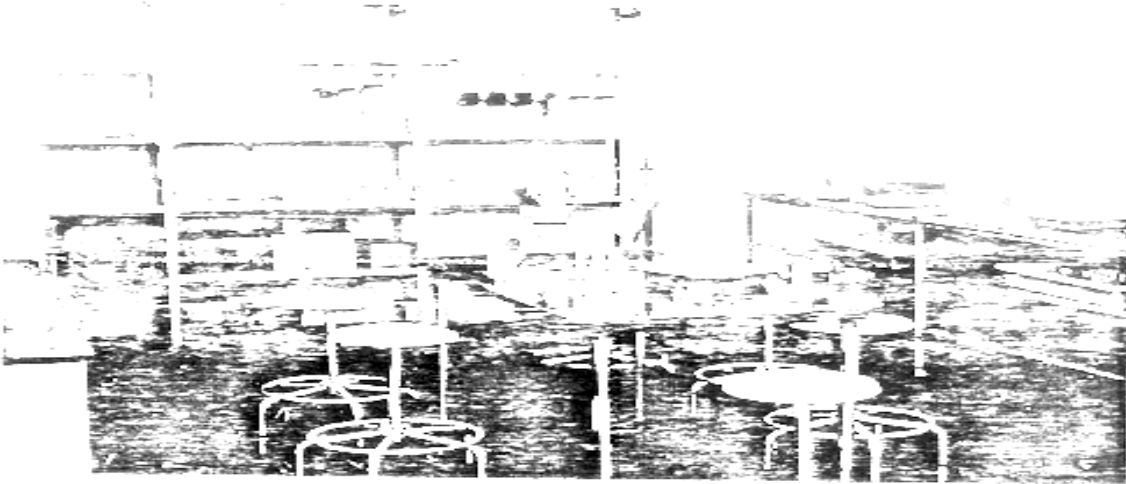
For trips outside the plant, the Centre has rented a small 9 seats bus, pending the delivery of its own vehicles.

Timetable Centre - Policoro - Centre:

Monday to Friday	7.00 to 9.30 p.m.
Saturday and Sunday	10.00 to 11.00 a.m. 3.00 to 5.00 p.m. 7.00 to 9.30 p.m.

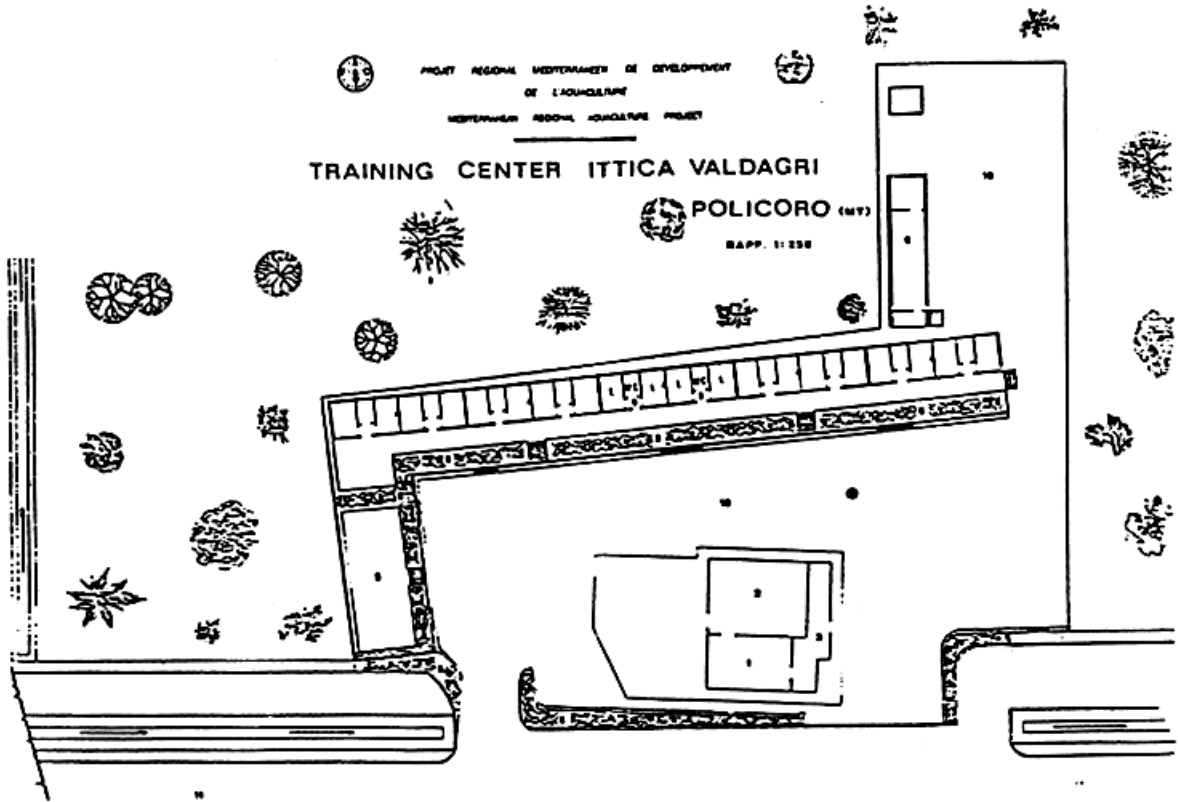


- A Campus
- B Campus and canteen



- A Laboratories
- B Library
- C Class-room

Fig. 2



- | | | |
|----------------------|-------------------------|----------------------|
| 1. Canteen | 5. Bicycles parking-lot | 9. Lamp-post |
| 2. Table tennis room | 6. Laundry | 10. Square |
| 3. Kitchen | 7. Clothes drying lines | 11. Farm's main road |
| 4. Living quarters | 8. Garden | |

