TRIP REPORT

Fisheries Technical Review

Minas Gerais, Brazil
November 2 – 14, 2004

Micheal Shawyer

BRAZIL INLAND FISHERIES

Sustainable Livelihoods and Conservation

Report on Technical Aspects of Artisanal Fisheries in the São Francisco River Basin, Minas Gerais, Brasil.

2004

Prepared for: World Fisheries Trust
204-1208 Wharf St.
Victoria, BC,
Canada V8W 3B9

Prepared by: Michael Shawyer. Fishery Consultant
2376 Topsail Road. Topsail, C.B.S.
Newfoundland. A1W 2H2
Canada.

November 2nd to November 18th 2004

Table of Contents

Annexes

1. Analysis, Fishery Enterprise with boat & 15hp O/B motor, São Francisco River
1a. Analysis, Fishery Enterprise with boat & 3.5hp O/B motor, São Francisco River
2. Analysis, Fishery Enterprise with boat & 3.5hp O/B motor, Três Marias Reservoir
2a. Analysis, Fishery Enterprise with boat & 3.5hp O/B motor, Três Marias Reservoir
3. Analysis, Fishery Enterprise with boat & 15hp O/B motor, Funil Reservoir
4. Retail Fish Prices, Belo Horizonte, M.G.
5. Fishing Equipment Costs, M.G. 2004
6. Boats, 2 typical types
7. Gillnet; São Francisco River
7a. Gillnets; Três Marias Reservoir
8 Longline; São Francisco River
8a. Longline; Três Marias Reservoir
9. Cast Net & Artificial Lure
10. Aquaculture Cage
11. Size limits, Commercial fresh water fish species
12. Noticia; Falsos Pescadores
13. Block Ice Grinder
14. Travel/Work schedule

1. INTRODUCTION

The World Fisheries Trust in conjunction with a consortium of Brazilian and Canadian partners, is currently implementing a project in Brazil to enhance “Sustainable Fisheries and Conservation” in the São Francisco river basin in the State of Minas Gerais, Brazil. The project is more commonly known and referred to as “Projeto Peixes Pessoas e Agua” (Fish People and Water Project). Key components of the project are to make positive changes in fisheries management practices and to enhance social support programs for fishing communities along the São Francisco river and the lakes formed by hydro electric dams along the river.

The project has requested the consultant provide baseline technical information and strategies on how it might be possible to improve the economic returns to fishermen on a sustainable basis. The terms of reference for this consultancy are shown below.

2. TERMS OF REFERENCE

2.1 In consultation with the World Fisheries Trust (WFT) Brazilian partners and community members (in particular, the Minas Gerais Federation of Artisanal Fishermen), conduct a field survey of artisanal fishing and fishing colonies in Minas Gerais, focusing on the São Francisco river valley. Issues to investigate should include; fishing technology being used, marketing strategies, fish handling and processing activities, governmental regulations and participation, other issues considered relevant.

2.2 During the survey, provide on-going feedback and suggestions to Brazilian participants in the survey, including protocols for handling and processing fish (including chilled and frozen storage, filleting, canning etc.)

2.3 Prepare a report detailing baseline information collected, recommendations for improvements or changes to current fishing, fish handling and processing, and marketing, including recommendations for any infrastructure and training requirements. Reference should be made, in the set of recommendations, to the fishermen’s reality and governmental restrictions or opportunities.

2.4 Prepare a recommended training curriculum for fishermen that would best address requirements for said improvements.

Work will be carried out in collaboration with Brazilian partners as much as possible, including employing participatory and positive approaches as much as possible.

3. METHODOLOGY

Prior to the consultants arrival in Brazil, WFT and Brazilian project personnel developed an outline field travel schedule / work plan (Appx: xxx) that was designed to provide the consultant with a representative overview of the situation(s) facing artisanal fishermen and their operations, fishing communities, marketing operations and the various organizations pertaining to fishermen. Methods used included attending group meetings of fishermen planned by project personnel as part of the ongoing project activities and visits to fishing sites and communities.

Key partner organizations in Brazil were also included in the work plan with scheduled meetings towards the end of fieldwork in Belo Horizonte the Minas Gerais state capital, and in the Federal capital Brasilia. These meetings were primarily with state and federal ministries, departments and regulatory agencies directly concerned with fisheries development in Brazil. Private sector interests were also consulted.

