添付資料
第３回合同委員会議事録

THE MINUTES OF THE THIRD JOINT COORDINATING COMMITTEE CONCERNING THE TECHNICAL COOPERATION FOR THE FISH CULTURE DEVELOPMENT PROJECT IN THE BLACK SEA OF THE REPUBLIC OF TURKEY

The Evaluation Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Dr. Yasuhiko TAKI visited the Republic of Turkey for the purpose of evaluating the Fish Culture Development Project in the Black Sea of the Republic of Turkey (hereinafter referred to as "the Project") from November 15 to November 26 in 1999.

During its stay, the Team surveyed in the Project site and had a series of discussion with Turkish authorities concerned.

As a result of discussion, both sides agreed to report to their respective Governments the matters referred to in the documents attached hereto.

Ankara, November 24, 1999

Yasuhiko TAKI
Evaluation Team Leader
Japan International Cooperation Agency
Japan

Ahmet BULBUL
Director General
General Directorate of Agricultural Production and Development
Ministry of Agriculture and Rural Affairs
Republic of Turkey

Shiro HARA
Project Team Leader
Fish Culture Development Project
Japan

The Midterm Evaluation Report for the Project

1. INTRODUCTION

Based upon the Record of Discussions (hereinafter referred to as "the R/D") signed on January 17, 1997, the Government of Japan and the Government of the Republic of Turkey have been implementing the Project since April 16, 1997. The Project is scheduled to be implemented for five (5) years at the Central Fisheries Research Institute in Trabzon (hereinafter referred to as "CFRI") and is to be completed on April 15, 2002.

At the midterm of the Project, the advisory team of JICA was dispatched to Turkey to evaluate the Project with Turkish side authorities and to give advice to the Project in making implementation plans for the remaining period.

In JICA's technical corporation projects, a Project Design Matrix (PDM) is prepared to facilitate appropriate management and evaluation of each project at it commencement. The PDM can be modified in accordance with the progress of activities. In the present Project, however, PDM was not prepared at its start, and hence a PDM was formulated based on the advice of the Team during its stay in Turkey. The PDM was agreed upon by both Japanese and Turkish side. The PDM and the results of evaluation of the performance by the Team were submitted to the third Joint Coordinating Committee meeting and agreed upon through a series of discussion between Japanese and Turkish authorities concerned. The contents of evaluation are described hereinafter.

The implementation plan of the Project for the remaining period, attached hereto as Annex III , was also submitted by the Project to the third Joint Coordinating Committee meeting and obtained its consent.

Narrative summary of the PDM

Outputs

1. A target flatfish species is identified
2. Broodstock rearing techniques are developed
3. Spawning techniques are developed
4. Larval/juvenile rearing techniques are developed
5. Data utilizable for growout are obtained
6. Research capability of counterparts is improved

Activities

1-1. Taxonomic study of flatfish species
1-2. Selection of target species based on aquaculture potential
2-1. Biology of target species in the wild
2-2. Environmental and dietary conditions for maturation
3-1. Artificial insemination
3-2. Conditions for the induction of spontaneous spawning
4-1. Cultivation of food organisms
4-2. Nutritional assessment of larvae and juveniles
4-3. Environmental manipulation for larval/juvenile rearing
4-4. Health control in larval/juvenile rearing
5-1. Culture systems and growth performance
5-2. Nutritional requirements of young and sub-adults
6. In-house and outside training of counterparts

2. Member of the Evaluation Teams

2-1. Japanese Side

Dr. Yasuhiko TAKI Leader	Emeritus Professor Tokyo University of Fisheries
Mr. Akio IWAMOTO Seed Production	Head, Yashima Station Japan Sea-Farming Association
Dr. Atsushi OHNO Broodstock Development and Management	Associate Professor Tokyo University of Fisheries
Dr. Shin-ichi TESHIMA Fish Nutrition	Professor Faculty of Fisheries, Kagoshima University
Mr. Ikuo TAKEKAWA Coordinator	Staff, Fisheries Cooperation Division Forestry & Fisheries Development Cooperation Department (JICA)

2-2 Turkish Side

Dr. Ahmet BULBUL	Director General General Directorate of Agricultural Production and Development (GDAPD), Ministry of Agriculture Rural Affairs (MARA)
Dr. Musa BAYRAK	Head, Fisheries Department GDAPD, MARA
Dr. Mustafa CETINER	Section Chief, Fisheries Department, GDAPD, MARA Director, Trabzon Central Fisheries Department, GDAPD, MARA
Mr. Berat TASER	Section Chief, Fisheries Department, GDAPD, MARA
Mr. Selcuk ERBAS	Section Chief, Fisheries Department, GDAPD, MARA
Mr. Hasan KILIC	Agricultural Engineer, Fisheries Department, GDAPD, MARA

3. OBJECTIVES OF THE EVALUATION

Objectives of the evaluation of the Project are as follows:

(1) To execute a comprehensive evaluation of the achievement in accordance with the original implementation plan described in the R/D, Tentative Schedule of Implementation (TSI), Plan of Operation, Annual Work Plan and PDM.

(2) To make recommendations and suggestions concerning the measures to be taken after the midterm of the cooperation period of the Project to the authorities of the respective Governments.

4. METHODOLOGY OF EVALUATION

4-1. Survey

Japanese and Turkish sides evaluated jointly the Project. The Team visited the Project site and had a series of hearings from Japanese long-term experts and Turkish counterpart personnel.

4-2. Items of the Evaluation

4-2-1. Accomplishment of the Project

Accomplishment of the Project was measured in terms of inputs, activities, outputs and project purpose in accordance with the R/D, TSI and PDM.

4-2-2. Effectiveness

Effectiveness was measured as the degree of contribution made by the outputs to fulfill the Project purpose.

4-2-3. Impact

Impact of the Project activities was identified as positive and negative, direct and indirect, effects of the Project.

4-2-4. Efficiency

Efficiency of the Project implementation was analyzed focusing on the relationship between outputs and inputs.

4-2-5. Relevance

Relevance of the Project was reviewed as validity of the overall goal and the Project purpose in connection with the development policy of the Government of the Republic of Turkey and needs of the beneficiaries.

4-2-6. Sustainability

Sustainability of marine fish seed production activities at CFRI was assessed from organizational, financial and technical view points.

5. RESULTS OF EVALUATION

5-1. Accomplishments of the Project's input and activities

The Team and the Turkish evaluation team received from the Project the progress report attached as Annex II . Significant accomplishment of input and activities is summarized below. Refer to Annexes I and II for details.

5-1-1. Accomplishment of Input (See Annex II for details)

(1) Contribution made by the Government of the Republic of Turkey

1) The necessary land, building, and facilities of the Project have been provided in line with Annex VI of R/D.

2) Allocation of counterparts and other personnel

- During the cooperation period, eight (8) counterparts were allocated (Table 1).

3) Allocation of expenditure

- Approximately 668.5 thousand US$ was allocated for the first three (3) years (Table 2).

(2) Cooperation by the Government of Japan

1) Dispatch of experts (Table 3).

- Four (4) long-term experts were dispatched.
- A total of eleven (11) short-term experts were dispatched.

2) Provision of machinery

- Approximately 124.5 million yen was allocated for the first three year. A list of machineries more than 100,000 yen per item is given in Table 4.

3) Counterpart training in Japan (Table 5).

- A total of six (6) counterparts have been trained in Japan.

4) Local expenditure

- Approximately 30 million yen was allocated for the construction of the new facility for basic growout studies.

5-1-2. Accomplishment of Activities

The accomplishments of activities are omitted. Refer to Annexes I and II.

5-1-3. Accomplishment of Outputs

The outputs of the Project are summarized as follows:

1) Target flatfish species was identified (Output 1 in PDM)

Taxonomic studies on the flatfish species in Turkish coastal waters were conducted. A

species, *Psetta maxima*, known as "Kalkan" in Turkey, was selected as the target species based on analyses of economic performance in aquaculture. It was found that Atlantic Kalkan and Black Sea Kalkan were conspecific, and that the number and structure of tubercles on the body are subject to great variations.

2) **Broodstock rearing techniques were developed (Output 2 in PDM)**

Live specimens of Kalkan were collected from the Black Sea reared in tanks to obtain spawners in future. It was found that the feeding activities became decline at water temperatures higher than 16 ℃.

3) **Spawning techniques were developed (Output 3 in PDM)**

Seasonal changes of the gonad-somatic index (GSI) were surveyed for wild populations. The GSI showed the highest value in April to May for females and in March to April for males.

Wild-caught specimens were brought to sexual maturity through hormone treatments. Artificial insemination was successful in all the 15 trials with hatching rates of more than 30 % in 8 trials. Cryopreserved sperm was found to be available for fertilization as was fresh sperm.

4) **Larval/Juvenile rearing techniques were developed (Output 4 in PDM)**

Mass-culture systems for *Nannochloropsis* sp. and rotifer, *Brachionus plicatilis*, were established. Culture of these organisms were maintained sustainable by the Turkish counterparts. Studies of nutrient enrichment of rotifer is in progress.

5) **Data utilizable for growout were obtained (Output 5 in PDM)**

Larval rearing with a feeding scheme using rotifer, *Artemia* and artificial food was successful with the highest survival rate of 62% at 15 mm TL. It was found that caution was necessary to prevent protozoa diseases. Larval and juvenile development of morphological characters was studied in detail.

6) **Research capability of counterparts was improved (Output 6 in PDM).**

Professional ability of the counterparts was improved in study planning, experimental design, and research result presentation.

5-1-4. Accomplishment of the Project Purpose

Notwithstanding difficulties commonly arising in dealing with a new aquaculture commodities such as the Kalkan, ample data necessary for the establishment of seed production techniques for Kalkan have been acquired, and mass-production of seed was successful in several trials.

