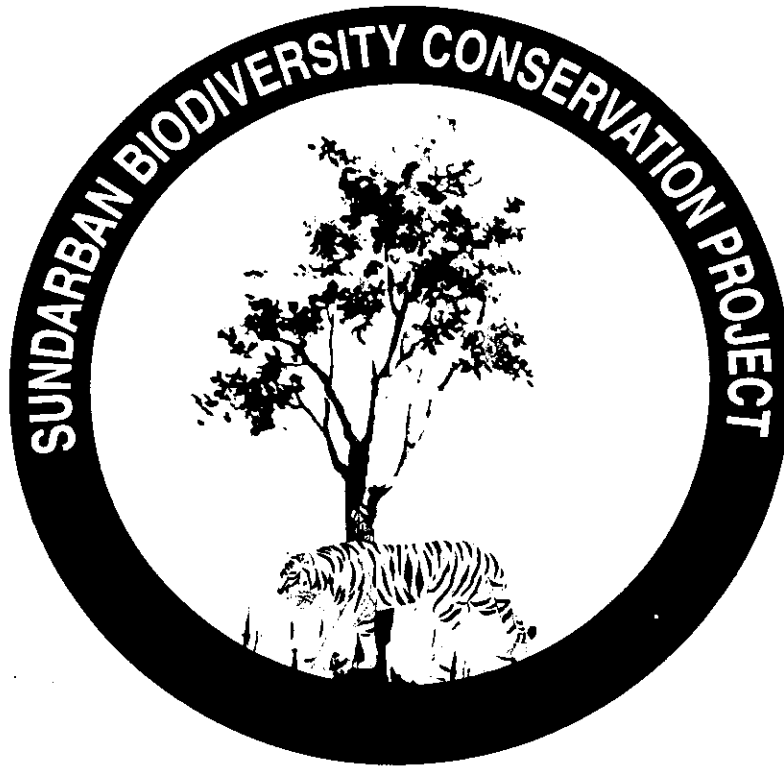


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Dhaka, Bangladesh**

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Aquatic Resources Programme: Processing and Aquaculture

**INTERNAL NOTES- IN No. 39**

By Mr. Hans van Zon, Fisheries Management Specialist

ADB: BAN 1643/3158

1st August 2001

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**AQUATIC RESOURCES PROGRAMME:  
PROCESSING AND AQUACULTURE**

**August 2001**

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## **Summary**

*This short report identifies opportunities for generation of additional employment in the Impact Zone through development of aquaculture and through processing of aquaculture and fisheries products. A series of potential opportunities, identified during 2000-2001, are prioritised on the basis of (mainly) technical feasibility and labour intensity.*

*As far as aquaculture is concerned, best opportunities are found in the improvement of pond culture and in nursing. Introduction of these opportunities has to be included in the programme of the NGOs selected under SBCP, preferably in cooperation with DOF extension officers.*

*Enhanced processing of fisheries products (more products, as well as value-adding) is expected to provide a major opportunity for generation of additional employment. Moreover, it would increase the economic status of the Impact Zone, and it would provide the country with additional foreign exchange. Opportunities are worked out for shrimp processing, crab processing, and processing of products from the winter fishery at from (mainly) Dubla Island. Improved handling and processing of fish species from winter fisheries has the potential of a substantial boost in fishermen's income, additional employment, and national earnings, whereas at the same time the need for wood will decrease.*

*Bringing the potential towards reality will require a positive interest from the private sector, namely from the owners of processing plants in the Khulna/Mongla region. Actions are specified in order to obtain their interest and cooperation. The first step will be a comprehensive collection of data on the procession plants, their plans for the future, and the constraints they meet. These data will be collected through a series of interviews, to be carried out by the National Fisheries Consultant. A draft questionnaire is annexed to the report.*

## 1 INTRODUCTION

In the Work Plan of the SBCP Aquatic Resources Programme (Technical Report ##, ## 2000) opportunities were identified for creation of new and additional employment through potential developments in the aquaculture and fish processing sub-sectors. It was the intention that these opportunities were either extended by NGOs to suitable groups in the communities in the Impact Zone, or worked out further by the SBCP national consultant.

Some delay was experienced, however, both in the selection of NGOs and in the recruitment of the national consultant. At present (Mid-2001) both are in place, and the intended activities could start in full swing.

## 2 PRIORITIES

The opportunities listed in the Work Plan were selected through a number of criteria:

- proven technical soundness (elsewhere);
- no market constraints for resulting products;
- high labour intensity, in order to create substantial employment;
- high spatial concentration, to facilitate input supplies, marketing, and enforcement of regulations.