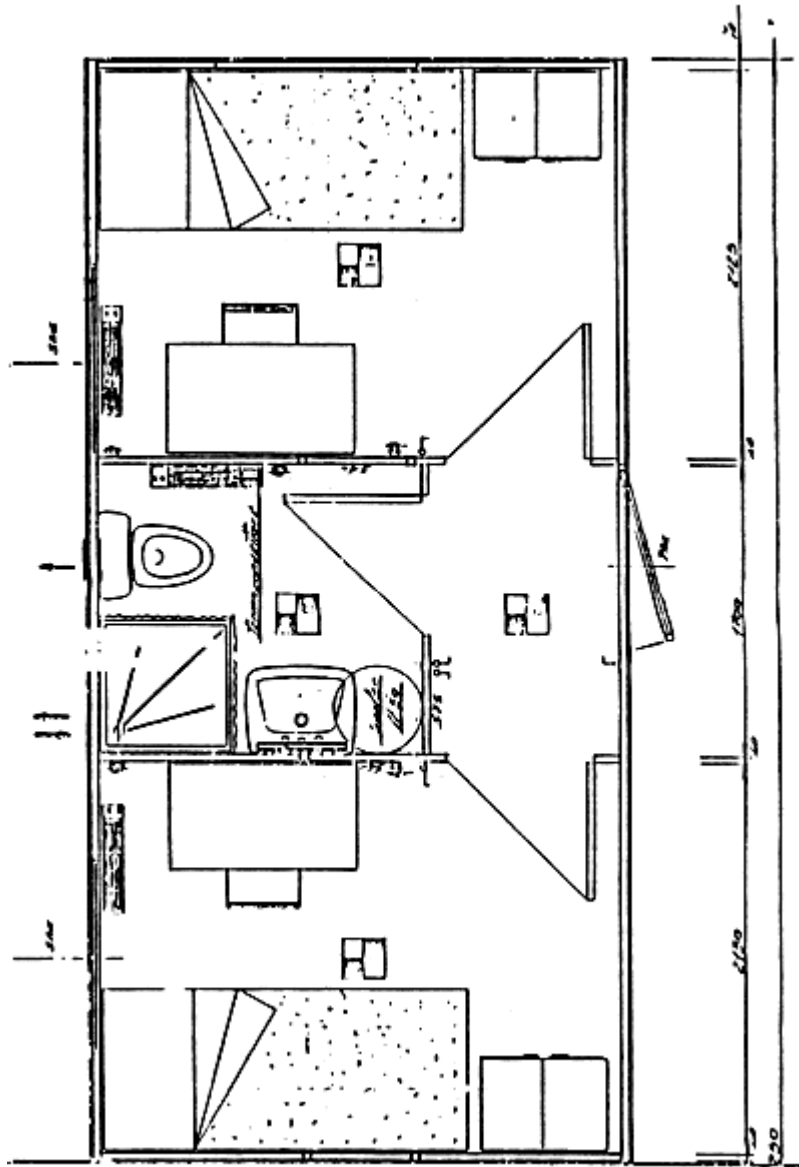


Fig.3 UNIT OF LIVING QUARTERS IN THE CAMPUS FOR TWO TRAINEES

3- DIDACTIC METHODOLOGY PROPOSED

3.1 DIDACTIC ORGANISATION

The course started on December 1st, 1984. After 10 days of adaptation, to settle down and to begin to know the Centre, the activities started.

The trainees filled the personal files, indicating their school and professional level, and their preferences for the different sectors of specialized training. They were then grouped in working teams for the base activities and for the specialist ones, according to their language knowledge and the preferences indicated above.

The trainers of the Centre included:

- MEDRAP staff: Director of the Centre
Didactic Coordinator
Experts in different fields
- Experts who held seminars and practical lessons on various matters

The Director of the Centre was responsible for the Centre both for the training aspects and for every day organization problems.

MEDRAP experts intervened according to the needs of the didactic programmes at various levels.

The Coordinator followed the compilation of programmes and their development, the preparation of documents, the experts' activities; he wrote the reports on the didactic activities in collaboration with the MEDRAP Coordinator and the Director of the Centre, with the supervision of other FAO experts.

The experts, most of them Senior experts in various fields connected with aquaculture, gave lectures and held practical lessons in the laboratory and in the field. The purpose of their intervention was to provide the trainees with a broader spectrum of world and of Mediterranean aquaculture, in addition to basic information.

3.2 DIDACTIC METHODOLOGY

The need of articulating some didactic programmes "on-the-job" finds good opportunities in the productive structures of Valdagri.

Each trainee, especially the one who is due to work directly in the productive process, must have a complete sight of the general technical aspects, and especially of the emergencies which may occur in an aquaculture plant.

Prior to be given specialized training, the trainee was given a precise knowledge of the consolidated facts of the sector. For instance, if all fish farmers had a good training in carp and trout culture, they would certainly acquire a clear idea of two fundamental elements in fish culture: the intensive and the semi-intensive systems, the "husbandry" fish culture and the biological approach.

Even though technical processes of the artificial reproduction of marine species are carried out through new biological strategies, especially as far as weaning is concerned, grow-out requires technicians and staff with at least general experience in fish handling, and who know how to control the water flow in a tank from the surface or from the bottom.

The didactic method tended to develop practical activities, fundamental for the experience of those who would later on produce.

Practical activities, common to all sectors, have been widened for those who specialized in lagoon management. But it is also important to underline the fact that also those who mainly worked in the hatchery took advantage from this kind of training, which was carried out by teachers who themselves had worked on these activities. Hence there was a transfer of experiences and the didactic action was effective. It is also evident that such practical experiences have been inserted in a wider practical and theoretical didactic programme.

The didactic programme is divided in two kinds of training, narrowly integrated: basis programme and special programme.

Basis programme

The basis programme was carried out essentially through the intervention of the didactic Coordinator, and was integrated to the course through seminars held by the experts. More than 50 hours of lessons were given, that, added to the hours of coordination (30 hours), made up a total of a minimum 80 hours of basic training on different topics.

Special programme for theoretical and practical training

The programme aimed at the on-the-job training in Mediterranean aquaculture. The programme was carried out through:

1. theoretical lectures which completed the basis programme,
2. theoretical preparation to the activities in the field and in the laboratory,
3. activities in the field and in the laboratories

3.3 METHODOLOGY ON THE BASIS PROGRAMME

It consisted of lessons in which a good proportion of time (at least 50%) was kept for discussion on basis topics, and more generally on matters that could give some elements on aquaculture, on the methodologies applied, etc., on sound scientific bases, with the help of slides, audiovisual and pictures.

The lecturers distributed short papers to summarize the lesson, and some bibliography on the matter, photocopies of books, tables and files of reference.

The lecturers filled up a file on the main subjects of their lesson, according to the terms of reference provided.



MEDITERRANEAN REGIONAL AQUACULTURE PROJECT



DIDACTIC FILE (lectures and explanations) SPECIAL PROGRAMME D.F/3

daily activity of Mr..... date

hours

SUBJECTS.....

.....

.....

.....

.....

Signature.....



MEDITERRANEAN REGIONAL AQUACULTURE PROJECT



DIDACTIC TILE (lectures and seminars) BASIS PROGRAMME D.F/1

daily activity of Mr..... date

lesson hours

SUBJECTS :

.....

.....

.....

.....

signature

For the lecturers who carried out both theoretical and practical lessons, the basis and the specialised activities were closely integrated, according to the didactic programme.

3.4 METHODOLOGY OF THE SPECIAL PROGRAMME

It was articulated in 3 closely related phases. The lecturer acted as trainer in the field and coordinator of the global activities of his sector.

Lessons of type 1 dealt with general topics related to the specific sector, with references to other experiences and methodologies.

Lessons of type 2 dealt with theoretical elements for the comprehension of the specific practical activities; in this part, the working programme is articulated day by day or phase by phase. The papers distributed in this phase consisted mainly in reference tables and lists of manual activities.

3.5 DIDACTIC FILES

Didactic files were very useful to collect with a simple methodology the didactic and training activities carried out in the KEDRAP Training Centre. They permitted to have an up-to-date report on the activities carried out, and to obtain a useful reference for the improvement of future courses.

The didactic files were of 3 types:

DF1 is the file for the basis programme

DF2 is the file for the special programme, concerning the practical training

DF3 is the file for the special programme concerning the training in class-rooms

During the basis and specialized training, under the control of the Director of the Centre and the Didactic Coordinator, the trainees elaborated some notes on their work, with the help of the papers distributed during the course. These notes were also enriched with photographic documents.