Considering such results were obtained at the mid-term of the Project, the accomplishment of the Project purpose is rather highly evaluated. Although seed production has not yet attained a steady level and there remain several technical problems to be solved to establish juvenile systems.

5-2. Analysis by Evaluation Items

5.2.1 Effectiveness

The effectiveness of the Project is evaluated to be high in view of the observations described below, although the seed production has not yet reached a stable level.

The Project, comprising three technical sections, i.e. broodstock management, food/feed management and seed production sections, has been implemented since April 1997. The Japanese government dispatched three (3) experts and one (1) coordinator and accepted in Japan five (5) Turkish scientists/technicians for technical training and one (1) for administrative observations. Turkish side provided eight (8) counterparts, and many affiliated/supportive staff members. The water intake system was designed by Japanese side and constructed by Turkish side.

Fundamental seed production systems, including systems for reproduction, cultivation of larval food organisms and larval/juvenile rearing, have been established, and a total of 7,600 juveniles of 100 mm TL were produced in 1998.

5.2.2. Impact

The impact of the Project, which is the first attempt of Kalkan cultivation in Turkey, is very satisfactory, the Project now being well known among the Turkish people.

Overall goal level:

MARA held the Kalkan release ceremony on March 5, 1999 at Trabzon, releasing into the

Black Sea juveniles produced in the Project. This ceremony was reported all over the country by mass media and helped contribute to enhance the popularity of the Project. The Turkish government is now examining the possibility of Kalkan aquaculture and restocking of the Black Sea with hatchery-produced juveniles.

As a negative impact, the possibility cannot be dismissed that the expansion of aquaculture industry would cause water pollution in the Black Sea.

Project purpose level:

Inquiries have already been received from aquaculture farmers about the supply of Kalkan seed from CFRI, signifying their high interest in the culture of this highly esteemed fish in Turkey.

5.2.3. Efficiency

The efficiency of the Project is evaluated to be relatively high, in view of the satisfactory progress of the Project attained by the limited number of Japanese experts.

The seawater intake system was designed by a Japanese short-term expert and constructed by the Turkish government. However, due to delay in the commencement of construction work, the short-term expert was not able to complete his task to supervise the construction work while he was assigned in Turkey. This has resulted in some inconveniences in performing research activities, and the inconveniences have often been attributed to the short-time expert.

The quality and quantity of inputs have been appropriated, judging from the progress reports of the experts and interviews with counterparts made by the Team.

5-2-4. Relevance

The project is considered to be highly relevant on both the overall-goal and project-purpose levels.

Overall goal level:

The overall goal of the Project agrees perfectly with the 7th national economic development policy (1996 to 2000) which emphasizes the necessity of fisheries development.

Project purpose level:

Given the decline of the fisheries resources in the Black Sea, in particular Kalkan

populations, and the urgent necessity of the development of aquaculture, this project, which will provide technical basis for aquaculture development and trigger the development of aquaculture industry in the Black Sea, is considered to be very appropriate and timely.

5-2-5. Sustainability

It is highly possible that the marine fish seed production program at CFRI is continued or even expanded after the termination of the Project, based on the following observations.

Organizational aspect:

The seed production program at CFRI is judged to be sustainable, in view of the political and institutional consistency of the governmental offices concerned and the fact that CFRI has become the central institute for fisheries research in Turkey.

Financial aspect:

The sustainability of the seed production program viewed from the financial stand point is fairly high, balancing the well-executed financial supports thus far provided by the Turkish government and possible budgetary inconveniences caused by the disasters the Republic experienced recently.

Technical aspect:

The sustainability of the program is judged to be high from the technical viewpoint.

Because of the relatively deep professional knowledge and eagerness of the counterparts, it is expected that they will become able aquaculture scientists accumulating practical knowledge and experience.

6. CONCLUSION AND RECOMMENDATIONS

This is the first attempt of Kalkan seed production in the Republic of Turkey. Establishment of seed production systems are on the way, with a remarkable progress owing to the political and budgetary support of the Turkish government, although the seed production performance is unstable.

It is still concluded that the Project should be continued basically in accordance with original implementation plan.

6-2. RECOMMENDATIONS

6-2-1. Recommendations for Short-Terms activities

(1) In view of the anticipated increase in disease outbreaks with increase in the production scale, capacity building should be made in pathological fields by both sides.

(2) For the successful development of aquaculture in Turkey, studies on aquaculture economics should be added to the Project activities. It is recommended that short-term expert in this field be dispatched by Japanese side.

(3) Countermeasures should be taken by the Project to prevent accidental changes in rearing conditions.

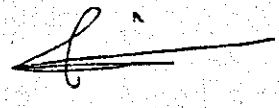
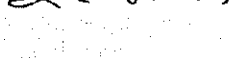
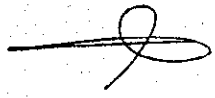
(4) It is desired that the seawater intake system be completed by the end of December 1999 by Turkish side.

(5) In order to conduct seed production activities functionally, it is necessary for Turkish side to ensure stable provision of labor force.

6-2-2. Recommendations for Long-term Activities

(1) It is desired that Turkish staff members responsible for the maintenance and efficient utilization of equipment and facilities be nominated.

(2) It is hoped that the Turkish government will pay due attention to prevent environmental pollution caused by aquaculture operations in the future when the aquaculture business are developed and extended in the Black Sea.

ANNEX I

Target Group: Researchers/technicians of Central Fisheries Research Institute

Duration : Apr. 16, 1997- Apr. 15, 2002

Date: October 1999

Narrative Summary	Objectively Verifiable Indicators	Achievements	Important Assumptions
Overall Goal Fish culture in the Black Sea coastal area is developed.	1) Number of fish farmers is increased. 2)Amount of aquaculture production is increased.	1) Fishfarming is spread around the Black Sea coastal area. 2) Aquaculture production is increased.	1) Environmental pollution in the Black Sea coast is not worsen.
Project Purpose Seed production and rearing techniques of flatfish are developed.	1) Sustainable experimental seed production is achieved by the termination of the Project. 2) A seed production manual is published.	1) Approximately 8,000 juveniles (100 mm TL size) were achieved. 2) Knowledge of seed production has been accumulated.	1) Turkish government policy for development of fisheries and local industry is not changed. 2) Economical value of target flat fish species is maintained.
Outputs 1. A Target flatfish species is identified. 2. Broodstock rearing techniques are developed. 3. Spawning techniques are developed. 4. Larval/juvenile rearing techniques are developed. 5. Data utilizable for growout are obtained. 6. Research capability of counterparts is improved.	1. A field guide for the identification of flatfish species in Turkish coastal waters is prepared. 2. Environmental conditions for broodstock rearing are clarified. 3-1. Hatching rate of more than 30% from whole eggs are attained. 3-2. Spawning induction methods for wild-caught spawners are established. 4-1. Sufficient quantities of food organisms are sustainablely cultivated. 4-2. Methods of nutritional enrichment of food organisms are established. 4-3. Survival rates of 10% or more are attained at 20mmTL. 4-4. Survival rates of 50% or more from 20 to 100mmTL are attained. 5. Fundamental data are obtained on the growth patterns and basic nutritional requirements of young and sub-adult fish.	1. A draft of the field guide has been prepared. 2. Approximate optimum range of water temperature for the rearing of subadults has been estimated. 3-1. 8 spawning trials out of 15 were successful. 3-2. Artificial insemination was successful using eggs spawned through hormone treatments and fresh and cryopreserved sperm. 4-1. *Nannnochloropsis* sp.and rotifer were successfully cultivated and maintained 4-2. Now in progress. 4-3. A survival rate of 62% at 15 mmTL was obtained in a larval rearing trial 4-4. A survival rate of 90% from 20 to 100 mmTL was achieved in a juvenile rearing trial. 5. At least a TL of 250mm was found to be attained in 500 days even under rather unfavorable rearing conditions.	1) Unpredictable disease dose not occur. 2) Abnormal weather does not occur.

	6-1. Study plans and experimental designs are made by counterparts. 6-2. Scientific papers are prepared by counterparts.	6-1. A total of 5 counterpart researchers/ technicians have been trained in Japan.	
Activities 1-1. Taxonomic study of flatfish species 1-2. Selection of target species based on aquaculture potential 2-1. Biology of target species in the wild 2-2. Environmental and dietary conditions for maturation 3-1. Artificial insemination 3-2. Conditions for the induction of spontaneous spawning 4-1. Cultivation of food organisms 4-2. Nutritional assessment of larvae and juveniles 4-3. Environmental manipulation for larval/juvenile rearing 4.4. Health control in larval/juvenile rearing 5-1. Culture systems and growth performance 5-2. Nutritional requirements of young and sub-adults 6. In-house and outside training of counterparts.	**Input** Japanese side 1. Dispatch of Japanese experts: (1) Long-term experts: 4persons,1 person in each field, were dispatched 1) Team leader/Broodstock management 2) Coordinator 3) Feed/Food development 4) Seed production (2) Short-term experts: 11 persons were dispatched 2. Counterpart training in Japan 6 persons were trained 3. Provision of machinery, equipment and materials: Approximately 124.5 million Yen 4. Special budget allocation for construction of grow-out facility. Approximately 30 million Yen 5. Local cost (1) Observation tour (2) Project implementation and management cost	Turkish side 1. Personnel: (1) Project manager 1 person (2) Counterpart Total 8 persons 1) Broodstock management 2 persons 2) Feed/Food development 3 persons 3) Seed production 3 persons (3) Secretary 1 person (4) Driver 1 person (5) Workers 9 persons 2. Facility and equipment: (1) Seawater intake system (2) Hatchery (3) Laboratories 3. Local cost (1) Personnel expenses (2) Project implementation and management cost (3) Improvement and maintenance costs for facilities and equipment *Expenditure for the first three years: Approximately 668,500US$	1) Work force (counterparts, worker, etc.) in the Trabzon Central fisheries Research Institute is secured. 2) Provision of equipment is not delayed. 3) Construction of facilities is not delayed. Pre-conditions

ANNEX II

PROGRESS REPORT

TECHNICAL COOPERATION FOR THE FISH CULTURE DEVELOPMENT PROJECT IN THE BLACK SEA OF THE REPUBLIC OF TURKEY

April 1997-October 1999

1. PREFACE

In April 1997, a group of four experts was dispatched by JICA, and the project entitled "Fish Culture Development Project in the Black Sea, started at MARA's Fisheries Research Institute in Trabzon (later named as Trabzon Central Fisheries Research Institute). Within the framework of agreement (R/D), six Turkish counterparts were appointed to the project by MARA. Trials of artificial fertilization of the Black Sea turbot ware carried out using species obtained from Trabzon whole-sale fish market from the mid-May, which were considered to be corresponded to the late part of spawning season. Well-ovulated live females were irregularly found, but mature males could not be obtained. Thereafter preliminary research activities in each technical cooperative field were made. Improvement (remodeling) of seed production facilities and sea water intake system were designed and started.

