

## Summary of Terminal Evaluation

I Outline of the Project	
Country: Republic of Cuba	Project Title: Project for Fish Culture in the Republic of Cuba
Issue/Sector: Fisheries	Cooperation Scheme: Technical Cooperation Project
Division in Charge: Field Crop Based Farming Area Division, Rural Development Department	Total Cost (at time of evaluation): approx. 199 million JPY
Period of Cooperation: From May 21, 2008 to May 20, 2013 (5 years) R/D: November 23, 2007	Partner Country's Implementing Organization: Ministry of the Food Industry (MINAL), Fisheries Research Center (CIP)
	Supporting Organization in Japan: —
Related Cooperation Project: —	
<p>1-1 Background of the Project</p> <p>In recent years, aquaculture has been playing an increasingly important role in the Cuban fisheries industry despite a sharp drop in fish catches. Today, approximately 30,000 tons are farmed each year, accounting for about half of all fisheries products produced in the country. In freshwater fish farming, tilapia, carp, and other fish are produced, while techniques for freshwater lobster farming have been introduced and shrimp cultivation has been promoted since the mid-1990s. The country exported 66 million USD (1.1% of its total export value) worth of fisheries products in 2011.</p> <p>The Ministry of the Fishing Industry of Cuba (MIP) has been working on the technical development of native species of marine fish for aquaculture at the Fisheries Research Center (CIP) through the “Marine Fish Culture” cooperation, organized as part of the Japan-Chile Partnership Programme. Although it has already become able to independently culture brood stocks, it has yet to reach the stage where it can also carry out egg collection and hatching on its own. For this reason the Cuban government requested the technical cooperation of Japan to further introduce advanced technology and promote marine fish culture.</p> <p>The project was launched in May 2008 with the dispatch of short-term experts to CIP. Just half a year after that, in November 2008, Hurricane Paloma directly hit the project site, leaving the project facilities severely damaged. Then, in June 2009, government reorganization took place in Cuba, resulting in the Ministry of the Food Industry of Cuba (MINAL) replacing MIP as the organization implementing the project. Although there have been delays in the restoration of the facilities, affected by the Cuban economic crisis, repeated talks have been held between the Cuban and Japanese sides to discuss the implementation of the project and restoration work, and their technical cooperation has been ongoing.</p> <p>In June 2011, the Japanese side began to dispatch a long-term expert to the project site to have him play the double role of managing the implementation of the project and introducing marine fish culture technology, making it possible to provide the Cuban side with daily guidance and support, including that for the restoration of the project facilities. The restoration of the minimum facilities required for</p>	

project cooperation, including testing facilities, was completed in February 2012.

## 1-2 Project Overview

The purpose of the project is to help increase the marine fish culture capacity of the Santa Cruz del Sur affiliate of CIP, which belongs to MINAL. The target fish species for the fish culture capacity improvement are Robalo (*Centropomus undecimalis*) and Pargo (*Lutjanus analis*).

### (1) Overall Goal

Government of Cuba runs the fish culture of Robalo and Pargo.

### (2) Project Purpose

Capacity of Robalo and Pargo culture in the Santa Cruz del Sur affiliate is strengthened.

### (3) Outputs

1) Technique of seed production of Pargo is established.

2) Technique of induced maturing and spawning of Robalo is developed.

3) The researchers of the Fisheries Research Center acquire the culturing technique developed in this project.

### (4) Inputs (estimated at completion of the Project)

Japanese side:

Dispatch of Experts: 7 person: (long-term) 1 person/(short-term) 6 persons, Training in Japan: 1 person, Provision of equipment: approx. 323 K USD, Local cost expenditure: approx. 99 K CUC

Cuban side:

Counterpart personnel: 14 persons, Local cost expenditure: 1,119 K CUP, Provision of land and facilities: Santa Cruz del Sur affiliate and expert offices

## II Evaluation Team

Members of Evaluation Team	Kenichi Kato, Leader, Field Crop Based Farming Area Division I, Rural Development Department, JICA Satoshi Chikami, Senior Advisor, Institute for International Cooperation, JICA Yutaka Yamaguchi, Consultant, Cranberry Ltd. Dr. Enrique Giménez, Regular Researcher, Marine Shrimp Division, CIP Dr. Barbarito Jaime, Regular Researcher, Marine Culture Division, CIP M.Sc. Eduardo Raul Flores, Associate Researcher, Marine Culture Division, CIP	
Period of Evaluation	From October 28 to November 15, 2012	Type of Evaluation: Terminal Evaluation

### III Results of Evaluation

#### 3-1 Achievement

##### (1) Project Purpose

Technical personnel of the Santa Cruz del Sur affiliate have acquired advanced technical skills in all aspects of Robalo and Pargo culture, particularly the production of Pargo juveniles. However, they are still unable to carry out the entire protocol of Robalo and Pargo culture, as culturing technique development for the two species has not been completed yet.