4. FINDINGS / OBSERVATIONS

Findings and observations made during field trips and other interviews with interested parties on the Rio São Francisco and the Três Marias reservoir areas are discussed in the following sections. Other areas visited though not within the São Francisco basin area are considered fully pertinent to the project and its aims and are discussed in relevant sections of this report.

Due to circumstances beyond control of the project and the consultant the fieldwork of the consultant took place during the closed season for fishery on the São Francisco River. Fortunately the closure did not particularly affect this work, as the actual fishery methods and operations as conducted on both river and lake are well known to the consultant from working on similar fisheries both in Latin America and Asia. Baseline information on local operations, methods and gear was collected directly from large numbers of fishermen interviewed during community meetings and several visits to individuals at their home bases, where the various types of gear typically used in the fishery were seen and measured. Closed season in this case also afforded the benefit of being able to have the undivided attention of fishermen for interviews. The lake fishery was apparently unaffected by closures on the river, other than the temporary relocation of some fishermen from river to lake.

In the São Francisco river basin area comprising the project area there are two types of extractive fishery, one prosecuted in the river downstream of the dams and the second being the reservoir fishery in the lakes formed by the dams.

Another or third category is that of aquiculture cage operations being carried out in both rivers and lakes within the river basin area. The primary species being produced in these operations is Tilapia. Other species, both native and exotics are also being produced but in lesser quantities at this time. Two aquiculture operations were visited during field trips, one in the river and a second in the lake behind the Três Marias dam.

Fishing gear and equipment used for capture of wild species is relatively simple, consisting primarily of hook and line, single hand-line and multiple hook long-line arrangements and basic gill net configurations either in single net sets or multiple fleets of nets set according to whether the operation is in the river or on the lake.

Some harpoon fishing gear was also seen during field research, though this equipment is apparently now illegal for commercial fishing use in Brazilian rivers and river basins.

Whilst conducting research into wholesale and retail marketing operations in Belo Horizonte M.G. several large fish were found with harpoon injuries indicating that the ban is being ignored in some places.

4.1 São Francisco River section

The fishery on the São Francisco river section comprising the project area is basically from the community of Ibiai in the north up to the downstream side of the Três Marias dam at the community of Três Marias. This section of river is estimated to be about 150 km in length with an estimated approximate surface area of 5,000 hectares not including tributaries. The river fishery is conducted for an average of 180 days per year, except for the rapids section in Buritiziero where fishery is prosecuted year round.

Catch estimates by Sato and Osorio[1] for a 60 km section of river below the Três Marias dam were in the region of 234 tonnes per year, extrapolation of these estimates to cover 150 km of river gives a rough estimate of 585 tonnes per year. Considering that fishermen are reporting smaller fish catches in recent years a precautionary approach to the fishery might be in order for this section of river to prevent over exploitation.

Estimates for numbers of active professional fishermen on this 60 km section of river in 1986 was in the order of 130 persons, or a density of just over 2 fishermen per kilometre, so for the whole 150km section of river this should equate to approximately 325 fishermen actively working. With no firm data on actual numbers for 2004 we should assume at least double the original figure and possibly a threefold increase to 390 persons. Figures available from the Federacão dos Pescadores do Estado de Minas Gerais for 2003 only indicate membership numbers for Colonias with no indication of actual fishing area, using numbers given for the area around Três Marias reservoir downstream to Ibiai possible numbers of professional fishermen operating on the river could be as high as 2, 318. Assuming that only 50% may be active on this 150km stretch of river this equates to a density of close to 8 fishermen per km of river or about 125 meTrês of riverbank per fisherman. Given the type of nets and the regulations governing size and deployment of this gear there would be little room for fish to move in the river so this estimate of numbers has to be too high.

Complicating the estimation of figures for registered professional fishermen is the apparent illegal registration of large numbers of persons, by some estimates in SEAP up to 40%, who have no connection to the professional fishery, these persons are joining the Federacão simply to avail of the unemployment benefits paid to professional fishermen during the annual “Piracema” or four month closed season. This problem is being vigorously addressed by Federal Authorities with a recent (9th Nov. 2004), crackdown on “False Fishermen”, see **Annex: 12**. This is to include a thorough revision of all licenses for professional fishermen and the immediate issuance of new licences for bona-fide fishermen. The legislation governing membership applications to the Federation is also to be amended to plug loopholes that allowed false applications. Besides the unemployment benefits the professional fisherman’s card also gives access to loans for equipment, boats and motors etc offered by development banks and financial institutes.