In 1998, we made a strategic plan to obtain the fertilized eggs of the target species. During its spawning season, sufficient number of live specimens and fertilized eggs were obtained. In the second year of the Project, we finally achieved about 7,600 young fish (range: 80-120mmTL) which is close to the Project's production target (10,000 fish: 100mmTL).

However in 1999, we failed to achieve the project's production target due to a partial failing in environmental management and the non-prevention of parasitic disease during larvae and juvenile rearing. We presume that one of the causes of this may be due to a partial breakdown in the intake system in February before the spawning season of Black Sea turbot.

The establishment of suitable seed production and rearing technologies will be considered as a further topic for study.

2. DISPATCH OF JAPANESE EXPERTS

Refer to Table 3 in detail.

3. PROVISION OF MACHINERY AND EQUIPMENT

Refer to Table 4 in detail.

4. TRAINING OF TURKISH COUNTERPARTS IN JAPAN

Refer to Table 5 in detail.

5. FACILITY

1) IMPROVEMENT (REMODELING) OF EXISTING HATCHERY AND CONSTRUCTION OF SEAWATER INTAKE SYSTEM

The improvement activities (remodeling work) of existing hatchery started in early October 1997, and completed by the end of March 1998.

The tender of the construction work for establishment of the new seawater intake system was opened on October 23, 1997, and successful contractor (selected company) started to the construction. The construction works were interfered several times due to the troubles with the contractor between December 1997 and February 1998. The contractor restarted his duties at the project side in February 1998 and almost completed by the end of July 1998.

2) CONSTRUCTION OF BASIC.GROW-OUT LABORATORY

A Japanese short-term expert was dispatched to the project site in March 1999 to design a new facility for basic grow-out study. Following discussions by the Japanese and Turkish sides, it was decided that the existing cold storehouse should be converted into a grow-out facility.

Demolishment of the old facility began in September 1999 and basic construction (floors, walls, drains and ceilings) were undertaken by the Turkish side at an estimated cost of ¥10 billion TL (equivalent to US$ 21,300 on November 1,1999).

The tender for the installation of the equipment and piping etc and so began at the end of October by the Japanese and is estimated at ¥30 million (equivalent to US$ 283,000). A Japanese short-term expert was dispatched in October 1999 to assist with the of tender of the project.

The construction works will be completed by the end of March 2000.

6. EXPENDITURES PAID BY TURKISH SIDE

Refer to Table 2 in detail.

7. RESEARCH ACTIVITIES (April 1997-December 1998)

7.1. Selection of target flatfish species

7.1.1. Identification of flatfish species occurring in Turkish waters

The purpose of this study is to clarify the taxonomic status of the species of flatfish that occur in Turkish waters. This study was conducted with Dr. Kunio AMAOKA between March 1998 and March 1999. A total of twelve species were identified. The following species were identified during the research periods: a species of *Citharidae*, four species of *Scophthalmidae*, two species of *Bothidae*, a species of *Pleuronectidae*, and four species of *Soleidae*. To identify these species, a field guide to flatfish (order Pleuronectiformes) found in the Black Sea and its adjacent waters was compiled.

In addition, based on data from morphometrics, meristics, and tubercle patterns in the Black Sea turbot, there is no evidence to suggest that the turbot collected from the five Turkish coastal areas, the Azov Sea, and Spain represent different species. We concluded from the results that all specimens used in this study are of the same species as the Atlantic turbot: *Psetta maxima.*

7.1.2. Selection of target species based on aquaculture potential

The purpose of this study was to determine the target species for our project based on aquaculture potential. The twelve identified species (cf 1-1) were examined on the basis of commercial size, economic value, taste, and occurrence patterns. Brill *Scophthalmus rhombus* and three *Soleidae* species had a high aquaculture potential as well as the Black Sea turbot, but they occurred only in the Sea of Marmara and the Aegean Sea. We concluded from the results that only the species of the Black Sea turbot can be found in the Black Sea.

7.2. Study of broodstock management and reproduction techniques

7.2.1. Biology of wild flatfish species

7.2.1.1. Growth, distribution and migration

Migration patterns, distribution, and spawning behavior of the Black Sea turbot were examined on using specimens from 24 July 1997 to 18 June 1999. 109 cruises caught a total of 433 specimens using 409 trawl nets during the survey periods. The average catch per unit effort was 1.1. The Black Sea turbot is distributed widely from a depth of 5 to 70 m off Trabzon during the survey periods. However, it appears that the Black Sea turbot migrates during the spawning season from deeper waters to the shallow coastal area to spawn. We conclude that the species spawns of the species in the shallow coastal area (under 20m deep) off Trabzon in the Black Sea.

7.2.1.2. Maturation process

1) Reproductive cycle

To clarify the spawning cycle of wild Black Sea turbot, the monthly changes in GSI (Gono-somatic lidex) from January to September 1999 were investigated in females and males. The GSI of female fish increased rapidly towards March (9.2). The GSI showed high levels in April (15.3) and reached the highest levels in May (18.3). Thereafter, the level decreased rapidly towards July (2.1) and continued at low level to September (2.3).

The GSI of males increased gradually and reached its highest level in March and April (0.9). Thereafter, it gradually decreased towards June (0.5) and reached low levels from July to September (0.2).

From the present observations, and previous findings in 1998, it was estimated that the peak spawning season of the Black Sea turbot is from April to May. This is based on the observationsof high GSI levels in females in April and May for two consecutive years.

2) Correct timing of artificial insemination

To clarify the correct timing of artificial insemination for wild ovulated females, 34 females were artificially inseminated at 12 hours, 18 hours, 24 hours, 38 hours and 48 hours after the initial artificial insemination (0 hours). The results show 50-100% fertilization success was observed at 18 hours, 36 hours and 60 hours. High fertilization rates were obtained at 0 hour and 38 hours. Large numbers of stripped eggs per kg of fish weight was observed at 0 hour, 36 hours and 54 hours containing 64,000, 55,000 and 70,000 eggs, respectively.

We conclude that correct timing of artificial insemination is about 36 hours after the initial artificial insemination. This is based on the findings of higher fertilization success and fertilization rates than at 0 hour, and favorable comparisons with the amount of stripped eggs taken at 0 hour and 54 hours.

7.2.2. Rearing of wild adults

7.2.2.1. Environmental conditions for rearing and maturation

27 wild broodstocks were reared and their feeding activities observed in 12 ton circular tanks (no.10) from November 1998 to June 1999. Active feeding by the fish was only observed when the water temperature in the tank dropped from 16℃ to 13℃ (November - December) and rose from 10℃ to 13℃ (March - May).

Some of the fish were occasionally observed to give large gasps; in addition, most fish were observed to gasp more frequently when the water temperature in the tank was raised to more than 16℃. At that time, the fish were observed to ceased feeding activities.

Based on the above findings, it was estimated that feeding activities were affected by the water temperature, and the favorable tank water temperature is below 16℃.

7.2.2.2. Broodstock diet

Feed containing frozen whiting and/or vitamin mixture were given 1-2 times a week to broodstock reared in a 10 ton FRP tank. The male fish matured but the female fish did not develop mature gonads during the spawning season from March to May.

7.2.3. Artificial insemination

7.2.3.1. Artificial insemination of wild spawners

To obtain fertilized eggs of the Black Sea turbot for seed production in 1999, 15 artificial inseminations were carried out and approximately 4,600,000 eggs and 1,650,000 newly hatched larvae were obtained. Average fertilization rates of 46.3% and hatching rates of 71.4% occurred. Higher fertilization rates were obtained compared to 1998 's results.

7.2.3.2. Artificial insemination of raised spawners

No artificial insemination was carried out due to the non-appearance of mature females in the tank.

7.2.3.3. Sperm cryopreservation

The motility of sperm after exposure for various durations to different concentrations of Turbot Ringer's solution was examined.. Sperm was diluted with four kinds of Turbot Ringer's solution. under near-zero liquid storage (0-4℃). Solution.A: the original formulation adjusted to pH7.4; Solution B: the original formulation minus a substance of HEPES and adjusted to pH8.0; Solution C: Solution A with added antibiotic agent); Solution D: Solution B with added antibiotic agent). Results indicated that the high motility of 4.0 was only observed up to 6 days in turbot Ringer's Solution D with motility of 3.0-3.5 for a further 8 days. Sperm motility scores of semen diluted with turbot Ringer's solution A, B and C were only between 3.0 and 4.0 on the 4th-8th day of preservation. We conclude that the turbot Ringer's solution D is the optimum extender for near-zero liquid sperm preservation. The use of the turbot Ringer's Solution D for cryopreservation will be considered for further study.

7.2.4. Induction of spontaneous spawning

To obtain a large amount of ovulated eggs from the female turbot, 3 types of hormone treatments were administered to every maturing wild female,. The treatments were (1) a pelleted, luteinizing hormone-releasing hormone analogue (LHRH); (2) a combination of LHRH-a and mixture of human chorionic gonadotropin (HCG) and the salmon pituitary gland (SPG), and (3) HCG/SPG.