Although it is possible to create a technical final report by the end of the project by compiling the outputs acquired through project activities so far, the technical report will not be able to cover the “protocol of Robalo and Pargo culture” that includes all processes from producing Pargo juveniles to obtaining fertilized Robalo eggs, as specified in PDM.

As for the proposal of implementing the technology to the productive sector, only Pargo can be discussed, as the project program does not include the production of Robalo juveniles. Given that sufficient testing results are unlikely to be available by the end of the project as to Output 1 and Output 2, it will be impossible to encourage introduction of the technology to the aquaculture industry by drafting the proposal of implementing the technology to the productive sector, supported by testing results.

##### (2) Outputs

###### 1) Output 1

As regards Output 1, great results have been achieved, but there is still room for improvement in some aspects. The project has succeeded in raising a brood stock of 31 fish, which were caught in 2010, from the end of the spawning season in 2011 to 2012, with no mortalities. This was an impressive outcome in brood stock rearing for seed production of Pargo. In addition, eggs were obtained through artificially induced maturing and natural spawning, and a satisfactory number of eggs and hatching rate were achieved. Furthermore, the project has produced about 100 juveniles from the hatched Pargo larvae, the rearing of which had been launched on a trial basis in 2012. As of the implementation of the evaluation, their breeding conditions were stable. However, as the survival rate of hatched larvae is below the target level, the project is conducting further research to improve its juvenile production techniques, for example by introducing new types of feedstuff.

###### 2) Output 2

Whilst there has been some achievement in Robalo brood stock rearing, it is considered difficult to establish the technique to induce maturing and spawning according to schedule, by the end of the project. The project continues with the effort to raise Robalo brood stock in the 70-ton water tank, monitor their maturity, and experiment with different methods of egg collection, for example through water temperature adjustments.

### 3) Output 3

It appears to be difficult to achieve Output 3 according to schedule, by the end of the project implementation period. Since the launch of the project, the compilation of manuals has been carried out under the supervision of Japanese experts and revisions have been made to them by reflecting testing results each year. However, as there has not been as much progress as expected in the development of the technique for hatched Pargo larvae rearing, as well as the technique for inducing maturing and spawning of Robalo, no testing results in these areas have been reflected in the manuals. These manuals are namely the “Technical Manual on Biological Feed Production,” the “Technical Manual on Artificial Seed Production of Pargo” and the “Technical Manual on Artificial Seed Production of Robalo.” These three manuals have been revised each year by incorporating the outcomes of the project.

#### 3-2 Summary of Evaluation Results

##### (1) Relevance:

This project is evaluated as being of high relevance, given that it is in line with the policies of MINAL and CIP, and because Japanese aquaculture technology is advanced enough to provide effective technical cooperation.

##### 1) Consistency with the policy of the Cuban government

According to the Fisheries Control and Science Division of MINAL, it is difficult to bring about a large increase in marine fish catches in Cuba at present, and aquaculture is regarded as an essential option that can increase the country’s fishery production in the future. Whilst it has already been a long time since freshwater fish farming developed into an advanced industry in Cuba, marine fish farming in the country is still at the early research stage. One of the functions of MINAL is to provide instructions for and supervision over the utilization and preservation of fishery resources and ecosystems in its territorial sea and inland waters. This is why marine fish culture development, which is directly related to the purpose of this project, is part of the functions of MINAL.

##### 2) Selection of a target group for the project

The missions of CIP as an organization include conducting research for cultivation of fishery products, providing scientific and technological services, and implementing technological transfers for such research. This makes CIP an appropriate target group for the project. The Marine Culture Division of CIP is engaged in research on marine fish culture. Particularly, the Santa Cruz del Sur affiliate has a team of enthusiastic and well-trained technical personnel. This is why it is the right choice as the project site.

##### 3) Consistency with the cooperation policy of Japan

The project is also consistent with Japan’s cooperation policy in the area of food security in Cuba. JICA’s technical cooperation for marine fish culture at CIP was launched in cooperation with the Japan-Chile Partnership Programme (JCPP), joined by the North Catholic University of Chile (Universidad Católica del Norte) in Coquimbo, Chile in 2000.