The documents collected and elaborated formed a basic manual that the trainees took home at the end of the course. These represent an useful data base for the improvement of future courses, after having been carefully analysed by MEDRAP trainers and coordinators.



MEDITERRANEAN REGIONAL AQUACULTURE PROJECT



DIDACTIC FILE (field and laboratory training) SPECIAL PROGRAMME D.F/2

daily activity of Mr..... date.....

training hours.....

SUBJECT.....

.....

.....

.....

MAIN INSTRUMENTS and/or FACILITIES.....

.....

.....

Signature.....

4. DIDACTIC PROGRAMME

4.1 BASIS PROGRAMME

– AQUACULTURE PRINCIPLES

INTRODUCTION TO AQUACULTURE

- * definition of aquaculture
- * aquaculture history
- * aims of aquaculture
- * returns in aquaculture
- * aquaculture systems in fresh brackish and salt water
- * economical aspects

SITE SELECTION IN AQUACULTURE

- * environmental characteristics in different types of aquaculture
- * technical considerations on site selection
- * climatic factors
- * socio-economical, political and legal aspects

CHOICE OF SPECIES TO BE REARED

- * commonly reared organisms
- * biological characteristics of the different species reared (elements of anatomy and physiology)
- * selection of species according to environment

EGG AND FRY COLLECTION AND PRODUCTION

- * eggs, fry and fingerlings in aquaculture
- * collection from the wild
- * production in the hatchery (incubation and hatching)
- * fry rearing
- * transport to grow-out ponds
- * transport methods

AQUACULTURE PLANT ENGINEERING AND PLANNING

- * type of plant according to the water resource available
- * planning
- * preliminary design
- * plant structures
- * production estimates
- * economical aspects in aquaculture plants

REARING IN RUNNING WATERS

- * water resource characteristics
- * different types of facilities used
- * types of rearing
- * economical aspects

REARING IN PONDS

- * species that can be reared
- * water resource characteristics
- * preparation of the ponds for rearing purposes
- * artificial reproduction techniques
- * types of rearing
- * economical aspects

REARING IN FLOATING CAGES

- * general conditions
- * types of cages
- * design and construction
- * species that can be reared
- * economical aspects

FISH CULTURE FOR RESTOCKING PURPOSES

- * definition
- * aims
- * species used for restocking purposes
- * restocking methods
- * economical aspects

SHELL FISH CULTURE

- * general conditions
- * criteria for the site selection
- * species that can be reared
- * seed collection
- * economical aspects

SHRIMP CULTURE

- * world review of marine shrimp culture
- * artificial reproduction
- * intensive rearing
- * semi-intensive rearing in mono and polyculture

FEEDING AND ARTIFICIAL FOOD

- * food requirements for fish, shrimps and shell fish
- * types of nutritional elements
- * feeding effects
- * artificial food
- * feeding techniques

FISH PATHOLOGY

- * environmental factors
- * main diseases and parasites
- * treatments and prophylaxis
- * economical aspects

TRADE AND TRANSFORMATION OF THE PRODUCT REARED

- * keeping market-size fish, shrimp and shell fish alive
- * shell fish depuration
- * (transport of live fish and shrimp
- * product alterations
- * evaluation of fish freshness
- * preparation of product for commercialisation
- * techniques of conservation and preparation of product
- * quality control
- * product marketing

SOCIO-ECONOMICAL ASPECTS

- * main socio-economical aspects in developing countries
- * contribution of aquaculture to solve the problem
- * *socio-econcnical contrasts related to aquaculture
- * negative economical aspects
- * investments evaluation

- MEDITERRANEAN AQUACULTURE

LAGOON AND "VALLI" ENVIRONMENT MANAGEMENT

- * description of a "valle"
- * "valle" management
- * traditions from the "valle"
- * restocking
- * economy and returns linked to "Vallicoltura"

MEDITERRANEAN LAGOONS

- * role of lagoons in local economies
- * Northern Adriatic lagoons
- * Southern Adriatic lagoons
- * Turkish lagoons
- * Algerian lagoons
- * Tunisian lagoons
- * Moroccan lagoons
- * Egyptian lagoons
- * Greek lagoons

DESCRIPTION OF FISHING GEAR

- * trammel and mono-twine nets
- * seines
- * baskets and hooks
- * fish barriers

INTEGRATION OF AQUACULTURE IN LAGOONS

- * structures on land
- * floating cages
- * shell fish culture

- * equipment for storage, processing and marketing
- * returns of the different types of interventions

4.2 SPECIAL PROGRAMME

ARTIFICIAL REPRODUCTION OF Sparus aurata, Dicentrarchus labrax AND Penaeus japonicus

- * introduction to artificial reproduction
- * aims of artificial reproduction
- * selection, maintenance and stocking of broodstock
- * reproductive physiology
- * natural reproduction
- * spawning behaviour
- * egg and embryo development
- * effects of chemical and physical parameters on the embryo's development
- * larval survival
- * larval rearing
- * larval feeding
- * filter for recycled water
- * hatchery design
- * prophylaxis

FRY AND FINGERLING COLLECTION

- * spawning periods of the different species reared
- * fry and fingerling migration
- * environmental factors linked to spawning seasons and migrations
- * capture sites
- * fishing gear
- * equipment
- * fishing team
- * fry transport
- * pre-adaptation techniques for restocking
- * prophylaxis and disinfection

SEA BASS REARING

- * bio-ecological aspects
- * wild and hatchery fry storage
- * fry rearing
- * intensive rearing

SEA BREAM REARING

- * bio-ecological aspects
- * juvenile stocking
- * first rearing
- * rearing in mono and polyculture

MULLET REARING

- * bio-ecological aspects
- * juvenile stocking
- * first rearing
- * rearing in mono and polyculture at different salinities

SHELL FISH CULTURE

- * mussel, oyster and clam : bio-ecological aspects
- * rearing methods for mussel and oyster

MANAGEMENT OF LARGE PONDS

- * semi-intensive and extensive fish culture in marine and brackish water ponds
- * elements in ecology applied to rearing environments
- * stocking planning
- * complimentary diets
- * fertilizing
- * predator control
- * fishing methods

Within the special programmes, the trainees, alone or associated in working teams, can propose some activities of study or research linked to the training, preparing some specific programmes, which can be accepted after a careful examination, if the programme does not interfere with the regular activities planned.



MEDITERRANEAN REGIONAL AQUACULTURE PROJECT



WEEKLY ACTIVITIES OF

ACTIVITES DE LA SEMAINE DE

day/Jour	morning/matin	afternoon/aprea midl

NOTES
.....
.....

date

signature

The study activities and the use of laboratories during spare time and rest days are allowed only in submittance of programmes and final reports.

Trainees must fill up a brief summary on their weekly training activities.

5. ACTIVITIES CARRIED OUT DURING THE FIRST COURSE 1984-1985

The trainees arrived at Policoro on 1.12.1984, and after 4 days of general organization the activities started.

Due to language problems, during this first phase the trainees were divided into two groups, one French speaking, (11 trainees), the other English speaking (9 trainees).

The activities at Policoro ended on 31.5.85, and the trainees left for a study tour until 16.6.85.

The trainees returned to their home countries on 17.6.85.