All hormone-treated fish ovulated and produced fertilized eggs. In particular, fish treated with a combination of (2) LHRH-a and HCG/SPG produced a good egg production result of 16.7% (1,770,000 eggs) of fish weight. The amount of stripped eggs ovulated by the other females treated with (1) LHRH-a and (3) HCG/SPG were only 8.9% and 4.0% of fish weight, respectively. More detailed research will be considered for further study.

7.3. Study of food organisms

7.3.1. Culture of phytoplankton

7.3.1.1. Mass-culture of *Nannochloropsis*

During the seed production season from April to June 1999, large-scale production of *Nannochloropsis* was conducted and sufficient volume ($297m^3$) and density (23.21×10^6 cells/ml) of *Nannochloropsis* could be provided to the rotifer culture and the larval rearing sections. These results showed that the production target density of 20×10^6 cells/ml at harvest was successfully accomplished.

7.3.1.2. Optimum culture temperature of *Nannochloropsis*

Optimum culture temperature for *Nannochloropsis* was investigated under laboratory conditions. The results indicated that the optimum temperature for the strain used for the experiment was below 18 ℃, and a culture temperature of over 25 ℃ caused poor growth.

7.3.1.3. Restoration growth of *Nannochloropsis*

Restoration growth of *Nannochloropsis* kept at cold temperatures (2-4℃) was investigated in order to reduce labor and as a countermeasure to poor algal growth. The results indicated that the preservation of *Nannochloropsis* at low temperatures would not interfere with further algal growth.

7.3.2. Culture of zooplankton

7.3.2.1.Mass culture of rotifer

During the seed production season from April to June 1999, large-scale production of L-type rotifer (*Brachionus plicatilis*) was conducted and a sufficient number (400 x 10^6 ind.) and density (255 ind./ml) of rotifer could be produced. These results show that the production target of mean density of 200 ind/ml at harvest was successfully accomplished.

7.3.2.2. Enrichment of L-type rotifer using *Nannochloropsis*

The rotifer enrichment method using *Nannochloropsis* has not been completely established. In order to obtain basic data on the feeding density and feeding amounts of *Nannochloropsis* by rotifer, a preliminary culture experiment was conducted. Based on the results, an initial stock density of *Nannochloropsis* at 20 x 10^6 cells/ml, an inoculation density of rotifers at less than 250 ind./ml and and an enrichment period of 5-6 hours seem to be recommendable.

7.3.2.3. Enrichment of rotifer using L-Phaeo.

At present, the rotifer enrichment method using *Phaeodactylum* has not been established. In order to obtain basic data on the composition rate of L-Phaeo by rotifer, a preliminary tertiary culture experiment was conducted. Based on the experimental results, L-Phaeo. At a density at 2.5 x 10^6 cells/ml, a rotifer inoculation density of less than 250 ind.s/ml and an enrichment period of 5-6 hours seem to be recommendable.

7.3.2.4. Population dynamics of the L-type Rotifer under laboratory conditions

A single cohort of L-type rotifer, obtained from artificially isolated eggs, was monitored in five 30L tanks at different temperatures with *Nannochloropsis* as feed. The intervals between hatching and spawning seem to decrease exponentially as the temperature increased in an experimental temperature range of between 15 ℃ to 25℃. Detailed analysis of this data will be conducted by counterpart Ms. Binnur Ceylan under Dr. Ohno's supervision in Japan.

7.3.3. Utilization of wild plankton for direct feeding

7.3.3.1. Zooplankton collection by lighting method

Monthly zooplankton collection by the lighting method was carried out at the Surmene fishing port since October 1998. It confirmed that two *Acartia* species that seem to be ideal food organisms for larvae and juveniles of the Black Sea Turbot can be collected. They resemble the known *Acartia*

species, i.e., *A. hudsonica* and *A. plumosa.* However, there is also the possibility that they are a new species, since the morphology of their 5th legs appears to be slightly different from what it should be. The differences in their seasonal occurrence suggests that *A. hudsonica* is a cold-water-origin species and *A. plumosa* is of warm-water-origin.

7.3.3.2. Rearing of larval Black Sea Turbot using wild copepods collected from Trabzon waters

Various wild zooplankton were collected, using polyester nets with a mesh size of 100 μm ,from coastal waters in front of the Institute. Of the collected zooplankton species, the Cyclopoid copepods were the most common at 80%. The rearing of early larval turbot was conducted in two 170-l tanks with the various zooplankton and L-type rotifer, respectively as feed.

This experiment indicates that early turbot larvae fed on L-type rotifer but did not feed on nauplius of copepods (mainly Cyclopoids). This result was different from the common understanding of the feeding ecology of marine fish larvae, i.e., copepods nauplii are generally suitable food organisms for fish larvae. Further experiments and examinations will be continued.

7.4. Study of larval rearing

Our project succeeded in producing a total number of 71,075 juveniles (mean 12.8 mm TL) at 20-30 days after hatching in 9 out of 23 rearing trails. The development of stable rearing techniques is neccessary for further study.

7.4.1. Incubation techniques

The Effect of egg management temperatures on the survival of hatched larvae and the effect of stocking density of eggs on the hatching rate of the turbot were examined. However, further studies are necessary to produce more detailed results.

7.4.2. Environmental conditions

Between 1 and 14 round rearing trials were conducted under almost natural environmental conditions, however, those trials were canceled at 2-25 days after hatching (DAH) on account of heavy mortality. We concluded that those mortality might be related with water management, microbial species in rearing water, and the water quality.

Based on the above results, the following four technical rearing skills were introduced between the 15th and the 23rd trails: 1) maintaining the water temperature at 17-18℃, 2) maintaing the rotifer density under 10 individuals per ml; 3) bathing of rotifer and *Artemia* for 1-3 hours before feeding with sodium Nifurstyrenate (50 ppm); and 4) using treated sea water apart from the control. To investigate the causes of mortality, the effects of differently treated sea water on turbot survival turbot was examined. Water treated with sodium Nifurstyrenate (10 ppm) showed the highest survival rate of 62.8% at 30 DAH, but we could not ascertain the main reason for the effects of Nifurstyrenate treated water for the survival of the turbot. We conclude that it is necessary to investigate further the relationships between the changes of bacteria fauna in the rearing tanks and the the gut contents of fish.

7.4.3. Feeding scheme

L-type rotifer were introduced to the tanks once or twice a day in order to maintain the rotifer density at approximately 10 individuals per ml when larvae were between Day 1 and Day 15. Rotifer were sufficiently enriched with *Nannochloropsis* at a density of 20-45 million cells/ml for 6-18 hours.

Newly-hatched *Artemia* containing a density of 0.5 individuals per ml in the tank was fed to larvae once or twice a day until the larvae reached Day 10. One day old *Artemia* were given until the larvae reached Day 20. *Artemia* was enriched by 0000 at a rate of 0.5g/□and/or by *Pheaoductyrum* at a density of 2-5 million cells/ml for 6-18 hours.

Artificial diet was given to the larvae from Day 20.

We recommend the above feeding scheme for the larval rearing of turbot.

7.4.4. Disease treatments

To avoid the introduction of unknown bacterial diseases, 0.5% benzalkonium chloride solution was placed in front of each room in the hatchery for disinfecting. All instruments and materials related to larval rearing such as nets, beakers, etc were disinfected before the rearing season.

7.4.5. Rearing systems

A manual for the larval rearing of turbot will be produced in the near future.

7.5. Study of juvenile rearing

Most of the larvae and/or juveniles at 25-30 DAH were affected by ciriata. Thereafter, mass mortality occurred and only a few juveniles remained alive in the tank.

7.5.1. Environmental conditions

This aspect has not been investigated in detail.

7.5.2. Feeding scheme

This aspect has not been investigated in detail.

7.5.3. Disease treatments

25 to 500 ppm formalin was introduced to the rearing tanks for 0.5-3 hours in order to exterminate ciriata in the tank; however, it could not exterminate the disease. Although the outward appearance of the fish appeared to be healthy, death occurred if the protozoa were inside the skin. To avoid infection from dead fish, all dead or infected juveniles were removed from the bottom of the tank and graded to other tanks 2 or 3 times a day. In addition, if the disease advanced there was no improvement in the net cage rearing.

To exterminate ciriata, formalin and/or ClO_2 treatments should be taken as soon as ciriata is observed adhering to the skin. Otherwise, it is impossible to exterminate ciriata. To prevent contamination from ciriata, the characteristics of ciriata and pathogen control are necessary for further

study.

With regard to the extermination of ciriata, the effect of ClO2 solution on the survival of juveniles was investigated using three tanks between 5 July and 20 September. Two tanks were treated with ClO_2 at 50 ppm concentration for 1 hour three times a week, with the remaining tank is kept at an ambient condition. The final survival rates obtained in the two treated tanks were 45.2% and 48.8%, and at 26.5% in the third tank. Further research is necessary into the optimum concentration of this solution for the extermination of ciriata and the survival of juveniles

7.5.4. Rearing systems

This aspect has not been investigated in detail.

7.6. Study of artificial diet

This aspect has not been investigated in detail.

7.7. Basic study of grow-out techniques

7.7.1. Growth/mortality patterns

To examine growth and feed efficiency, hatchery-bred young fish ,averaging 22cm TL and 188g BW in size, were stocked in a 4-3 ton circular FRP tank containing 60 fish/tank and 4-4 ton square FRP tank containing 80 fish/tank. The first group (Treatment 1-4) was fed with frozen cod. The second group (Treatment 5-6) was fed with rainbow trout commercial pellets containing 40% protein. The third group (Treatment 7-8) was fed with a combination of frozen cod and the above commercial pellet. Satiable feeding was done once a day. The experiment was conducted from February 2 to May 4 1999. Fish were reared in a water temperature of 9.0-11.8℃.