Moreover, development of new opportunities should not meet any legal constraints, also in relation with international conventions to which Bangladesh is a signatory.

Given the relative shortness of manpower in SBCP, not all identified opportunities should be taken up. A choice is made (Table 1) by the Aquatic Resources Group (FD and TAG) on the basis of the relative significance of the above criteria, and the potential pace of introduction.

**Table 1 - Priorities in development of aquaculture/processing opportunities**

opportunity	technology known	market	labour* intensity	spatial concentration	pace of introduction	priority **
better PL survival	yes, local	good	low	low	prohibited?	low
PL/fish nursing	yes, local	good	high	high	can be fast	high
backyard shrimp hatcheries	yes, abroad	good	medium	high	study needed	low
crab nursing	yes, abroad	good	high	high	can be fast	high
improved pond culture	yes, local	first-rate	high	medium	can be fast	high
integrated aquaculture	yes, local	first-rate	medium	low	can be fast	medium
backyard aquaculture	yes, abroad	good	?	low	study needed	low
borrow pits for aquaculture	yes, local	good	low	low	can be fast	medium
mollusc culture	yes, abroad	good	medium	high	study needed	low
fish cage culture	yes, abroad	good	high	high	study needed	low
use of by-catch	yes, abroad	not yet	low	?	?	low
central services	yes, abroad	good	low	high	study needed	medium
improved fish handling	yes, local	first-rate	high	low	can be fast	high
crab processing	yes, abroad	first-rate	high	high	can be fast	high
shrimp processing	yes, local	first-rate	high	high	can be fast	high
fish processing	yes, local	first-rate	high	high	can be fast	high

\* additional labour or employment

\*\* from point of view of employment generation only

Table I leads to two groups of priority developments: one related to aquaculture development, and one related to handling and processing.

### 3 AQUACULTURE DEVELOPMENT

For the time being, the focal area for development of aquaculture activities will be the Impact Zone, and not the SRF. Most promising opportunities for aquaculture development include the improvement of pond culture (integrated, or fish/shrimp/crab only), and the production of high-quality aquaculture seed through nursing.

The viability of nursing operations for fish is known in Bangladesh; the basic technology was described in the Fisheries Work Plan. In the Impact Zone opportunities exist for nursing of shrimp fry and crab larvae, both in (very) small ponds or hapas. The activity would be new for the area, and could create quite a number of jobs among landless (nursing in borrow pits) or smallholders. The selected NGOs under SBCP, in cooperation with specialists from DOF, should include nursing development in their Impact Zone activities: extension, demonstration, and provision of credit.

Improved pond culture, with the objective to harvest more product per surface area, can be obtained in various ways: improved pond management, improved harvesting, adding products to the existing production systems (polyculture, integrated culture), and, especially, intensification of shrimp culture in polders. All these opportunities are found in the DOF development programmes; cooperation with DOF specialists is required in order to harmonize information and extension. Additional employment will partly be the result of additional daily work (especially feeding) in order to secure the harvest, as well as of additional handling and processing of the more bulky harvest. Involving smallholders in slightly intensified shrimp culture in polders (internal dikes, stocking, feeding, harvesting) would prevent them to look for work elsewhere: they will be year-round busy on their own plot. Moreover, the resulting yield can be expected to be at least ten times higher than the yield from the present low-intensive system, which will add to employment in transport and processing. Also these developments will have to be included in the programmes of the SBCP-selected NGOs.

If required, the TAG fisheries team could organize an informative workshop in Khulna with NGO field workers, in cooperation with the Aquatic Resources Division of the Forest Department and with DOF, in order to make sure that correct messages are distributed to the communities.

### 4 HANDLING AND PROCESSING

The TAG fisheries team is of the opinion that the focus of the programme for employment generation in this sector will have to focus on handling and processing of fisheries and aquaculture products, since:

- this will have a very positive effect on the output of the sector as a whole (produce, foreign exchange, jobs);
- it will not additionally affect Sundarban resources; and
- it can be developed rather quickly.



Handling and processing include a number of different activities, that will be described hereunder.