5.1 DIDACTIC ACTIVITIES

The didactic programme was applied according to the two lines programmed; table 1 summarizes the general time table of the activities carried out by the trainers. Table 2 shows the main topics treated with the number of hours, divided in base and special programme.

A total of 669 hours were necessary for the special programme and 192 hours for the basis programme, with a ratio of 77% and 23%.

In this first course, a higher number of experts' intervention came towards the end of the course itself, as some delays in recruitments were experienced; this problem will be solved for next year, so that lessons of general information will be regularly distributed during the year.

5.2 DIDACTIC PAPERS

Since its inception, the Training Centre has been collecting some copies of FAO papers which could be useful to the course purposes, and organized a library. The trainees could freely access to this papers, which could also be photocopied. Papers of which more copies were available were distributed to the trainees. The Centre made over 40.000 photocopies, to face to trainees need to have their own collection of technical papers.

The library contained also basic literature on Mediterranean aquaculture.

All the trainers wrote specific texts or brought some references left to the students to read. The course management found sometimes difficulties to obtain papers both in English and French. Efforts were undertaken to translate as many papers as possible.

5.3 DIDACTIC REPORTS

The trainees wrote 15 didactic reports, relative to the newly acquired knowledge and summarized from the references available. At the end of the course, each trainee received a copy of all the reports written by his colleagues in the various chapters of study, eventually enriched with original pictures taken during the most spectacular phases of work.

The next two courses will certainly benefit from the results obtained during this first phase, especially considering the lack of didactic papers available dealing with such a recent activity as Mediterranean aquaculture.

GENERAL TIME TABLE FOR ALL THE ACTIVIES CARRIED OUT DURING THE COURSE

	hours		
	Basis	Special	Total
1) Phyto and zooplankton production, Artemia naupli production	20	90	110
2) Phyto and zooplankton cultures in eutrophised ponds	2	6	8
3) Artemia rearing	2	3	5
4) Zooplankton collection from the wild	1	3	4
5) Capture and selection of sea bass and sea bream brood stock	1	5	6
6) Artificial reproduction	3	6	9
7) Egg collection and control	2	4	6
8) Egg incubation and hatching	2	5	7
9) Larval rearing	18	50	68
10) Weaning and first rearing	8	85	93
11) Filters for water recycling	4	5	9
12) Capture, transport, counting, stocking and captured of the fry	10	108	118
13) Classification of the fry captured	4	24	28
14) Utilization of fishing gear	8	51	59
15) Fish barrier construction	4	31	35
16) Systematics and biometry of the species captured	2	3	5
17) Intensive, semi-intensive, extensive and po-lyculture rearing of different species (sea bream, sea bass, mullets, eels, white bream, shrimp)	28	80	108
18) Mullet over wintering and first rearing	2	12	14
19) Rearing ponds menagement	8	30	38
20) Feeding techniques	21	35	56
21) Prophylaxis and curative treatments	10	10	20
22) Methods marketing of product	2	5	7
23) Shell-fish culture	8.	12	20
24) Control of environmental parameters	3	4	7
25) Elementary Biology	10		
26) Data analysis and file preparation	11		
	192	669	861

TABLE 2
EXPERTS INTERVENTIONS AT THE TRAINING CENTRE

		Dec.	Jan .	Feb.	Mar.	Apr.	May	Jun.	Number of days
Director of Centre	*	_____		_____				_____	186
MEDRAP coordinetor	*	_____		_____			_____	_____	10
Didactic coordinetor	***	_____	_____	_____	_____	_____	_____	_____	27
Aquac. /fry collec. /fisher. ex.	***	_____	_____	_____	_____	_____	_____	_____	182
Hatchery senior expert	*	_____	_____	_____	_____				48
Hatchery junior expert	*		_____						19
Phytoplankton expert	*		_____					_____	25
Engineering expert	*				_____			_____	19
Aquaculture expert	**		_____						2
Fish feed technology, expert	**		_____						9
Lagoon expert	**								2
Basic biology expert	***				_____				5
Zoology expert	***				_____	_____			11
Ecology expert	***					_____		_____	5
Fresh water aquaculture ex.	***						_____		2
Shell fish culture expert	***				_____				2
Shell fish culture expert	***				_____	_____			3
Shrimp culture expert	***						_____		2
Shrimp culture junior expert	***						_____		15
Pathology expert	***						_____		

MEDRAP staff member	*
FAO	**
MEDRAP expert	***

6. FIELD ACTIVITIES (S.P.)

6.1 Phyto- and zooplankton, Artemia nauplii production and cultures in eutrophised ponds

These activities were carried out during the entire period of the course.

The trainees cooperated in the production of various phyto- and zooplankton species, using the farm's own facilities, and following all the productive cycle, from the clone replication and maintenance to the production using different methods.

The theoretical part dealt with the different productive systems and facilities used, and described the characteristics of the species reared .

Some trials were carried out by using large volumes of fertilized waters, as an alternative to more sophisticated methods.

As far as Artemia nauplii are concerned, a series of theoretical lectures illustrated decapsulation and cyst hatching techniques, without forgetting the biological aspects of the species. The practical part dealt with the applicative aspect of some methods used in cyst hatching and incubation, analysing the hatching rate and the number of cysts to treat to satisfy the quantity of nauplii required for larval feeding.

6.2 Zooplankton collection in the wild

This activity had the aim to show how the plankton, particularly in the lagoon environment can be utilized in the production cycle as integration to the phyto- and zooplankton production obtained from specific systems.

The trainees cooperated with the realization of a plankton net and with the sampling, assisted to the automatic collection of plankton through the use of special gear, whereas under the theoretical aspect they attended some lessons on productive cycles and natural food webs.

6.3 Capture and selection of broodstock

This activity was carried out during the entire course.

From the theoretical point of view, the trainers tried to sensitize the students to the problems related to the stress caused by capture and transport.

From the practical point of view, demonstrations of fishing methods, transport and stocking were carried out.

Particular attention was devoted to broodstock both from the feeding and the prophylaxis points of view.

Selection techniques were shown to select ripe broodstock to be used for artificial reproduction.

6.4 Artificial reproduction of sea bream and sea bass

These didactic activities were carried out from December 1984 to February 1985.

The lessons were imparted with a theoretical part held in the class room, concerning the biology of the species on which artificial reproduction was carried out, spawning seasons, reproduction physiology, the various techniques used in artificial reproduction, in" particular hormone induction.

Practical lessons included a series of operations carried out by the trainees such as choice and handling of broodstock, hormone preparation and hormone induction.

During this period, the trainees obtained 5 kg of sea bream eggs and 12 kg of sea bass eggs.

6.5 Egg collection

The didactic activities relative to such topic coincide with the reproduction operations of sea bream, sea bass and shrimp, in December 1984, February 1985, May 1985 respectively.

The programme included a series of theoretical lessons to demonstrate the different egg development stages and fertilization, using the equipment available in the laboratory.

The trainees observed and carried out egg collection in the spawning tanks, with manual and automatic methods, weight control and techniques used for transport and long-distance shipping.

6.6 Egg incubation and hatching

The theoretical lessons given from December 1984 to January 1985 concerned different incubation technique and relative structures, importance of the water physical and chemical quality in different species, recycling systems, importance of the use of filter beds, control of environmental parameters and different embryo development phases up to the hatching.