The highest growth was obtained to the first group resulting in daily growth rates of 0.44mm TL/day and 1.56g BW/day. The third group obtained the second highest growth resulting in daily growth rates of 0.20mm TL/day and 0.56g/day. The lowest growth occurred in the second group resulting in daily growth rates of 0.18mm TL/day and 0.45g/day.

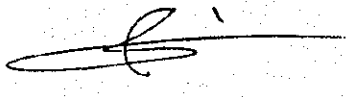
The best feeding efficiency was in the first group resulting in 1.36, then 1.99 for the third group. The worst feeding efficiency was obtained in the second group resulting in 3.23. A mortality of 1.6-16.6% was observed only in the first group that contained a sand-bed in the tank.

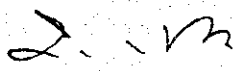
7.7.2. Environmental conditions

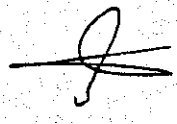
This aspect has not been investigated in detail.

7.7.3. Nutritional requirements

This aspect has not been investigated in detail.







8. RESEARCH ACTIVITIES (January-October 1999)

8.1. Selection of target flatfish species

8.1.1. Identification of flatfish species occurring in Turkish waters

The purpose of this study is to clarify the taxonomic status of the species of flatfish that occur in Turkish waters. This study was conducted with Dr. Kunio AMAOKA between March 1998 and March 1999. A total of twelve species were identified. The following species were identified during the research periods: a species of *Citharidae*, four species of *Scophthalmidae*, two species of *Bothidae*, a species of *Pleuronectidae*, and four species of *Soleidae*. To identify these species, a field guide to flatfish (order Pleuronectiformes) found in the Black Sea and its adjacent waters was compiled.

In addition, based on data from morphometrics, meristics, and tubercle patterns in the Black Sea turbot, there is no evidence to suggest that the turbot collected from the five Turkish coastal areas, the Azov Sea, and Spain represent different species. We concluded from the results that all specimens used in this study are of the same species as the Atlantic turbot: *Psetta maxima.*

8.1.2. Selection of target species based on aquaculture potential

The purpose of this study was to determine the target species for our project based on aquaculture potential. The twelve identified species (cf 1-1) were examined on the basis of commercial size, economic value, taste, and occurrence patterns. Brill *Scophthalmus rhombus* and three *Soleidae* species had a high aquaculture potential as well as the Black Sea turbot, but they occurred only in the Sea of Marmara and the Aegean Sea. We concluded from the results that only the species of the Black Sea turbot can be found in the Black Sea.

8.2. Study of broodstock management and reproduction techniques

8.2.1. Biology of wild flatfish species

8.2.1.1. Growth, distribution and migration

Migration patterns, distribution, and spawning behavior of the Black Sea turbot were examined on using specimens from 24 July 1997 to 18 June 1999. 109 cruises caught a total of 433 specimens using 409 trawl nets during the survey periods. The average catch per unit effort was 1.1. The Black Sea turbot is distributed widely from a depth of 5 to 70 m off Trabzon during the survey periods. However, it appears that the Black Sea turbot migrates during the spawning season from deeper waters to the shallow coastal area to spawn. We conclude that the species spawns of the species in the shallow coastal area (under 20m deep) off Trabzon in the Black Sea.

8.2.1.2. Maturation process

1) Reproductive cycle

To clarify the spawning cycle of wild Black Sea turbot, the monthly changes in GSI (Gonosomatic lidex) from January to September 1999 were investigated in females and males. The GSI of female fish increased rapidly towards March (9.2). The GSI showed high levels in April (15.3) and reached the highest levels in May (18.3). Thereafter, the level decreased rapidly towards July (2.1) and continued at low level to September (2.3).

The GSI of males increased gradually and reached its highest level in March and April (0.9). Thereafter, it gradually decreased towards June (0.5) and reached low levels from July to September (0.2).

From the present observations, and previous findings in 1998, it was estimated that the peak spawning season of the Black Sea turbot is from April to May. This is based on the observationsof high GSI levels in females in April and May for two consecutive years.

2) Correct timing of artificial insemination

To clarify the correct timing of artificial insemination for wild ovulated females, 34 females were artificially inseminated at 12 hours, 18 hours, 24 hours, 38 hours and 48 hours after the initial artificial insemination (0 hours). The results show 50-100% fertilization success was observed at 18 hours, 36 hours and 60 hours. High fertilization rates were obtained at 0 hour and 38 hours. Large numbers of stripped eggs per kg of fish weight was observed at 0 hour, 36 hours and 54 hours containing 64,000, 55,000 and 70,000 eggs, respectively.

We conclude that correct timing of artificial insemination is about 36 hours after the initial artificial insemination. This is based on the findings of higher fertilization success and fertilization rates than at 0 hour, and favorable comparisons with the amount of stripped eggs taken at 0 hour and 54 hours.

8.2.2. Rearing of wild adults

8.2.2.1. Environmental conditions for rearing and maturation

27 wild broodstocks were reared and their feeding activities observed in 12 ton circular tanks (no.10) from November 1998 to June 1999. Active feeding by the fish was only observed when the water temperature in the tank dropped from 16℃ to 13℃ (November - December) and rose from 10℃ to 13℃ (March - May).

Some of the fish were occasionally observed to give large gasps; in addition, most fish were observed to gasp more frequently when the water temperature in the tank was raised to more than 16℃. At that time, the fish were observed to ceased feeding activities.

Based on the above findings, it was estimated that feeding activities were affected by the water temperature, and the favorable tank water temperature is below 16℃.

8.2.2.2. Broodstock diet

Feed containing frozen whiting and/or vitamin mixture were given 1-2 times a week to broodstock reared in a 10 ton FRP tank. The male fish matured but the female fish did not develop

mature gonads during the spawning season from March to May.

8.2.3. Artificial insemination

8.2.3.1. Artificial insemination of wild spawners

To obtain fertilized eggs of the Black Sea turbot for seed production in 1999, 15 artificial inseminations were carried out and approximately 4,600,000 eggs and 1,650,000 newly hatched larvae were obtained. Average fertilization rates of 46.3% and hatching rates of 71.4% occurred. Higher fertilization rates were obtained compared to 1998 's results.

8.2.3.2. Artificial insemination of raised spawners

No artificial insemination was carried out due to the non-appearance of mature females in the tank.

8.2.3.3. Sperm cryopreservation

The motility of sperm after exposure for various durations to different concentrations of Turbot Ringer's solution was examined.. Sperm was diluted with four kinds of Turbot Ringer's solution. under near-zero liquid storage (0-4℃). Solution.A: the original formulation adjusted to pH7.4; Solution B: the original formulation minus a substance of HEPES and adjusted to pH8.0; Solution C: Solution A with added antibiotic agent); Solution D: Solution B with added antibiotic agent). Results indicated that the high motility of 4.0 was only observed up to 6 days in turbot Ringer's Solution D with motility of 3.0-3.5 for a further 8 days. Sperm motility scores of semen diluted with turbot Ringer's solution A, B and C were only between 3.0 and 4.0 on the 4th-8th day of preservation. We conclude that the turbot Ringer's solution D is the optimum extender for near-zero liquid sperm preservation. The use of the turbot Ringer's Solution D for cryopreservation will be considered for further study.

8.2.4. Induction of spontaneous spawning

To obtain a large amount of ovulated eggs from the female turbot, 3 types of hormone treatments were administered to every maturing wild female,. The treatments were (1) a pelleted, luteinizing hormone-releasing hormone analogue (LHRH); (2) a combination of LHRH-a and mixture of human chorionic gonadotropin (HCG) and the salmon pituitary gland (SPG), and (3) HCG/SPG.

All hormone-treated fish ovulated and produced fertilized eggs. In particular, fish treated with a combination of (2) LHRH-a and HCG/SPG produced a good egg production result of 16.7% (1,770,000 eggs) of fish weight. The amount of stripped eggs ovulated by the other females treated with (1) LHRH-a and (3) HCG/SPG were only 8.9% and 4.0% of fish weight, respectively. More detailed research will be considered for further study.

8.3. Study of food organisms

8.3.1. Culture of phytoplankton

8.3.1.1. Mass-culture of *Nannochloropsis*

During the seed production season from April to June 1999, large-scale production of *Nannochloropsis* was conducted and sufficient volume ($297m^3$) and density (23.21×10^6 cells/ml) of *Nannochloropsis* could be provided to the rotifer culture and the larval rearing sections. These results showed that the production target density of $20x10^6$ cells/ml at harvest was successfully accomplished.

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Optimum culture temperature for *Nannochloropsis* was investigated under laboratory conditions. The results indicated that the optimum temperature for the strain used for the experiment was below 18 ℃, and a culture temperature of over 25 ℃ caused poor growth.

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8.3.2.1.Mass culture of rotifer

During the seed production season from April to June 1999, large-scale production of L-type rotifer (*Brachionus plicatilis*) was conducted and a sufficient number (400×10^6 ind.) and density (255 ind./ml) of rotifer could be produced. These results show that the production target of mean density of 200 ind/ml at harvest was successfully accomplished.

8.3.2.2. Enrichment of L-type rotifer using *Nannochloropsis*

The rotifer enrichment method using *Nannochloropsis* has not been completely established. In order to obtain basic data on the feeding density and feeding amounts of *Nannochloropsis* by rotifer, a preliminary culture experiment was conducted. Based on the results, an initial stock density of *Nannochloropsis* at 20×10^6 cells/ml, an inoculation density of rotifers at less than 250 ind./ml and and an enrichment period of 5-6 hours seem to be recommendable.