#### 4.1 Processing of shrimp

Shrimp is an important export product and a major money earner for Bangladesh, but is still mainly transported over the world as frozen raw material. Processing and value-adding is done abroad; in Bangladesh it is limited to deheading (and maybe sometimes deveining), blockfreezing, and packing. A product quality monitoring system is in place (DOF). Some 40 plants of varying capacity exist in Khulna/Mongla. They are reported to have installed overcapacity, especially in the winter months (after the shrimp pond harvesting time). In spite of this, many of the shrimps are transported (by road) to plants in Chittagong. Although transportation takes place under ice, the duration of the trip (over 24 hours), the type of open trucks used, and the way of packing on the trucks guarantee a low-quality product once it reaches the plant in Chittagong. The overcapacity in Khulna/Mongla is also reported to result in acceptance of batches of shrimps that are more or less spoiled already; by mixing them with larger batches of good quality shrimps the chance of discovery during quality control is small. Opportunities for improvement are shown in Table 2.

**Table 2 - Opportunities for improved shrimp handling/processing**

opportunity	result	actor(s)	role of SBCP
improved pond harvesting systems	less damage; higher price for farmer	DOF extension	through NGOs: credit for nets; information
deveining at harvesting site	less risks for bacterial contamination; better price; more employment	DOF extension	stimulate plant owners to increase price for deveined shrimps
improved pond-to-plant transportation (on ice in insulated boxes)	higher quality; better price for farmer, higher graded export product	DOF extension; private sector	through NGOs: credit for boxes
prohibit road transport of raw shrimp to Chittagong	less quality loss; higher graded export product; less risks of export suspension; more jobs in Impact Zone	Government, through DOF	stimulate DOF
add value to shrimps for export (pre-packing; shrimp balls; other)	more employment; increased export earnings; may partly be done in off-season	private sector	stimulate plant owners

#### 4.2 Processing of crab

Crabs (mainly mudcrab) from the Sundarban are exported live and in bulk to (mainly) Hong Kong and Singapore. Females with ripe gonads fetch highest value. Virtually all crab is harvested from the Sundarban through long-line fishing throughout the year. There are signs that crab recruitment is suffering from the extensive killing of crab larvae during shrimp PL collection; the present tendency to ban PL collection is expected to restore the situation, therewith securing the continued availability of this interesting export commodity. Other important management measures are proposed in the draft Fisheries Management System (SBCP Internal Notes 31, March 2001). In principle, the Bangladesh Sundarban has the potential to become a major world producer and exporter of mud crab.

Crab culture is hardly developed; in the Paikgacha area grow-out and fattening takes place on a small, mostly experimental scale. The technology is found to be viable and feasible in other countries in the region. Introduction of nursing of crab larvae will increase the potential to develop a full-scale crab aquaculture system.

Crab handling does not create major problems as long as they are not piled too much; since the animals remain alive for a long time they are not very susceptible for rotting and decomposition processes. However, export earnings and employment could be raised substantially through crab processing, as is shown in Table 3.

**Table 3 - Opportunities for crab processing**

opportunity	result	actor(s)	role of SBCP
extract crab meat (high-pressure air technology)	more employment; export of high-value product;	private sector	stimulate plant owners
export crab claws (pre-packed; males only)	more employment; increased export earnings; work for plant in shrimp off-season	private sector	stimulate plant owners
add value to crab meat for export (surimi, pre-packing; other)	more employment; increased export earnings; work for plant in shrimp off-season	private sector	stimulate plant owners

### 4.3 "Dubla Island" products

#### 4.3.1 Present situation

The "Dubla Island" fishery is a winter fishery in the Bay of Bengal and the mouths of the Sundarban rivers. It is called after Dubla Island in the south of the Sundarban, where the most important temporary fishing camp is established yearly. The fishery is also carried out from a number of other camps in the south of the Sundarban. Altogether, over 100,000 fishermen are reported to participate in this winter fishery.

The fishery yields a variety of products. It uses a variety of gear, and is of a rather intense character. Main harvested fish species are ribbonfish (churi), anchovy (fasa), bombay duck (loitta) and small sharks (suri kanot). A substantial harvest of shrimps is harvested as well. There is no information on Maximum Sustainable Yields for the fishing grounds, and therefore it is also not clear whether the stocks are being overexploited or not. The draft Fisheries Management System, designed under SBCP, provides for a number of measures in order to secure long-term sustainability of the fishery (especially by decreasing juvenile mortality), largely by gear and mesh limitations and by concentrating the camps. The present total catch amounts to around 15,000 t/year, with a value of some 1.2 billion Taka (22 million US\$).