In the practical part, the trainees could check and follow all the operations on the eggs they produced themselves. Particular care was paid to operations such as aeration control, temperature, egg density per unit volume, hatching rate and time.

All the phases of embryonal development were followed and observed under the microscope, also to eventually determine malformations.

6.7 Larval rearing

The duration of these activities coincided with the reproductive cycles of sea bass, sea bream and shrimp.

The programme was divided in a series of theoretical and practical lessons on the following topics: different types of structures for larval rearing, biological filters, colours, shape and size of tanks, rearing densities, water flow, prophylaxis; optimal temperatures, photoperiod and salinity; larval stages and their behaviour; feeding techniques, weaning and artificial food use; control of chemical and physical parameters in the biological filter and in the rearing tanks; estimation and control of survival rate.

The practical part led the trainees directly to a productive cycle, through the management of the larval rearing system.

6.8 Weaning and first fattening

During this part of the programme, the trainees followed the farm's activities for the production of about 250.000 sea bass, 50.000 of which were wild, and 50.000 sea bream.

The trainees took turns to directly manage some ponds, checking rearing densities, weaning (passage from natural to artificial feeding), diet formulation and preparation in different development stages, sanitary treatments and prophylaxis, cleaning and hygienic control, size selection, study of environmental parameters.

These activities were carried out from March to May 1985.

6.9 Preparation of a biological filter

The course included theoretical lessons on recycled water filtering systems, which are very important especially in winter months, corresponding to sea bass and sea bream spawning seasons. Filtering units connected to heating and recycling mechanisms were illustrated.

From a practical point of view, trainees participated to the realisation of the biological filter connected with the hatchery and checked the biological parameters during the entire rearing cycle.

6.10 Fry capture, transport, stocking, counting and classification

These operations are particularly important in the productive cycle of marine aquaculture farms connected with lagoon systems. These were carried out during the course as practical activity, to show the alternance in migration of different species.

The theoretical part dealt with fry migrations and their biology, with particular reference to mullets, and identified the capture systems, the gear and the techniques used for transport, stocking and counting. Emphasis was given to the identification of the captured species.

The practical part consisted in the utilization of fishing gear, fry handling, transport, counting and number estimation, pre-adaptation in ponds.

Each fishing operation was registered in files which contained not only the description of the operation itself but also biometric data of the fry captured.

6.11 Use of fishing gear, systematics and biometry of the species captured

This part of the programme was useful to teach both a correct use of gears and of various fishing techniques, and the biology of the species captured.

The practical part concerned the use and the maintenance of fishing gear, the choice of the gear and the mesh size, according to the species to be captured.

The theoretical part concerned the commercial aspect, especially the product preparation and conservation methods.

Each operation was noted on files, which also recorded the biometry of the species captured according to the gear used.

6.12 Building a fish barrier

This activity, integrative to the exploitation of "valli" and lagoons, was articulated in a series of theoretical lessons to show the different types of fish barriers, the materials used for their construction, their function and management. The practical part consisted in building a small fish barrier and its management.

6.13 Intensive, semi-intensive, extensive and polyculture rearing of marine species: Product preparation for marketing

These activities were carried out during the entire training course. Trainees attended lessons on rearing techniques, with particular reference to Mediterranean species.

The different phases of a project were analysed, from the feasibility study to the numerical estimate of fry or pre-fattened fish to be stocked in the various ponds.

For the practical activities, trainees worked alternatively on productive cycles and on pond management, with intensive, semi-intensive, extensive and polyculture rearing methods.

Some groups were formed to follow independently the different trials, but regular meetings provided information on the other activities.

Some operations which could not easily be repeated, as the stocking of extensive and semi-intensive ponds, or fishing of marketable product in the rearing ponds, were carried out by all trainees at the same time.

During this phase, trainees filled in files concerning all the operations and the activities carried out, without neglecting the environmental parameters and the periodical samplings of the fish reared to check their growth.

6.14 Mullet overwintering and first fattening

Mullet fry captured by trainees was directly used to perform some experiments in different environments and at different densities. Four rearing models were prepared, two in earth ponds and two in concrete tanks outside the hatchery.

These trials were carried out from December 1984 to May 1985.

These activities permitted to show the trainees the problems connected to winter temperatures and all the operations useful for a correct rearing cycle, ranging from periodical sampling of the product to pond cleaning and maintenance.

6.15 Rearing ponds management

The technical characteristics and all the operations needed for a correct management of rearing ponds with different methods were discussed in details.

Trainees followed directly the rearing phases with extensive, semi-intensive, intensive and polyculture techniques, up to marketable size product, through water flow management, weed removal, feeding, prophylaxis and control of water quality parameters.

6.16 Feeding techniques

The feeding problem was first faced in a theoretical part which provided the basic elements on the composition of artificial food, on the role of all the essential elements to improve a diet, on the effects of unbalanced diets, in different rearing conditions and on different species.

As far as the practical part was concerned, trainees cooperated at the preparation of the food distributed in the farm, by using a kneader and an industrial mill. They also attended the food distribution in the ponds, assisting the farm's staff. They also constructed devices for food distribution and used automatic food dispensers.

6.17 Prophylaxis and sanitary treatments

This delicate topic includes a theoretical part which showed the various fish disease agents, their prophylaxis and treatment, and provided elements for diagnosis.

In the practical part, trainees used tests to analyse and to culture bacteria clones.

Trainees attended to and operated in the prophylaxis and curative treatments within the farm productive activities, by using and calculating the dosis for every single substance.

6.18 Shell fish culture

A series of theoretical lessons illustrated both the biology and the rearing techniques of the species reared.

Trainees carried out rearing trials on clams, mussels and oysters, built the structures needed for the purpose; using seed collected in the farm, and monitored their increase in size by keeping regular records.

6.19 Control of environmental parameters

In all the activities carried out during the training course - artificial reproduction, fishing, rearing, fry collection, phyto- and zooplankton production - trainees always had to consider environmental parameters (temperature, oxygen, salinity, pH, ammonia, nitrate, nitrite):

Theoretical and practical lessons were held on the main elements cycles in water, on their influence on the environment, with particular reference to rearing plants, and on the correct use of the instruments.

7 .STUDY TOUR

The aim of the study tour carried out at the end of the course was to show the trainees some different productive and technico-scientific facilities in Italy and Jugoslavia, which well represent the Mediterranean aquaculture.

The trip lasted 11 days, during which time 11 fish farms, 2 research institutes and fish processing plants were visited.

- 3.6.85 Ittica Ugento (LE) : intensive plant for marine species
- 4.6.85 San Nazario (FG) : hyperhaline eel farm
CNR (FG) : National Research Council, aquaculture research institute
- 6.6.85 S.I.R.A.P. (VE) : farm for marine species, artificial reproduction and first rearing
Valle Ca' Pisani (VE) : integrated "Vallicoltura"
- 7.6.85 Valle Dogà (VE) : integrated "Vallicoltura"
- 10.6.85 Friulittica (UD) : intensive trout farm
Euroittica (UD) : fish processing plant
Stella (UD) : intensive trout farm
Istituto Zooprofilattico di Udine (UD) : research on fish diseases
- 13.6.85 Mirna (Rovinj , Jugoslavia) : fish and shell fish processing plant
- 14.6-85 Limski Canal (Rovinj , Jugoslavia) : intensive rearing in floating cages, shell fish culture
- 16.6.85 Laboratorio Ittiogenico di Santa Liberata (Orbetello, GR) : marine fish hatchery Visit to Orbetello Lagoon fish barriers
ENEL (Civitavecchia, RM) : hatchery and intensive rearing farm using waste waters from an electric power plant

The study tour was organized with the collaboration of the FAO Fisheries Department Travel Unit.