8.3.2.3. Enrichment of rotifer using L-Phaeo.

At present, the rotifer enrichment method using *Phaeodactylum* has not been established. In order to obtain basic data on the composition rate of L-Phaeo by rotifer, a preliminary tertiary culture experiment was conducted. Based on the experimental results, L-Phaeo. At a density at 2.5×10^6

cells/ml, a rotifer inoculation density of less than 250 ind.s/ml and an enrichment period of 5-6 hours seem to be recommendable.

8.3.2.4. Population dynamics of the L-type Rotifer under laboratory conditions

A single cohort of L-type rotifer, obtained from artificially isolated eggs, was monitored in five 30L tanks at different temperatures with *Nannochloropsis* as feed. The intervals between hatching and spawning seem to decrease exponentially as the temperature increased in an experimental temperature range of between 15 ℃ to 25℃. Detailed analysis of this data will be conducted by counterpart Ms. Binnur Ceylan under Dr. Ohno's supervision in Japan.

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A manual for the larval rearing of turbot will be produced in the near future.

8.5. Study of juvenile rearing

Most of the larvae and/or juveniles at 25-30 DAH were affected by ciriata. Thereafter, mass mortality occurred and only a few juveniles remained alive in the tank.

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8.7.1. Growth/mortality patterns

To examine growth and feed efficiency, hatchery-bred young fish ,averaging 22cm TL and 188g BW in size, were stocked in a 4-3 ton circular FRP tank containing 60 fish/tank and 4-4 ton square FRP tank containing 80 fish/tank. The first group (Treatment 1-4) was fed with frozen cod. The second group (Treatment 5-6) was fed with rainbow trout commercial pellets containing 40% protein. The third group (Treatment 7-8) was fed with a combination of frozen cod and the above commercial pellet. Satiable feeding was done once a day. The experiment was conducted from February 2 to May 4 1999. Fish were reared in a water temperature of 9.0-11.8℃.

The highest growth was obtained to the first group resulting in daily growth rates of 0.44mm TL/day and 1.56g BW/day. The third group obtained the second highest growth resulting in daily growth rates of 0.20mm TL/day and 0.56g/day. The lowest growth occurred in the second group resulting in daily growth rates of 0.18mm TL/day and 0.45g/day.

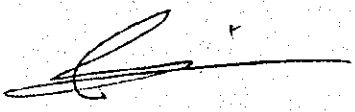
The best feeding efficiency was in the first group resulting in 1.36, then 1.99 for the third group. The worst feeding efficiency was obtained in the second group resulting in 3.23. A mortality of 1.6-16.6% was observed only in the first group that contained a sand-bed in the tank.

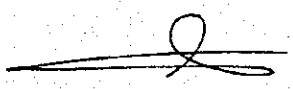
8.7.2. Environmental conditions

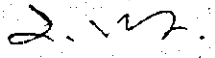
This aspect has not been investigated in detail.

8.7.3. Nutritional requirements

This aspect has not been investigated in detail.







ANNEX III

IMPLEMENTATION PLAN FOR THE REMAINING TWO YEARS

THE TECHNICAL COOPERATION
FOR THE FISH CULTURE DEVELOPMENT PROJECT
IN THE BLACK SEA OF THE REPUBLIC OF TURKEY

Duration : November1999-April 2002

1. Broodstock rearing techniques

Optimum range of water temperature for the rearing of adults will be studied.

2. Spawning techniques

2-1. Study of artificial insemination of wild-caught spawners

To attain hatching rates (from whole eggs) of 30% or higher, optimum timing of fertilization will be elucidated.

2-2. Method of hormone treatments

In order to obtain quality eggs through hormone treatments, dose and injection timing will be examined for various hormones.

3. Larval/juvenile rearing techniques

3-1. Cultivation of plankton

Growth patterns of zoo- and phytoplankton and utilization of wild zooplankton for larval rearing will be studied. Results of these investigations will be incorporated in a manual of plankton cultivation to be prepared by the end of the project period.

3-2. Study of nutrient enrichment of food organisms

Major nutrient requirements of larvae will be studied to establish treatment methods of nutrient enrichment methods of food organisms for larval rearing.

3-3. Study of larval rearing systems

To attain survival rates of 10% or more at 20mm TL, management systems will be established to maintain rearing water at optimal temperatures and in good quality. Feeding efficiency in relation to the densities of larvae and food organisms will also be investigated.

3-4. Study of juvenile rearing systems

Management systems for environmental condition's of rearing tank bottoms will be established, corresponding to the shift of the fish from free-swimming to dimarsal life. Nutrient requirements will also be elucidated. Survival rates (from 50 to 100mm) of 50% or more will thus be attained.

4. Accumulation of data utilizable for grow-out

Growth patterns from the juvenile to sub-adult stages will be assessed through various rearing runs. Nutrient requirements in young and sub-adult fish will also be examined.

5. Research capability of counterparts

The ability of the counterparts as scientists/technicians will be improved through routine in-house work, participation in outside scientific meetings/workshops, and editing scientific publications such as newsletters and research reports.

Table 1 Assignmemt of Counterpart

Calendar Year	1997				1998				1999				2000				2001				
	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ
Fiscal Year (*)	1997				1998				1999				2000				2001			
	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ
Ⅰ. Project Manager																				
Yilmaz BEKIROGLU		—9/18		—2/11	—4/21				6/21—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dr.Temel SAHIN	—	—7/9																		
Yusuf KAYIKCI			12/22	—3/26	—	—	—	—	—6/18											
Ⅱ.Counterpart																				
1.Broodstoc management																				
(1)Erdinc GUNES	4/16—	—	—	—	—	—	—	—	—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
(2)Mustafa OZONGUN		7/6—	—	—	—	—	—	—	—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
2.Feed/Food development																				
(1)Adnan ERTEKEN	4/16—	—	—	—	—	—	—	—	—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
(2)Binnur CEYLAN		7/6—	—	—	—	—	—	—	—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
(3)Abdussamet DAL											10/1—	.....	.....	.....	.....	.....	.....	.....	.....	.....
3. Seed production																				
(1)Yilmaz CIFTCI	4/16—	—	—10/9								12/1...	.....	.....	.....	.....	.....	.....	.....	.....	.....
(2)Cennet USTUNDAG	4/16—	—	—	—	—	—	—	—	—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....
(3)Temel SAHIN		7/10—	—	—	—	—	—	—	—	—	—	.....	.....	.....	.....	.....	.....	.....	.....	.....

Note: (*) Japanese fiscal year starts in April and ends in March.
— assigned period ···planning period

Table 2

EXPENDITURES PAID BY TURKISH SIDE(1997～1999)

支出項目	内　訳	1997		1998		1999	
Item	Details	MillionTL	Thousand yen (¥)	MillionTL	Thousand yen (¥)	MillionTL	Thousand yen (¥)
200	Travel Expenses	100	80	600	320	1,422	410
300	Maintenance of cars, machinary and buldings, Communications costs, Hiring workers	4,300	3,340	2,800	1,490	6,650	1,920
400	Fuel,Lighting and heating expenses, Feed,Chemicals,Different expendables	4,002	3,100	5,600	2,980	17,812	5,150
600	Purchase of office equipment and machinary	10,194	7,910	1,573	840	8,863	2,560
700	Civil works	34,693	26,940	30,876	16,440	15,905	4,590
800	Taxs	0	0	0	0	0	0
	Circulating capital	0	0	＊5,000	2,660	0	0
	TOTAL	53,289	41,370	41,449	24,730	50,652	14,630

＊5 billion TL has been provided by the circulating capital of the Central Fisheries Research Institute.

Table 3 Dispatch of Long and Short-Term Experts

Calendar Year	1997			1998				1999				2000				2001				
	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I
Fiscal Year (*)	1997				1998				1999				2000				2001			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Long-term Experts																				
Team Leader / Broodstock Development & Management																				
*Dr.Shiro HARA	—	—	—	—	—	—	—	—	—	—	—	—	—	...	...	...	...	...	...	...
Coordinator																				
*Yumiko NAKAZAWA	—	—	—	—	—	—	—	—	—	—	—	—	—	...	...	...	...	...	...	...
Feed/Food Development																				
*Goro NAZAKI	—	—	—	—	—	—	—	—	—	—	—	—	—	...	...	...	...	...	...	...
Seed Produvtion																				
*Kenzo YOSEDA	—	—	—	—	—	—	—	—	—	—	—	—	—	...	...	...	...	...	...	...
Short-term Experts																				
Planning of seawater intake system and hatchery remodeling																				
*Kazuhiko DOI (15/Jun-25/Jul 1997)	—																			
Supervision of seawater intake system and hatchery remodeling																				
*Kazuhiko DOI (4/Oct-21/Nov 1997) (12/Jan-7/Mar 1998)			—	—																
Species identification of Black Sea turbot																				
*Dr.Kunio AMAOKA (3/Mar-18/Mar 1998) (4/Jan-29/Mar 1999)				—				—												
Feed/Food Development & Broodstock Management																				
*Dr.Atsushi OHNO (28/Feb-28/Mar 1999)								—												
Early life history of fish																				
*Dr.Hiroshi KOUNO (30/Mar-11/Apr 1999)								—												
*Dr.Masato MOTEKI (6/Apr-4/Jun 1999)									—											
Construction design of basic grow-out facility																				
*Soichi TAKAI (1/Mar-7/Apr 1999)								—												
Artificial diet & Chenical analysis																				
*Dr.Manabu ISHIKAWA (20/Sep-19/Oct 1999)										—										
Tender and Inspection of construction facility																				
*Masanori DOI (2/Oct-5/Nov 1999)											—									
Nutritional requirements															...					
Fish disease														...			...	...		
Publication work															...					
Economic study																.....				
Publication of manual																			...	