Catch rates are apparently not accurately known for the São Francisco river basin, with only global figures being available from the Ministerio do Meio Ambiente (MMA), and the

[1] A Pesca Profissional na Região de Três Marias, MG em 1986: Sato, Y. (CODEVASF) and Osorio, F.M.F. (CODEVASF)

Instituto Brasiliero do Meio Ambiente (IBAMA)[2]. These figures are collected through their Diretoria de Fauna e Recursos Pesqueiros and the Coordinacão-Geral de Gestão de Recursos Pesqueiros. The data is apparently collected from fish retailers who fill out a monthly form with quantity bought and sold, species and origin of fish. This data only registers the fish actually passing through retailers and does not include direct sales by fishermen, so figures are expected to be somewhat low. Latest figures (2002) obtained from MMA/IBAMA indicate that Minas Gerais total catch for the continental extractive fishery is at about 4% of the Brazilian total of 239,416 t. The actual production figures for Minas Gerais are 7,714 t for Pesca Extractiva and 7,768 t attributed to Aquiculture production for a total of 15,401 t. It is notable that the total fishery is presently balanced with 50.1% extractive and 49.9% for aquiculture respectively.

Since 1997 total continental fish production for M.G. has climbed from 8,526 t to its present level of 15,401 t. Virtually all of this increase is attributable to the increase in aquaculture operations with only a very small increase in the figures for extractive fishery indicating that catch rates for extractive fishery are only increasing slightly despite an apparently much higher level of catch effort, this may indicate problems with the wild stock of fish.

Nationally extractive catch rates for continental fishery have also been virtually stagnant for the period 1995 to 2001 with a very small increase in production levels in 2002, there is no reason to believe that the extractive production rates for M.G. or the São Francisco basin will vary significantly from the national figures.

Prior to 1997 there were considerable fluctuations in total catch data for M.G. that are unexplained, but could possibly be from data collection problems[3] and / or variable rainy seasons. Reports from fishermen have indicated that heavy rainy seasons do cause notable increases in catch rates of some species.

4.2 Três Marias Reservoir area

The lake behind the Três Marias dam has a surface area of approximately 80,000 hectares. In 1986 a paper by Dr. Yoshimi Sato indicated a production rate of approximately 5kg of fish per hectare equating to approximately 400 tonnes of fish per year from the lake. Data collected by Dr. Sato during 2003 (unpublished) indicates that the production rate per hectare has risen somewhat from the earlier figures. Some fluctuations are possibly attributable to either good or bad rainy seasons. However, the numbers of professional fishermen on the lake has increased from 158 in 1986 to an estimated 300-350 on average today. Occasionally numbers of fishermen can rise as high as 400, especially during the closed season on the river when some fishermen transfer operations to the lake.

[2] Estadistica Pesqueira Nacional 2002; Published by MMA-IBAMA, Brasilia, Setembro de 2004.

[3] It is noted by IBAMA on p.3 of “Estadistica Pesqueira Nacional 2002” that there were some problems with statistics and data collection prior to 1990 which have now been corrected.

As a general rule Sato estimated that fishermen on the lake are actively engaged in the fishery for an average of 240 days per year, this figure is commonly applied for similar type fishery in other areas of Brazil and elsewhere.

Principal commercial native species found in the lake today are Piau Branco, Corvinas and Curimatas, also found in the lake in commercial quantities is an introduced exotic from the Amazon, Tucunare or Peacock Bass. In discussions with Dr. Sato at CODEVASF he intimated that at one time after introduction of this species it was feared that they would kill off some native species in the lake, however he reports today (2004) that there appears to have been an equilibrium point reached between Tucunare and the native species, this could be a subject for further study. Tucanare are also a favourite “sport fish” species for many aficionados of rod and line fishery. Other secondary commercial fish species found in the lake include Mandi-Amarelo, Trairas and Piranha.

There are also reports of some escapee Tilapia from aquiculture operations being caught in the lake. The numbers are not as high as might be expected due no doubt to the low nutrient levels of this lake, reported to be one of the lowest levels of similar reservoir lakes in Brazil.