##### (2) Effectiveness

Although the project has been progressing towards achieving its purpose, its outputs are not evaluated

as producing adequate effects to achieve the project purpose.

1) Degree of attainment of the project purpose

Counterparts at the Santa Cruz del Sur affiliate have developed advanced technical skills, particularly those involved in Pargo juvenile production. At the same time, however, it still cannot be said that their skills are as good as they should be.

Technical development has not yet been finished for the protocol of Robalo and Pargo culture, and the manuals have yet to be completed.

As such, it is predicted that the technical final report of the result of the project will not be able to cover the “protocol of Robalo and Pargo culture” that includes all processes from producing Pargo juveniles to obtaining fertilized Robalo eggs, as specified in PDM.

As of now, there is insufficient technical information available to develop a proposal of implementing the technology to the productive sector.

2) Outputs that contributed to achieving the project purpose

Although there was an impressive outcome in seed production of Pargo in 2012, there is still room for further improvement in some aspects.

(3) Efficiency

The efficiency of the project is evaluated as having been high in 2012 after having been relatively low until 2011 due to the hurricane damage.

1) Project stage-specific efficiency analysis

Taking into account the relationship between the inputs and outputs of the project, it is considered appropriate to divide the implementation period into two stages and examine the efficiency of each of them. The first stage is from the onslaught of Hurricane Paloma in 2008 to the completion of the restoration work in February 2012. The second stage is from February 2012 to the terminal evaluation.

The efficiency of the project is evaluated as having been relatively low until February 2012, affected by external negative conditions that were out of control of the project, including the damage caused by the hurricane. By contrast, important outcomes began to be obtained, particularly in seed production of Pargo, in the next stage that started upon completion of the restoration work in 2012, as mentioned earlier in the “effectiveness” section. This also attests to the fact that the impediments pointed out in the “effectiveness” section were preventing the outputs which the inputs were expected to bring about from becoming produced according to program.

2) Appropriateness of the inputs and activities designed to achieve the outputs

a. Dispatch of Japanese experts to CIP

It can be judged that the Japanese experts have contributed significantly to producing the project outputs. Experts in the Marine Fish Seed Production category tended to be burdened with a lot of work because their workloads were too heavy for the length of their placement, as they were required to take on logistics work generated due to the damage the hurricane had caused on the Santa Cruz del Sur affiliate, in addition to their original duties. However, the situation improved when a long-term expert in the Project Management/Marine Fish Culture Technology category was dispatched to CIP in addition to the above experts to deal with tasks related to the restoration of facilities, resulting in a large

reduction in their workloads.

b. Assignment of the Cuban counterparts personnel

The person who was appointed as Counterpart Chief in November 2011 has spent more time working in the Santa Cruz del Sur affiliate, contributing to better implementation of the project. At the same time, however, the replacement of the affiliate's personnel in important areas, such as biological feed production and brood stock/hatched larvae rearing, caused the efficiency of technological transfers to drop in some items, as mentioned in the "effectiveness" section.

c. Equipment and facilities

CIP and JICA have provided materials, equipment and services for the restoration of the Santa Cruz del Sur affiliate. As only limited materials and equipment were available in Cuba, there were a lot of difficulties in procurement of them. The restoration work was completed in February 2012. Taking into account all the inputs that have been made to this day, it can be concluded that the project has obtained satisfactory results, as verified in the chapter on the achievement of outputs.

d. Training for the Cuban counterparts personnel

A researcher on the Cuban side has participated in an individual counterpart training course in Japan. This training has provided the researcher with the opportunity to acquire a wide range of knowledge about the Japanese situation concerning marine fish seed production and brood stock rearing. It is expected that training specializing in the target fish species of the project can also help improve the capacities of counterparts.

(4) Impact

The impact of the project is evaluated as being of medium level. However, given the fact that it was only in 2012 that the project resumed full operation using facilities and equipment that had just been recovered to full functionality, it is considered too early to make projections about the possibility of the project achieving its overall goal. Actually, recent years have seen an impressive outcome in hatched Pargo larvae rearing. This is why expectations are now growing among state enterprises and the local government of the city of Camagüey for the possibility of Pargo farming. In fact, this was the first case in Cuba to succeed in rearing made-in-Cuba Pargo seeds and was a great achievement across all of Latin America. Besides this impact, the project is expected to cause more impacts in the future, such as increasing natural resources resulting from fish releases, research results published in academic journals, contributions to education in the area of marine fish culture, information exchanges with other projects, and so on.