Note: (*) Japanese fiscal year starts in April and ends in March.
— assigned period ···planning period

Table 4

THE LIST OF MACHINARY AND EQUIPMENTS DONATED BY JICA (> 100,000 YEN)

FISCAL YEAR-No	PURCHASED IN T/J	FIELD	No.	MACHINARY , EQUIPMENT	Q'ty	MODEL,SIZE	UNIT PRICE	PURCHASED DATE	INSTALLED PLACE	NOTES
97-1	JAPAN	O	O-01	COMPUTER	1 SET	POWER MAC 7200	¥322,000	8-May-97	EXPERT OFFICE	
97-2	JAPAN	O	O-06	COMPUTER	1	POWER MAC 7300	¥402,000	8-May-97	EXPERT OFFICE	
97-3	JAPAN	O	O-14	COMPUTER	1	POWER MAC 8600	¥574,000	8-Jun-97	EXPERT OFFICE	
97-4	JAPAN	O	O-18	COMPUTER	1	G X I 5200M	¥282,000	8-Jun-97	EXPERT OFFICE	
97-5	TURKEY	H	C-01	MINI BUS WITH ACCESSORIES	1	FORD T15/61-EE-117	$26,480	30-Jul-97	GARAGE	
97-6	TURKEY	O	O-23	PHOTOCOPY MACHINE	1	CANON NP-6025	$7,478.05	13-Aug-97	EXPERT OFFICE	
97-7	TURKEY	BR	BR-04	ELEKTRONIC BALANCE	1	PRECISA 6200D	TL 140.4M	21-Aug-97	LABORATORY(BR)	¥100,000
97-8	TURKEY	BR	BR-05	FRP SQUARE TANK	1	W3XL4XH1.2	$3,680	5-Nov-97	HATCHERY	
97-9	TURKEY	BR	BR-06	FRP CIRCULAR TANK	2	R4XH1.2	$2,949.80	5-Nov-97	HATCHERY	
97-10	TURKEY	BR	BR-07	FRP CIRCULAR TANK	8	R2XH1.0	$879.80	5-Nov-97	HATCHERY	
97-11	TURKEY	FD	FD-08	FRP SQUARE TANK	2	W2XL4XH1.2	$2,346	5-Nov-97	HATCHERY	
97-12	TURKEY	H	HM-01	FRP SQUARE TANK	1	W2XL3XH1.2	$3,070	5-Nov-97	HATCHERY	
97-13	TURKEY	LR	LR-06	FRP OVAL (RACEWAY) TANK	4	W2XL5XH1.0	$2,760	5-Nov-97	HATCHERY	
97-14	TURKEY	H	HM-02	BOILER SYSTEM	1	HKK50	$9,152	10-Nov-97	HATCHERY	
97-15	TURKEY	H	HM-03	UV SYSTEM	2	ULTRAMAX HC-20	$4,025	10-Nov-97	HATCHERY	
97-16	TURKEY	H	HM-05	AIR BLOWER	1	HICK HARGREAVES2032	TL 838M	28-Nov-97	HATCHERY	$4,500
97-17	JAPAN	BR	BR-09	LIQUID NITROGEN REFRIGERATOR	2	SR-29X	¥279,000	9-Dec-97	LABORATORY(BR)	
97-18	JAPAN	BR	BR-10	HANDLY LIQUID NITROGEN CONTAINER	1	SR-17	¥210,000	9-Dec-97	LABORATORY(BR)	
97-19	JAPAN	BR	BR-11	LIQUI NITROGEN CONTAINER	2	DC-30	¥160,000	9-Dec-97	LABORATORY(BR)	
97-20	TURKEY	H	HM-06	CHILLING UNIT	1 SET	CLIMAWANETTA	$17,931.06	30-Dec-97	HATCHERY	
97-21	JAPAN	BR	BR-14	BIOLOGICAL MICROSCOPE(NIKKON)	1 SET	E-4B-11-1,E-400	¥663,000	30-Mar-98	LABORATORY(BR)	
97-22	JAPAN	LR	LR-09	OBJECTIVE MICROSCOPE(NIKKON)	1 SET	SMZ-1B-3	¥247,000	30-Mar-98	LABORATORY(LR)	
97-23	JAPAN	BR	BR-16	PARAFFIN METER	1	SC-4d-CP	¥288,000	12-Jun-98	LABORATORY(BR)	

FISCAL YEAR-No	PURCHASED IN T/J	FIELD	No.	MACHINARY , EQUIPMENT	Q'ty	MODEL,SIZE	UNIT PRICE	PURCHASED DATE	INSTALLED PLACE	NOTES
97-24	JAPAN	BR	BR-17	INFILTRATOR(SATRIFUJ)	1 SET	EM-INFILTRATOR-I	¥126,000	12-Jun-98	LABORATORY(BR)	
97-25	JAPAN	BR	BR-18	ELECTRICAL BALANCE	1 SET	AB-204	¥181,800	12-Jun-98	LABORATORY(BR)	
97-26	JAPAN	BR	BR-19	BIOLOGICAL MICROSCOPE	1 SET	E400(E6F-21-1)	¥808,700	12-Jun-98	LABORATORY(BR)	
97-27	JAPAN	BR	BR-20	OBJECTIVE MICROSCOPE	1 SET	SMZ-U-4(NIKON)	¥672,500	12-Jun-98	LABORATORY(BR)	
97-28	JAPAN	BR	BR-22	WATER FILTABLE UNIT(SAF SU CIHAZI)	1 SET	MILLI-Q JR ZD20 100JR	¥220,000	12-Jun-98	LABORATORY(BR)	
97-29	JAPAN	FD	FD-13	BIOLOGICAL MICROSCOPE	1 SET	BX40-32(OLYMPUS)	¥637,000	12-Jun-98	LABORATORY(FD)	
97-30	JAPAN	FD	FD-14	OBJECTIVE MICROSCOPE	1 SET	SZH10-141(OLYMPUS)	¥560,600	12-Jun-98	LABORATORY(FD)	
97-31	JAPAN	FD	FD-15	PH METER	1 SET	D-22E	¥253,000	12-Jun-98	LABORATORY(FD)	
97-32	JAPAN	LR	LR-10	OBJECTIVE MICROSCOPE	1 SET	MZ-8(LICA)	¥983,800	12-Jun-98	LABORATORY(LR)	
97-33	JAPAN	LR	LR-16	BIOLOGICAL MICROSCOPE	1 SET	E400(E6F-21-1)	¥852,300	12-Jun-98	LABORATORY(LR)	
97-34	JAPAN	LR	LR-17	PHOTO MICROGRAHER	1	H-III-35	¥472,500	12-Jun-98	LABORATORY(LR)	
97-35	JAPAN	LR	LR-27	CAMERA	1	F-70D(NIKON)	¥472,500	12-Jun-98	LABORATORY(LR)	
97-36	JAPAN	LR	LR-28	OXYGEN METER	1 SET	DO-14P	¥382,000	12-Jun-98	LABORATORY(LR)	
97-37	JAPAN	LR	LR-18	IMAGE ANALYSIS SYSTEM	1	SEARCH PARTY	¥1,890,000	12-Jun-98	LABORATORY(LR)	
97-38	JAPAN	O	0-25	LASER PRINTER	1 SET	CANON LBP-830	¥1,438,000	23-Sep-98	EXPERT OFFICE	
97-39	JAPAN	BR	BR-31	ROTARY MICROTOME	1 SET	RM2135	¥1,337,500	23-Sep-98	LABORATORY(BR)	
97-40	JAPAN	BR	BR-32	PARAFFIN STRETCHER	1	PS-52C	¥195,000	23-Sep-98	LABORATORY(BR)	
97-41	JAPAN	BR	BR-35	DRYING OVEN,CONSTANT TEMPERATURE	1 SET	MOV-112(U)	¥210,000	23-Sep-98	LABORATORY(BR)	
97-42	JAPAN	FD	FD-21	CLEAN BENCH	1 SET	MCV-710ATS	¥580,600	23-Sep-98	LABORATORY(FD)	
97-43	JAPAN	FD	FD-24	LOW TEMPERATURE INCUBATOR	1 SET	MIR-153	¥352,800	23-Sep-98	HATCHERY	
97-44	JAPAN	FD	FD-30	FREEZER	1	MDF-435	¥340,000	23-Sep-98	LABORATORY(FD)	
97-45	JAPAN	FD	FD-31	ELECTRONIC BALANCE	1 SET	BW-420D	¥175,000	23-Sep-98	LABORATORY(FD)	
97-46	JAPAN	FD	FD-33	REFRIGERATOR	1 SET	MPR-161D	¥213,000	23-Sep-98	LABORATORY(FD)	
97-47	JAPAN	FD	FD-34	DRYING STERILIZER	1 SET	MOV-212S	¥287,000	23-Sep-98	LABORATORY(FD)	
97-48	JAPAN	FD	FD-36	AUTOCLAVE	1 SET	MLS-2420	¥480,000	23-Sep-98	LABORATORY(FD)	