8 GENERAL CONSIDERATIONS

The MEDRAP Centre in Policoro carried out an intensive activity, and the programme was followed according to schedule.

The experience of this first course confirms the advantage to operating in a commercial farm where, even if completely autonomously, the trainees are in direct contact with many operational problems that Mediterranean aquaculture has to face.

The living-in of trainees within the farm permitted to intensify the didactic action, and after a first phase of tiredness due to adaptation at the end of the first month of activity, each trainee identified its interests and created its autonomous rythm of life, outside the hours of planned work. We must not forget that most trainees were abroad for the first time in their lives.

A good integration in the Centre was also demonstrated by the trainees' excellent behaviour and participation in activities. From the results, we can asserrt that more than 90% of the trainees worked with good or excellent results.

Languages were a limitation to some of the trainees , who at the beginning had difficulties in analysing pavers and follow the activities. At the end of the 2nd month, the problem was nearly solved, and only one or two still had some difficulties, even though they were assisted by more advanced compatriots. In future courses, greater attention will be required from Governments on the trainees selection, but it will be also useful to provide basic audiovisual language courses.

The course as planned, was essentially aimed at technicians who would later work on production. Younger people seemed more suitable to learning manual and

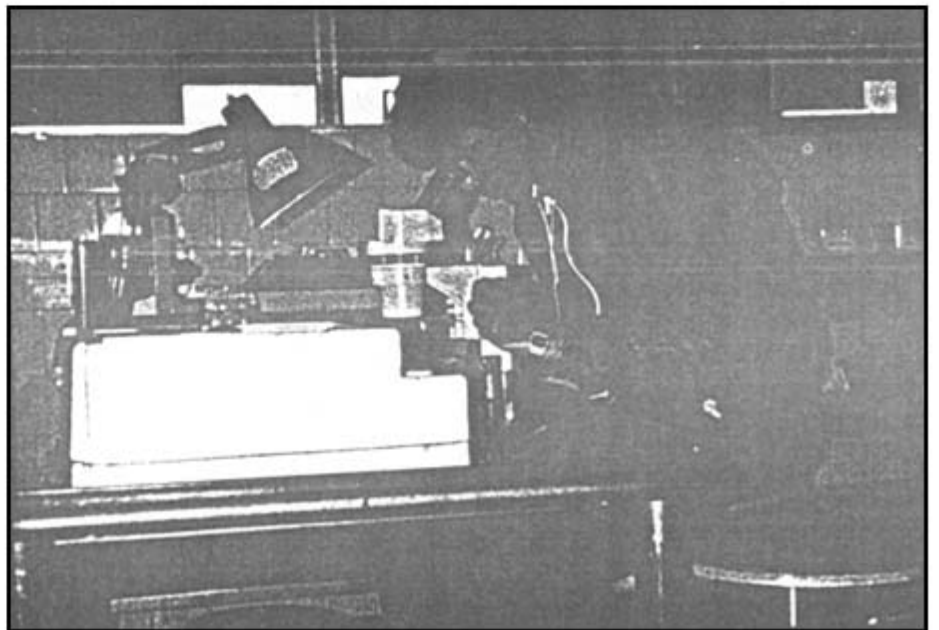
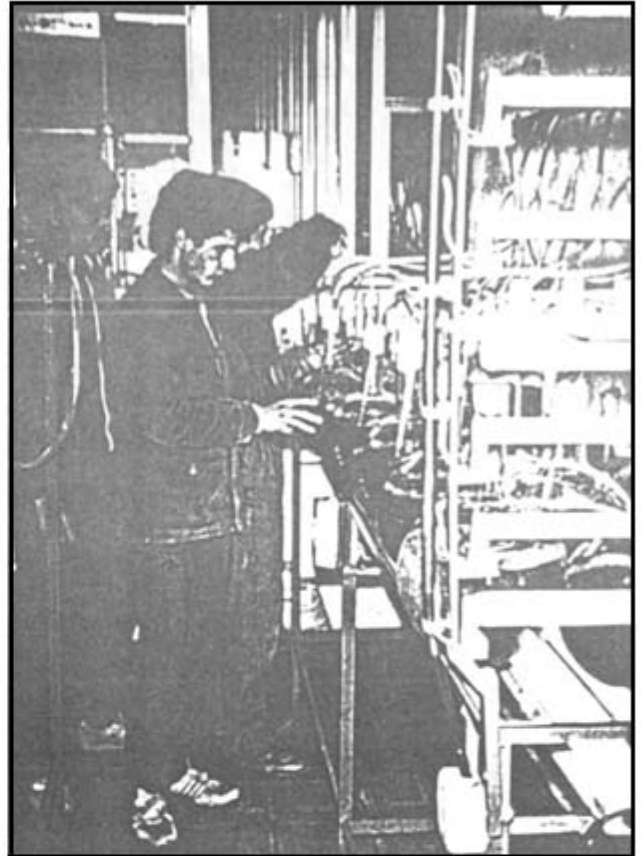
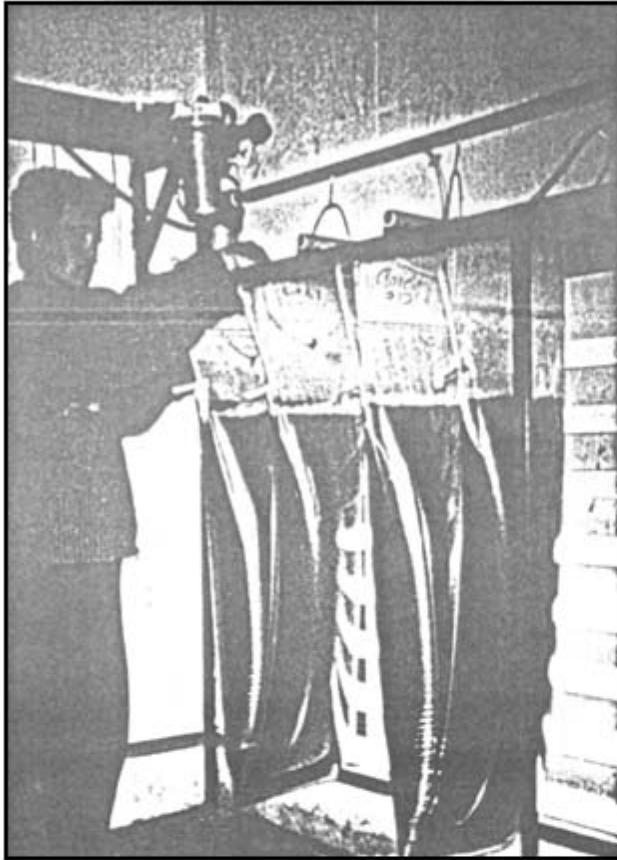
routine activities essential for production. They are more adaptable to new life style in the campus and the intensive time table of the course.