The complete harvest is brought ashore unsorted. Both handling of the catch on-board and sorting ashore are done in a rough manner, resulting in extensive product damage. No ice is used before sorting. After sorting, the bulk of the catch is sun-dried, either on mats (small species, pomphrets), or hanging from racks. The quality of the final product is generally low, because of the bad status of the raw product and the influence of insects and micro-organisms. The dried fish is shipped for marketing, mainly to Chittagong.

A relatively small part of the catch consists of shrimps and a limited quantity of (large specimens of) high-value fish species. The shrimps are deheaded; the heads are used for preparing chicken feed. Shrimps and high-value fish are put on ice (brought by boat from Khulna), and shipped to processing plants (shrimps) or consumer market (fish) in Khulna.

In the SBCP project documents, there is mentioning of the severe impact from Dubla Island fisheries on the forest resources. Every year a medium-sized village is built with its accompanying infrastructure of jetties and fish drying facilities. This, and the stakes required for the "behundi" nets, consume large amounts of wood. SBCP is expected to improve the situation on Dubla Island for the fishermen themselves by provision of cyclone shelters. SBCP is also supposed to decrease the impact on forest resources. The most obvious way seemed to replace the hectares of wooden drying racks and platforms by more sustainable ones (concrete poles and ropes). This will, however, not help the fishermen. On the contrary: they will have to pay a higher price for the facilities, whereas the value of their products remains unchanged. It seems therefore more feasible to decrease the drying area itself by (on the one hand) strongly increasing the share of the catch that is not dried, and (on the other hand) by concentrating the remaining drying (camp) areas.

There is considerable scope for enhancement of the value of the catch from the winter fishery by improved handling and increased processing: at least doubling of the present value towards over 2.5 billion Taka would be a realistic goal. This would require a number of changes in the present fisheries activities, to be introduced in the coming years; they are identified hereunder. All of these will increase employment opportunities in the Khulna/Mongla region as well.

#### *4.3.2 Improved handling*

Product price is in the first place related to the average value of the harvested species mix and, especially, their size. In general, a larger size means a higher price. In Dubla Island fisheries, the bulk of the catch is of a small to very small size, as a result of the small mesh size of the behundi nets. Because of the large quantity of small fish, opportunities for adequate handling of the higher-valued larger fish specimens are very limited: the size of the haul prevents sorting on board, and the unsorted storage causes damages and quality loss. Enlargement of mesh size will increase the opportunities for improved handling of catch on board, whereas at the same time recruitment of the fish stocks is better assured.

Increase of product price is directly related with improved product quality, and improvement of product quality starts with improved handling, from harvesting onwards. Realistic opportunities are shown in Table 4. An important part of the improved handling aims at transporting a larger part of the catch as fresh (high-quality) fish to either processing factories, or the consumer market. Fresh fish movements (on ice) are far more bulky than their transportation in dried form, resulting in additional employment.

**Table 4 - Opportunities for improved handling of Dubla Island fisheries products**

opportunity	result	actor(s)	role of SBCP
increased mesh size behundi nets	higher percentage of high quality fish; less damage	FD-ARD; camp leaders	approval fisheries management plan; provision of extension materials
sorting on board	improved quality high-value products	FD-ARD; camp leaders	provision of extension materials; training
landing high-value catch directly onto Khulna transport vessels (on ice)	improved quality (higher price) by shortening handling time; employment	FD-ARD; private sector	stimulate ship/plant owners
iced transport of fresh high-value fish (e.g groupers, pomphrets) to consumer markets	more fresh fish on the market; much increased price (as compared to dried fish)	private sector	stimulate ship/plant owners
availability of insulated ice containers on Dubla Island	availability of ice (brought by transport vessels) to maintain product quality; employment	FD-ARD; private sector	funding of containers; stimulate plant owners.
availability of insulated boxes	to selectively maintain quality high-value products; employment	FD-ARD; private sector	credits; stimulate plant owners
deheading/deveining of shrimps on-board	improved quality high-value products; better price	FD-ARD; camp leaders	provision of extension materials; training
salting products to be dried	decrease of losses	FD-ARD; camp leaders	provision of extension materials; training

#### 4.3.3 Processing of high-quality products

Utilizing part of the opportunities from Table 4, especially those for improved handling of high-value fish, is dependent on the willingness of processing plant owners to process and export the products. The potential extra income for them is beyond doubt, both through adding to their range of exportable products, and through an extended operational season for the plant.