(5) Independent development potential

Judging by the aspects of policy, system and organization, this project demonstrates high independent development potential. However, it is still true that the project is unstable in some financial and technological aspects. As such, the independent development potential of the project at the moment is evaluated as being of medium level.

1) Policy/System

Although a radical institutional change took place during the project implementation period (in June

2009), namely the integration of MIP into MINAL, the country's fisheries policies were not affected very much. The most important legal framework concerning collection of fishery resources and environmental preservation has remained unchanged and relevant policies have also stayed the same. In addition, the above organizational change did not really affect the roles of CIP, which belongs to MINAL and has always been the implementing organization for the project up to this day. Under such policies, it is certain that CIP will continue to conduct research on marine fish culture after 2013, in which the project is scheduled to be completed. In fact, CIP also launched a new five-year project with the Norwegian Agency for Development Cooperation (NORAD) in September 2011 with the aim of developing marine fish culturing technology.

## 2) Organization

The personnel size of the Santa Cruz del Sur affiliate has been stably maintained throughout the project period. This attests to how much effort MINAL and CIP have put in to maintain the organizational foundation of the affiliate in the midst of the ongoing severe economic crisis, which is affecting almost all Cuban governmental organizations, and thus deserves to be praised. If the current size of the affiliate continues to be maintained, the project is expected to produce constant outcomes in the future.

## 3) Finance

CIP bears expenses for the implementation of the project, such as personnel expenses and the cost of purchasing brood stock feed, in addition to electricity and other miscellaneous expenses, while JICA bears part of the expenses indispensable for the implementation of the project, including the costs for purchasing materials and goods for consumption, maintaining equipment and facilities, fueling vehicles, and so on. To increase the independent development potential of the project, CIP is required to put more funds into the project.

Another essential element of assuring independent development for the project is the support which state enterprises belonging to MINAL provide for it. To this day, CIP has been maintaining good relationships of cooperation with several state enterprises, namely CULTISUR, EPISUR and ALISUR, which have been supporting the supply of fresh water, electricity, feed, etc. to the Santa Cruz del Sur affiliate. Assuring the independent development of the project requires the continued support of these organizations.

## 4) Technology

The technological transfers that are being carried out by the project appropriately reflect the realities of the Cuban side and make sense. As such, it can be said that the project has good independent development potential in terms of technology. However, there is still room for uncertainty in regards to the following two aspects: Firstly, it cannot be said that the project has made much progress in technological development, due to the severe damage the hurricane caused. Secondly, it has yet to establish the originally planned level of technological transfers because of a replacement of personnel in the Cuban counterpart.

## 5) Continuation of cooperation with state enterprises under the control of MINAL

Some state enterprises around the project site have been showing growing interest in marine fish culture, holding the achievements the project had made until 2012 in high regard. In fact, there is a possibility that these companies will begin to make use of the outcomes of the project in their marine

fish culture businesses in the future. In this regard, it can be said that the project has high independent development potential.

### 3-3 Conclusion

As of the time of the terminal evaluation, it can be concluded that there is no chance of the project achieving its purpose by the end of the project period in May 2013. Although it has achieved its targets for some items by the date of this terminal evaluation, the devastating impact of Hurricane Paloma on the implementation of project activities has made it difficult for it to achieve its targets in other items before completion.

Judging by the outcomes produced in 2012, after the restoration of the project facilities, however, it can also be assumed that if the facilities had not been damaged by the hurricane and both the Japanese and Cuban sides had implemented the planned inputs according to program, the project purpose would have been achieved. Therefore, it would have been very likely that the project purpose would have been achieved if the originally planned length of implementation period had been allocated for the project by excluding the period of time in which project activities stagnated due to the damage caused by the hurricane.

### 3-4 Factors that promoted realization of effects

- (1) Completion of the main restoration of the facilities damaged by the hurricane
- (2) Effective posting of personnel on the Cuban side that continued despite the country's economic crisis
- (3) Support for the project provided by fishery-related state enterprises under the control of MINAL

### 3-5 Problems and factors that raised problems

- (1) Devastating damage caused by Hurricane Paloma on the facilities
- (2) Delays in procurement of materials and equipment for the restoration of the facilities
- (3) Replacement of technical personnel at the Santa Cruz del Sur affiliate
- (4) Shortage of fresh water supply to the facilities
- (5) Difficulty of ensuring a stable electricity supply for the facilities

### 3-6 Recommendations

- (1) Extend the implementation period of the project

Taking into account the possibility that the project purpose would have been achieved if it had not been for the consequences of the hurricane, it is recommended that the implementation period of the project should be extended, as least to the extent that two cycles (spawning seasons) of the target fish species can be covered, to achieve the original purpose of the project. This is expected to enable the technological transfer to be completed for Pargo juvenile production in Cuba.