5. REGULATORY ASPECTS AFFECTING THE SÃO FRANCISCO RIVER BASIN

5.1 Licensing of fishermen

There are two distinct classifications of fishing licence issued by the competent authorities in Brazil, they are “Professional Fisherman” issued by SEAP to all commercial fishermen both for coastal and continental waters including aquaculture operations, and the “Sport Fishing Licence” issued by IBAMA at the Federal level which is valid for all States.

Several states including; Mato Grosso, Mato Grosso do Sul, Goiás, Tocantins, Para, Amazonas and Minas Gerais have their own licensing for sport-fishing and fishing regulations / legislation applicable to both sport and professional fishermen licences. At this time the federal government accepts State licences and regulations provided they are more restrictive than the applicable Federal regulations. State issued sport-fishing licenses are only valid for the state in which they are issued.

Professional and sport fishing licences in Minas Gerais are further sub-divided as outlined by State Decree[4], basically there are 4 principal categories “A”, “A1”, “A2” and “E” for sport-fishery. For professional fishermen the categories are “B”, “B1” for full professional fishermen using all types of fishing gear and “B2” being an apprentice professional. Another sub-category “C” is for subsistence fishery for those persons who live by the river and catch fish to feed their family. Other categories cover Scientific Research etc.

[4] Decreto Estadual No 43713 de 14/01/2004. Regulamenta a Lei N^{o} 14.181, de 17 de Janeiro de 2002, que dispõe sobre a politaca de protecãoa fauna e a flora aquaticas e de desenvolvimento da pesca e da aquicultura no Estado e da outras providencias. (See Chapter II Articles 8 – 10).

Rivers come under Federal jurisdiction when they form borders with other States or cross the borders of more than one State.

5.2 Regulations for equipment

There are two levels of equipment regulations for professional fishermen, the primary regulations are developed and administered by the Federal Government for the whole country. State regulations are then developed based on the federal regulations and to address specific needs within the fishery being conducted in that state, this may involve specific prohibitions or size restrictions for certain types of gear in particular locations within a river basin, and / or time limits for use of such gear on a particular fishery. State regulations are normally more stringent than federal base regulations, they cannot override the base Federal regulations.

An example of a locally instituted regulation is the ban on all fishing activity for a distance of 4km below the Funil hydroelectric dam, due to the very high numbers of people (1500 at one count) causing environmental pollution, damage to riverbanks and endangerment of life and limb besides the extreme pressure on the migratory fish passing through this channel to the fish lift at the dam.

The regulations governing fishing gear at both state and federal levels are well documented and somewhat understood, but apparently not by all fishermen. Whether this is due to lack of general dissemination of the regulations or fishermen simply ignoring regulations because they have no particular fear of regulations being enforced was not determined. These regulations also clearly define the penalties that can be levied if infractions are prosecuted by authorities.

On several occasions during fieldwork various types of clearly illegal fishing gear were observed, both in use and in storage. Also apparently illegally caught fresh fish were found openly for sale in public markets. Clearly resources for enforcement of regulations are not sufficient to be regularly or uniformly applied.

Regarding equipment supply there does not appear to be any restrictions governing what fishing gear is allowed for sale, this is simply left to free market forces. There is no apparent shortage of equipment or materials for fishery activities. There also appears to be a healthy Brazilian industry sector producing fishing gear, boats and motors.

5.3 Size limits

Federal and state laws clearly define size limits for all commonly harvested native commercial freshwater fish species. The size limits are by length of fish according to species and are shown in **Annex: 11**. Size limits can also vary for the same species depending on actual location within a state or river system, these variations are also noted in the published information of IBAMA. For example in Minas Gerais there are Corvina, *Pachyurus francisci,* and Corvina (Pescada-do-Piaui) *P/ squamosissimus* listed for size restriction that are not restricted by the Federal Regulations, several others such as Mandi Amarelo, Mandiacu, Matrinxa, Pacu, Pacu-Caranha, Piau-Três-Pintadas etc

are covered by M.G. supplementary regulations but not by Federal Regulations, in these cases the State Laws being more onerous than the Federal are fully applicable. Besides the regulations for size limits there are also regulations that prohibit the transportation of fish subject to “piracema” regulations as well as undersized fish.

Despite the published size limits it was noted by the consultant that there are considerable quantities of undersized fish being offered for sale in various locations, which may or may not be a function of some fishermen using illegal gear types or simply a function of “bycatch” from legitimate fishery which in itself is a worldwide problem affecting commercial fisheries.