In general, there was high consensus for practical activities, especially if related with experiences in production.

The availability of personal equipment underlined a sense of responsibility for the tools which were used.

On the whole, the autonomy of movement in the farm and the personal bicycle permitted to follow with liberty the activities carried out in the farm.

Toward the end of the course and thanks to improved knowledge of languages, contacts with the farm workers and technicians could be established. The didactic effect was obvious, also because continuously supported by the assistance of specialized technicians and consultant experts.



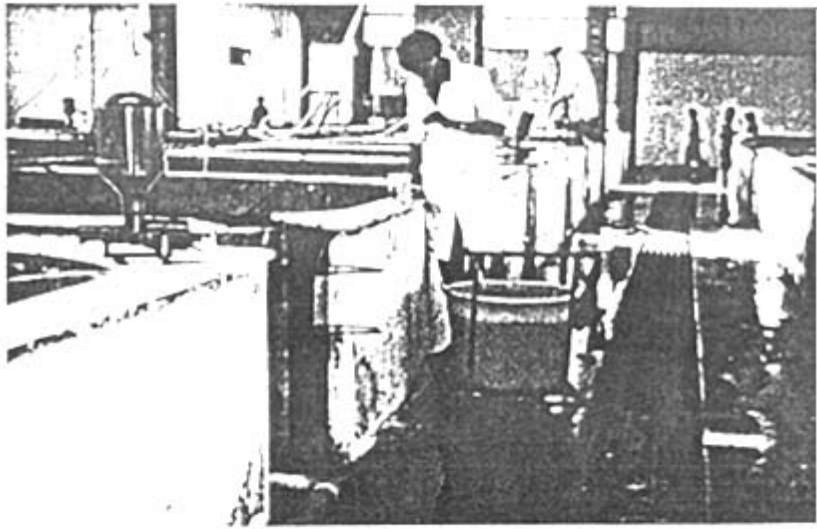
A – B Trainees working on phytoplankton
C Observating and counting zooplankton under the microscope



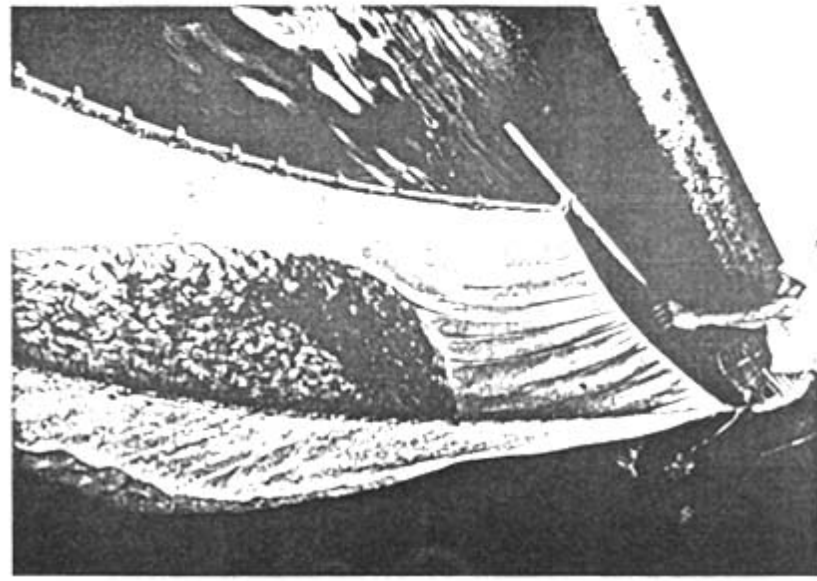
- A Fish fry collection with small seinc net
- B Fish fry collection with large seinc net in the sea
- C Oxygen control for the transport of the fry captured



A

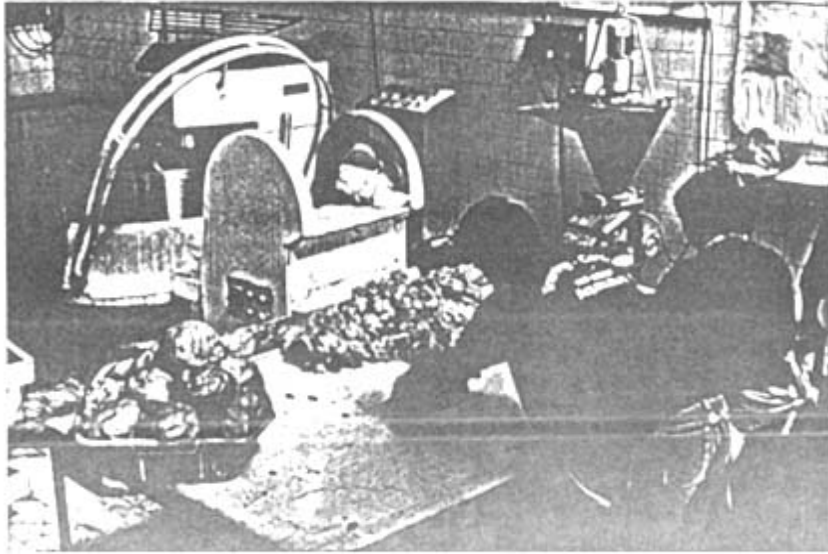


B



C

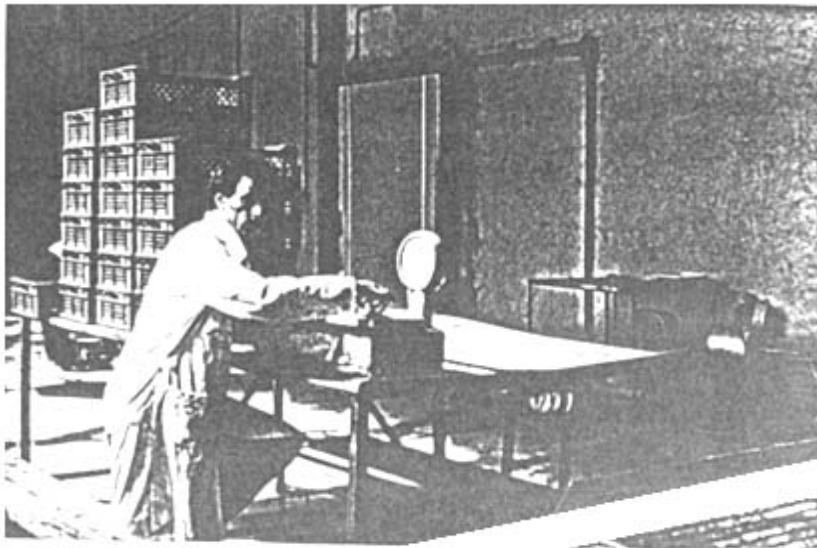
A Zooplankton collection in extensive ponds
B Control of environmental parameters in the hatchery
C Growth control in trials of intensive rearing