FISCAL YEAR-No	PURCHASED IN T/J	FIELD	No.	MACHINARY , EQUIPMENT	Q'ty	MODEL,SIZE	UNIT PRICE	PURCHASED DATE	INSTALLED PLACE	NOTES
97-49	JAPAN	LR	LR-34	WATER TEMPERATURE CONTROLLER	1	WTCA-601LP	¥694,000	23-Sep-98	HATCHERY	
97-50	JAPAN	LR	LR-36	HIGH PRESSURE WASHER	1	SJM-630-BA	¥589,500	23-Sep-98	HATCHERY	
97-51	JAPAN	LR	LR-38	FRP RACEWAY TANK	2	ERT-2.0	¥350,000	23-Sep-98	HATCHERY	
97-52	JAPAN	FD	FD-20	MICROALGAE ENRICHMENT APPARATUS (MIKROALG KONSANTRE MAKINESI)	1	ENRICH-10	¥2,863,100	23-Sep-98	HATCHERY	
98-1	TURKEY	BR	BR-42	PORTABLE SPECTROPHOTOMETOR(HACH) (SU ANALIZ CIHAZI)	1	DREL/2010-01-KAT.NO.26700-01	TL2,103.4M	20-Nov-98	LABORATORY(BR)	¥996,000
98-2	JAPAN	BR	BR-47	PORTABLE WATER DISTILLED APP	1 SET	WS-80	¥689,700	19-Dec-98	LABORATORY(BR)	
98-3	TURKEY	FD	FD-45	PLANET MIKSER	1 SET	PN23	TL746.1M	25-Dec-98	LABORATORY(FD)	¥298,000
98-4	TURKEY	H	HM	FREEZING STOREHOUSE	1 SET	OZALP(360X150X195) -18℃	$5,600	5-Jan-99	HATCHERY	
98-5	TURKEY	FD	FD-54	DRY OVEN (FIRIN)	1 SET	DINCER MAK.	TL840M	9-Feb-99	HATCHERY	¥295,000
98-6	TURKEY	H	HM-12	POLIETILEN PIPE	1	ALMAPLAST ¢ 160 (230m)	TL1,378M	23-Mar-99	SEA WATER INTAKE LINE	¥455,000
98-7	JAPAN	FD	FD-66	BLOWING CONCENTRATOR	1	MGS-2100F	¥267,000	17-May-99	LABORATORY(GLC)	
98-8	JAPAN	FD	FD-68	AUTOCLAVE	1	MLS-3020	¥545,000	17-May-99	LABORATORY(FD)	
98-9	JAPAN	LR	LR-52	COPY STAND	1	OKUMA BR-4	¥185,000	9-Jul-99	LABORATORY(LR)	
98-10	JAPAN	LR	LR-53	ANATYTICAL ELECTRONIC BALABCE	1	METTLER TOLEDO AG245	¥337,660	9-Jul-99	LABORATORY(LR)	
98-11	JAPAN	LR	LR-54	SALINITY METER	1	YSI JAPAN YS130-10FT	¥165,300	9-Jul-99	LABORATORY(LR)	
98-12	JAPAN	LR	LR-55	ILLUMINATOR FOR FLUORESCENCE MICROSCOPE	1	NIKON E400	¥989,000	9-Jul-99	LABORATORY(LR)	
98-13	JAPAN	LR	LR-56	LIGHTING UNIT FOR MICROSCOPE	1	NIKON SMZ	¥167,000	9-Jul-99	LABORATORY(LR)	
98-14	JAPAN	LR	LR-57	UV/VIS SPECTROPHOTOMETER	1	UV-1202	¥1,021,470	9-Jul-99	LABORATORY(LR)	
98-15	JAPAN	FD	FD-71	HOMOGENIZER	1	MST PH 91-1	¥251,750	9-Jul-99	LABORATORY(GLC)	
98-16	JAPAN	FD	FD-77	ROTARY EVAPORATOR	1	EYELA N-INW	¥831,440	9-Jul-99	LABORATORY(GLC)	
98-17	JAPAN	FD	FD-78	FAT EXTRACTION APPARATUS, SOXHLET, LARGE VOLUME	1	SIBATA ,4323-0	¥192,850	9-Jul-99	LABORATORY(GLC)	
98-18	JAPAN	FD	FD-79	WATER BATH	1	SIBATA 5025-480 B-480	¥385,400	9-Jul-99	LABORATORY(GLC)	
98-19	JAPAN	FD	FD-81	WATER BATH	1	SIBATA 4600-04 WB-4S	¥128,700	9-Jul-99	LABORATORY(GLC)	

FISCAL YEAR-No	PURCHASED IN T/J	FIELD	No.	MACHINARY , EQUIPMENT	Q'ty	MODEL,SIZE	UNIT PRICE	PURCHASED DATE	INSTALLED PLACE	NOTES
98-20	JAPAN	FD	FD-84	FREEZE DRYER	1	EYELA FD-5N	¥1,413,100	9-Jul-99	LABORATORY(GLC)	
98-21	JAPAN	FD	FD-85	DRYING OVEN	1	EYELA WFO-450SD	¥318,000	9-Jul-99	LABORATORY(GLC)	
98-22	JAPAN	FD	FD-86	SAMPLE MILL	1	TGK 716-60-80-13 D	¥122,500	9-Jul-99	LABORATORY(GLC)	
98-23	JAPAN	FD	FD-87	SEALER	1	SHIGA AM-300R	¥217,550	9-Jul-99	LABORATORY(GLC)	
98-24	JAPAN	FD	FD-89	ELECTRONIC BALANCE	1	SHIMADZU BX320S	¥147,250	9-Jul-99	LABORATORY(GLC)	
98-25	JAPAN	FD	FD-91	PHOTOMICROGRAPHIC SYSTEM	1	OLYMPUS PM10-AK3-35AC	¥565,250	9-Jul-99	LABORATORY(FD)	
98-26	JAPAN	FD	FD-92	MILK MIXER	1	HANAKI MX-40	¥294,500	9-Jul-99	LABORATORY(FD)	
98-27	JAPAN	BR	BR-49	INCUBATOR(2)	2	SANYO MIR-162	¥209,000x2	9-Jul-99	LABORATORY(DIS)	
98-28	JAPAN	BR	BR-50	REFRIGERATOR	1	SANYO MPR-161D	¥226,720	9-Jul-99	LABORATORY(DIS)	
98-29	JAPAN	BR	BR-52	STEREOSCOPIC MICROSCOPE	1	NIKON SMZ-1B-3	¥205,000	9-Jul-99	LABORATORY(DIS)	
98-30	JAPAN	BR	BR-55	ULTRASONIC CLEANER	1	SHARP UT-205	¥237,500	9-Jul-99	LABORATORY(BR)	
98-31	JAPAN	BR	BR-56	ELECTRONIC BALANCE	1	METTLER PB5001	¥132,050	9-Jul-99	LABORATORY(DS)	
98-32	JAPAN	BR	BR-61	ACCESSORY FOR MICROSCOPE	1	NIKON	¥152,480	9-Jul-99	LABORATORY(BR)	
98-33	JAPAN	BR	BR-62	PHOTOMICROGRAPHIC SYSTEM	1	NIKON H-III-35-PLI	¥463,500	9-Jul-99	LABORATORY(BR)	
98-34	JAPAN	BR	BR-63	SIEVE SHAKER	1	IUCI 55-4001-03 AS200DIGIT	¥444,600	9-Jul-99	LABORATORY(BR)	
98-35	JAPAN	BR	BR-64	pH METER	1	METTLER TOLEDO MP230	¥475,470	9-Jul-99	LABORATORY(BR)	
98-36	JAPAN	BR	BR-65	SHAKER	1	NISSIN EM I	¥400,420	9-Jul-99	LABORATORY(BR)	
98-37	JAPAN	BR	BR-66	HEMATOCRIT CENTERIFUGE	1	KOKUSAN H-1200B	¥247,000	9-Jul-99	LABORATORY(BR)	
98-38	JAPAN	BR	BR-67	LAW TEMPARATURE INCUBATOR	1	SANYO MIR-153	¥662,080	9-Jul-99	LABORATORY(BR)	
98-39	JAPAN	BR	BR-68	DISSOLVED OXYGEN METER	1	HORIBA OM-14-02	¥157,720	9-Jul-99	LABORATORY(BR)	
98-40	JAPAN	BR	BR-69	LIQUID NITROGEN REFRIGERATOR FOR STORAGE & SHIPPING	1	FUJIHIRA DR-2DS	¥110,000	9-Jul-99	LABORATORY(BR)	
98-41	JAPAN	O	O-32	COLOR PRINTER	1	SEIKO EPSON PM-2000C	¥104,400	9-Jul-99	EXPERT OFFICE	
98-42	JAPAN	O	O-33	IMAGE SCANNER	1	SEIKO EPSON GT-9500WIN	¥109,250	9-Jul-99	EXPERT OFFICE	
98-43	JAPAN	O	O-35	VIDEO CAMERA	1	SONY DCR-TRV7E	¥281,200	9-Jul-99	EXPERT OFFICE	
98-44	JAPAN	FD	FD-70	GAS CHROMATOGRAPH	1	SIMADZU GC-17AAF V3	¥3,648,000	9-Jul-99	LABORATORY(GLC)	

Table 5 Counterpart Training in Japan

Calender Year	1997				1998				1999				2000				2001				
	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	
Fiscal Year (*)	1997				1998				1999				2000				2001				
	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	
Name of Counterpart & Period of Training																					
Year of 1997 (20/Jan~21/Apr1998)	+ Dr.Temel SAHIN (Field of Seedproduction)																				
Year of 1997 (20/Jan~21/Apr1998)	+ Mr.Erdinc GUNES (Field of Seed production)																				
Year of 1998 (04/Nov~16/Feb1999)					+ Mr.Mustafa OZONGUN (Field of Broodstock management)																
Year of 1998 (11/Jan~21/Apr1999)									+ Mr.Adnan ERTEKEN (Field of Feed and food development)												
Year of 1999 (21/Sep~21/Dec1999)													+ Ms.Binnur CEYLAN (Field of Feed and food development)								
Year of 1999 (20/Oct~6/Nov1999)													+ Dr.Musa BAYRAK (Field of Managemant and planning of aquaculture)								
Year of 2000(**)																	+ Ms.Cennet USUTUNDAG (Field of Seed production)				
Year of 2000(**)																	+ Mr.Yilmaz BEKIROGLU (Field of Managemant and planning of aquaculture)				
Year of 2001(**)																					+ Mr.Yilmaz CIFTCI (Field of Fish disease)
																					+ (Field of Chemical analysis)

Note: (*) Japanese fiscal year stars in April and ends in March.
(**) According to the 1999 schedule.

•	CLASSIFICATION OF FIELD
BR	Broodstock section
FD	Feed/Food development section
LR	Seed production section
O	Business machine
C	Vehicle
HM	Common use in facility
DIS	Fish Disease
GLC	Gas Chromatograph

JICA