Main products for processing are the shrimps and the high-value table fish species: groupers, croackers, snappers, sea bass, pomphrets, grunts, Indian salmon, and the like. These fish can be individually deep-frozen (whole or filleted), packed and exported, in the same way as is done already in Bangladesh with freshwater fish species. The product opportunities are summarized in Table 5.

**Table 5 - Opportunities for processing of Dubla Island high-quality fisheries products**

opportunity	result	actor(s)	role of SBCP
add value to shrimps for export (pre-packing; shrimp balls; other)	more employment; increased export earnings; may partly be done in off-season	private sector	stimulate plant owners
export deep-frozen whole/filleted table fish	more employment; increased export earnings; may largely be done in shrimp off-season	private sector	stimulate plant owners

#### 4.3.4 Processing of other products

There are a number of potential exportable products from processing of common Dubla Island fish species, such as sashimi, fish fingers and fish balls from ribbonfish, and paste and filets from anchovy. General opportunities are summarized in Table 6. To achieve this, a significant part of the catch should be transported to Khulna/Mongla on ice. Processing of this common fish to exportable commodities will substantially increase the value of the original product, with the following advantages:

- better price for the fishermen;
- less drying area required (= less wood needed);
- additional products for export;
- extended processing plant operational season;
- additional employment in transportation, ice production, and processing.

In order to achieve this “win-win” situation, some major conditions are to be met:

- processing plant owners should be made interested;
- processing plant owners should organize a system of regular transport boats to Dubla Island, bringing ice and bringing back fish;
- fishermen should adapt their handling methods in order to guarantee optimum fish quality.

**Table 6 - Opportunities for processing of Dubla Island other fisheries products**

opportunity	result	actor(s)	role of SBCP
processing of ribbonfish, anchovies, and other common fish species into exportable products	higher price for fishermen; lower wood needs; more income for processing plants; more foreign exchange earnings; additional employment	FD-RDA, camp leaders, private sector	promotion; initiate pilot activities; extension; stimulate plant owners

#### 4.4 Involvement of the private sector

In initiating many of the opportunities mentioned in Tables 2-6, the “private sector” has to play a pivotal role: especially in processing new products investments will be required in ice production, equipment, transport means, training, and marketing. It is an important task of SBCP to promote the ideas in the private sector, and to stimulate initiatives. To proceed in this potential important opportunity for employment, the following action plan is proposed:

1. Collection of information.  
Information is required on the technical status of the processing plants in the Khulna/Mongla area, on the interest of their owners in expansion of activities and products, and on existing or expected constraints to expansion. In order to collect this information a questionnaire was made (see *Annex*). During August - October 2001, SBCPs National Fisheries Consultant will make appointments with the production managers and with the export managers of all existing processing plants in the region, in order to fill in the questionnaire.

2. Processing of information.

In October 2001, the National Fisheries Consultant, in cooperation with staff of the FD-ARD, will process the collected information, and prepare a report with findings and conclusions. If required, assistance can be sought from SBCPs MIS specialists.

3. Workshop

In November 2001 the SBCP/ARD fisheries group will organize a workshop with processing plant owners (or their representatives) and the fishermen leaders from Dubla to discuss the results from the questionnaire and steps to be taken for further progress. During the workshop, the ARD/FD will make clear that the "government", through SBCP, is ready to make investments for infrastructure on Dubla Island, but would like to see an adequate answer from the private sector. In exchange, needs and types of investments are open for discussion as well.

Preparation for this workshop should start as early as September. The workshop could include a display of fresh fish from Dubla Island, and/or an excursion on the following day or days, in order to facilitate direct discussion between processors and fishermen, and to demonstrate development opportunities. Interest for such excursion has to be checked through a subscription form with the invitation letter for the workshop.

4. Next steps.

After the workshop (November 2001 - January 2002) the SBCP/ARD fisheries group will determine next steps, based upon the conclusions in the report and the results of the workshop. These might include the organization of workshops for Dubla Island fishermen; selection of plant(s) for a cooperative pilot project under SBCP; preparation of a special project.

## ANNEX

### QUESTIONNAIRE ON PROCESSING OPPORTUNITIES

- To be filled in by the National Fisheries Consultant during **separate sessions** with **production managers and export managers** of all processing plants in the Khulna/Mongla region.
- The consultant should make **appointments** for filling in the questionnaires, in order to get enough time. A maximum of one hour should be requested from each of the people to be interviewed.
- The managers to be interviewed should first receive an **SBCP brochure**, as well as a **summary write-up of the proposed developments** and their expected benefits in both English and Bangla.
- The interviews themselves should start with an **oral explanation** of the objectives of the project, of the fisheries programme, and of the potential plans to assist the plant owners in diversifying their produce and in increasing their income. They also receive a **copy of the questionnaire** form, and are promised a copy of the resulting summary report.
- The consultants has to try to get answers on the questions as **sharp and concrete** as possible. He can make additional notes during the session.
- Immediately after each session, the consultant has to write short "**session notes**", summarizing the discussions and his own feelings. This is required in order to enable interpretation of information after a time lapse.