A



B

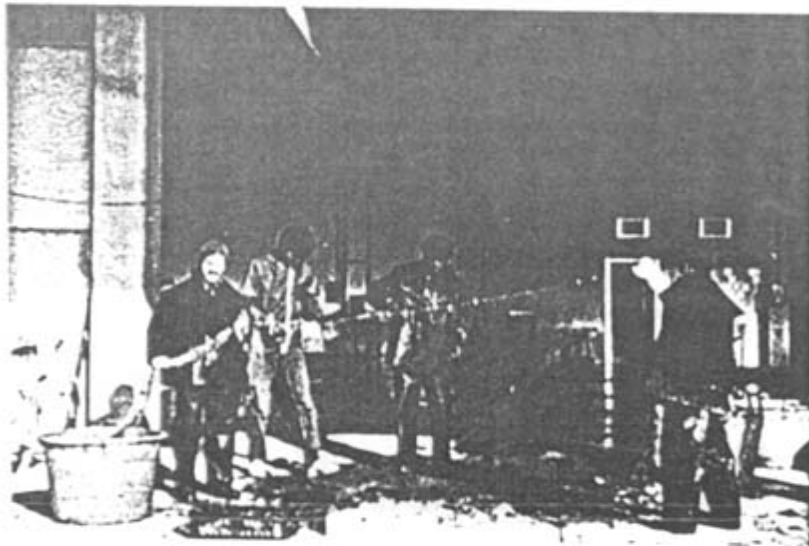


C

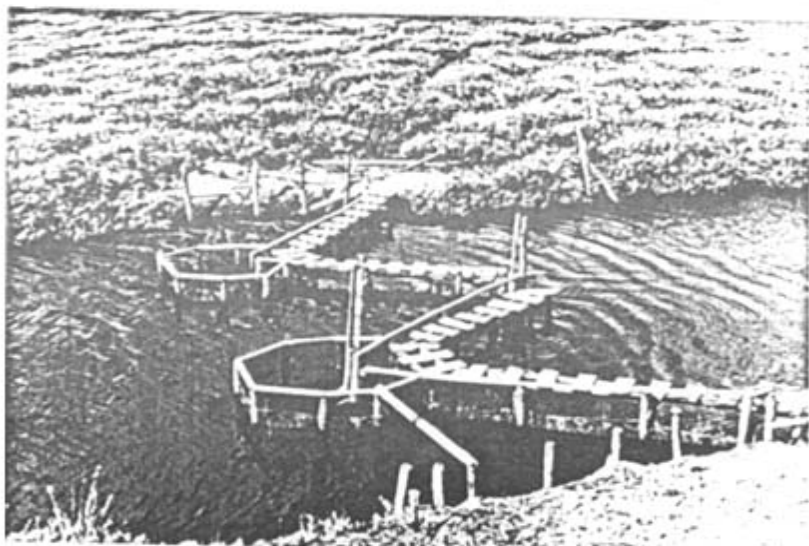
- A Preparation of fish food with fresh fish and meal
- B Washing and selection of the product
- C Biometric analyses of the product



A



B

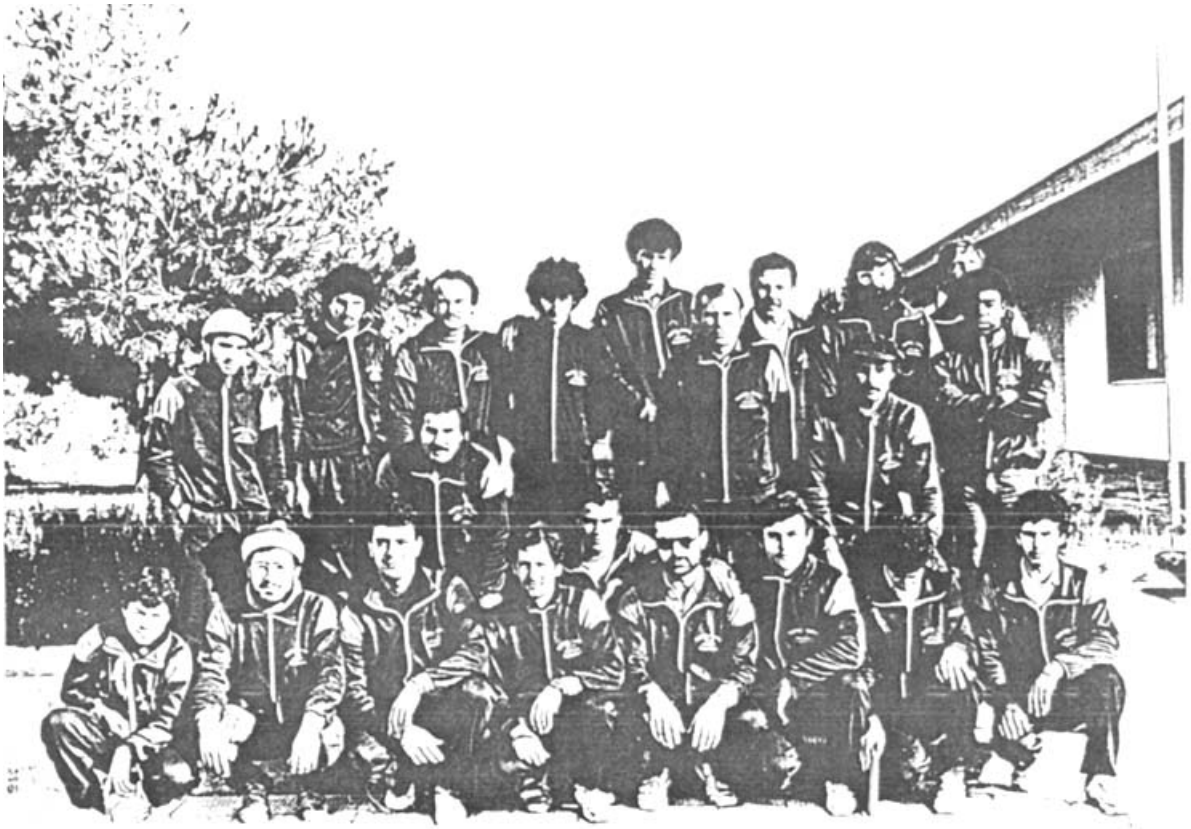


C

- A Handling sea bass brood stock
- B Cleaning mono - twine nets
- C Fish barrier built by the trainees

LIST OF PARTECIPANTS AT THE TRAINING CENTRE IN POLICORO 1984/85

Mohamed	LARABI	} ALGERIA
Mefteh	BOUSSAHA	 EGYPT
Fouad El S.	ALY YOUSSEF	 CYPRUS
Marios	DAVID	} GREECE
Aristidis	KOSKINAS		
Dimitris	SARIKOS		
Lampros	ZAXARIAS		
Apostolos	TSOLLIS		
Seddik	BOUZKRAOUI	 MOROCCO
Adel	HAMOUDA	} TUNISIA
Mohamed	BELHAJ HASSEN		
Ghoulem	BACCAR		
Chokri	STAMBOULI		
Ridha	ABDELSSELEM		
Chedly	KHLASS		
Salem	BEN LAMINE		
Mustafa	DENIZ	} TURKEY
Nihat	FILIS		
Marijan	BRSTILO	} YUGOSLAVIA
Vinko	HERLJA		



Participants to the 1st MEDRAP Training Course at Policoro