- (2) Promote technical improvements
  - a. Improve the technique for producing biological feed



It is important that continued efforts should be made to acquire more advanced techniques for biological feed production (with a view to achieving not only the project purpose but also the overall goal of the project). Biological feed production is an essential element of hatched larvae production, which is one of the indicators, and is indispensable also for the marine fish culture industry that Cuba aims to develop in the future.

b. Identify the spawning cycle of Robalo in natural environments

Research needs to be undertaken to identify the spawning cycle of Robalo in natural environments to contribute to achieving the project purpose. Although there are several obstacles to conducting this research, CIP should endeavor to overcome them.

c. Provide technical training at the experiment station of the National Autonomous University of Mexico (UNAM)

Located in Sisal City in the Yucatán peninsula of Mexico, UNAM Experiment Station is an organization with a record of success in producing hatched larvae of Common Robalo. Visits to this organization should be an essential part of the Cuban counterpart's learning of perspectives that will be of use when they learn the basics of induced maturing and spawning techniques, and thus should be implemented.

d. Ensure a stable fresh water supply

Ensuring a stable fresh water supply to the Santa Cruz del Sur affiliate is indispensable not only for implementing technical tests but also for managing the affiliate. At present, CIP is supporting the supply of fresh water in cooperation with the Santa Cruz del Sur City Assembly of the People's Power and other public agencies. However, it is recommended that CIP should continue to look for a better solution in order to ensure the sustainability of the business.

e. Promote installation of equipment at the Santa Cruz del Sur affiliate

Although the facilities of the Santa Cruz del Sur affiliate have been reconstructed and improved, there are still more measures it can take to demonstrate its functions better. CIP is recommended to install the sand filter that has already arrived from Japan and a pump to pump up sea water, as well as promote the procurement and installation of power generation equipment. At the same time, CIP should develop and put into action maintenance management programs for these equipment items.

(3) Clarify what should be stated in the "proposal of implementing the technology to the productive sector"

As for the "proposal of implementing the technology to the productive sector," as specified in the "Objective Verifiable Indicators" column of the project purpose, it is necessary to clarify what should be stated in it for future development of the written proposal, as well as work out and create a proposal development program.

(4) Encourage use of the outcomes of the project

a. Encourage companies to make use of the developed techniques

It is desirable that fishery-related state enterprises under the control of MINAL, etc. should be encouraged to make use of the outcomes of the project, so that the overall goal of the project can be achieved and the outcomes of the project can be put to more lasting use.

b. Publish research results

The project has enabled the natural spawning and juvenile farming of Pargo for the first time in Cuba. CIP researchers are expected to report the outcomes of the project in academic journals, such as the “Cuban Journal of Fisheries Research,” published by CIP, and “Fisheries Research,” an international journal, after further research has been conducted in the project and the data has been verified.

c. Contribute to education related to marine fish culture

CIP researchers normally instruct students, supervise them with their theses, and support education in aquaculture-related fields. As such, the knowledge that these researchers have acquired through the project can be put to use in marine fish culture-related education at university and secondary education levels.

d. Exchange information with other projects

It is possible for this project to exchange information and experiences with other marine fish culture-related projects, such as the joint project launched by CIP and the Norwegian Agency for Development Cooperation (NORAD) in September 2011, to benefit each other.

(5) Develop information about marine fish culture-related costs

As the aim of the project is to increase technical capacity for marine fish culture through research and development activities, the project does not include activities that make economic assessments of marine fish culture business. Nevertheless, given that the Cuban side will be required to promote the independent development of the outcomes of the project after the project is over, it is vital to know about the costs involved in the production processes. For this objective, it is desirable that the project should develop information that supports the calculation of costs incurred in marine fish culture.

### 3-7 Lessons Learned

(1) Risk management against major climatic disasters

It is beneficial to take measures against natural disasters, while still at the initiation stage of the project, to reduce potential damage caused by natural disasters during the implementation of project activities. For this reason, it is desirable that records of past disasters, etc. should be examined to develop as good a grasp as possible of natural disaster risks, while records of post disaster restoration and reconstruction, if any, should be organized for reference. As risk management against natural disasters is effective also in promoting the independent development of the effects of the project after the project period, attention should be paid to it also in this regard.