The (draft) questionnaire is presented on the following page. It was discussed with other TAG members and with FD-ARD on 31 August 2001, and is expected to provide the information needed. Still it is recommended to try out the questionnaire during the first one or two interviews, and, if needed, to adapt it before the large series of interviews takes place.

**QUESTIONNAIRE FISH PROCESSING, page 1 of 10**

**1 GENERAL DATA**

1.1 Date of interview .....

1.2 Name of plant .....

1.3 Address of plant .....

1.4 Telephone .....

1.5 e-mail address .....

1.6 Name of owner .....

1.7 Telephone of owner .....

1.8 Production manager .....

1.9 Export manager .....



**QUESTIONNAIRE FISH PROCESSING, page 2 of 10**

**2 THE INTERVIEW**

2.1 Date of interview .....
2.2 Interviewed person .....
2.3 Name of plant .....
2.4 Duration of interview .....
2.5 General remarks made regarding SBCP or the purpose of the interview ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... .....

**3 THE PLANT**

3.1 Installed freezing capacity

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.....

3.2 Number of regular staff

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3.3 Number of temporary staff

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3.4 Average duration of temporary contracts

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3.5 Description of year cycles (when peaks, when closed)

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3.6 Description of plant (size, equipment, storage facilities; other facilities)

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4 PRESENT PRODUCTS: SHRIMP

4.1 Species (% bagda, %golda, other) .....

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4.2 Processing activities (cleaning, %deheading, %deveining, other)

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.....

4.3 Main exported sizes (%) .....

.....

.....

4.4 Main exported form (%blockfrozen, %individual frozen, other)

.....

.....

4.5 Main export markets .....

QUESTIONNAIRE FISH PROCESSING, page 5 of 10

**5 PRESENT PRODUCTS: OTHER**

<p>5.1 Species (crab, fish, other) .....</p> <p>.....</p> <p>.....</p>
<p>5.2 Average yearly quantities for each product .....</p> <p>.....</p> <p>.....</p>
<p>5.3 Processing activities (cleaning, other) .....</p> <p>.....</p> <p>.....</p>
<p>5.4 Main exported form (individually deep frozen, blockfrozen, other)</p> <p>.....</p> <p>.....</p>
<p>5.5 Main export markets .....</p> <p>.....</p> <p>.....</p>
<p>5.6 Constraints (quantity raw material; quality raw material; markets; storage; transportation; payments; other) .....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>

**6 PRESENT PRODUCTS: ICE**

6.1 Sales of ice (quantities, %block, %chips) .....

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6.2 Possibilities to increase production (maximum production blocks, chips)

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6.3 Constraints (water quantity; water quality; market; transportation; storage; other) .....

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**7 EXISTING PLANS FOR THE FUTURE**

7.1 Are there any plans for expansion of the plant (product quantity, plant, operational season) .....

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7.2 If there are no plans for expansion, why not (constraints in raw material, labour, market, other) .....

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**8 POTENTIAL NEW PRODUCTS**

8.1 Is there any interest in new products (crab, crab meat, whole fish, fish file, processed shrimp/fish) .....

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8.2 If there is interest, why was it not done (what are the constraints to develop new products: knowledge, raw material, markets, money, labour, other constraints) .....

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**9 INTEREST IN COOPERATION WITH SBCP**

9.1 Is there interest in advanced processing (value-adding) of shrimps

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9.2 Is there interest in development of a relation with the Dubla Island fishery (fish, fish products, shrimp)

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.....

9.3 Is there interest in development of a cold chain to Dubla island (ice down, products up)

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9.4 If there is interest, what would be important conditions

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9.5 If there is no interest, why not (unrealistic ideas; no investment opportunities; other constraints)

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9.7 Is there interest in participation in a SBCP workshop on increasing processing opportunities (owners, managers, both; banks; who else)

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**10 OTHER RELEVANT REMARKS OR COMMENTS**

A large rectangular area containing horizontal dotted lines for writing.