5.4 Closed season

Federal and state laws clearly state the timing of closed seasons for spawning species found in the river basins. Presently the closure in the São Francisco River basin is from 1st Nov. 2004 to 28th Feb. 2005[5]. Closed season generally coincides with the rainy season that triggers spawning activity.

Closed seasons only fully apply to the river portions of the basins. Lakes formed by power dams are not included as the species found behind dams are in general not of the same species found in the rivers.

Even during the closed season there seems to be some exceptions to a total ban, in that single hook and line fishery is permitted as is the setting of small mesh nets for catching bait-fish. Possession of allowed species is limited to 5kg plus one fish.

5.5 Confederacão de Pescadores Artesanales

The majority of professional fishermen belong to the Confederacão, which is a national body founded with the aim of unifying (identifying) all artisanal fishermen in the country, giving them input and a voice in decision making of government ministries that will affect their livelihoods. A small yearly membership fee is charged to all members. The organization is similar in structure to others in existence around Latin America established by artisanal fishermen’s communities.

Structure of the organization appears well developed around the country and is set up as follows:-

- Confederacion de Pescadores Artesanales; Works at the national level and coordinates inputs to government that are received from the State organizations that are known as;
- Federacion(s) de Pescadores Artesanales; Functions at State level and whose mandate is to work on behalf of members in the State on issues which are of direct

[5] Instrucão Normativa No. 12, de 14 de Outubro de 2004. Gabinete da Ministra. Marina Silva.
Note; This Instrucão Normativa also outlines some permitted fishery activities and equipment types allowed during the closed season, it also permits professional fishermen to catch and transport certain species in specified quantity.

concern to them at State and/or National levels. The Federacion receives inputs from fishermen members via the regional organizations within the state known as;

- Colonias de Pescadores; In Minas Gerais for instance there are 21 Colonias with a total membership of 11 265 persons plus another 302 persons in “non declared” locations within the State. Colonias are sometimes further fragmented into;
- Capitanias, Fishermen’s Unions and Co-operatives some of which have only a loose affiliation with the Colonias and are reported to operate in a cooperative fashion for their own direct benefit. Some groups of this nature are reported forming spontaneously within the project area, apparently viewing the Federacion as somewhat remote from their needs and slow to respond to their inputs and concerns when voiced.

There are reports of Unions and Cooperative groups of fishermen forming and eliminating the “middle man” or traditional buyer from the marketing chain by cooperating with a Municipality[6] who buy quantities of fish for use in “Food security program”. This aspect of fishermen’s organization demonstrates that there are alternatives. However this does not mean the existing structure is not viable but more likely indicates a need for more flexibility by State and National levels to include “grass roots” groups who ultimately will still need a forum in which to voice their concerns to regulators and other authorities.

In the project area the project has a good working relationship with the M.G. Federacion office, this should continue as the project will need input and cooperation from Federacion and Colonia members and executive for execution of key project components.

5.6 Habitat mitigation around Dams (Fish ladders, breeding and Re-stocking fish)

When hydroelectric dams are placed across rivers they cause a complete disruption of the eco-system, particularly regarding migratory species of fish. Recognizing this, federal laws require that environmental impact mitigation systems or methods be put in place and maintained by the Electric Power Companies to help alleviate the disruption to affected species. Some of the methods used include “Fish ladders” alongside dam structures that will allow fish to travel upstream. Also in one instance observed during this trip an automated “Fish lift” is employed as the height of the dam precluded construction of a ladder style structure.

If both methods above are not considered practical another option is used, this is the construction of fish breeding facilities to provide replacement stock on a continuing basis principally for stocking the lake formed behind the dam, and on occasions for sections of river. One such operation was visited in Três Marias that is headed by Dr. Yoshimi Sato. The owners of the Três Marias Dam Companhia de Desenvolvimento do Vale São Francisco, (CODEVASF) and the power distribution and operating company Companhia Energetica de Minas Gerais (CEMIG), operate the breeding station. The fish culture station has been operating since the early 1980’s and started stocking fish to the

[6] It was reported by SEAP Brasilia that the community of Pelotas in the south is participating in this program.

reservoir in 1983/84 with 2 species. At this time the station didn't know what fish were actually in the river system so a provisional inventory was started. Breeding of native species proved difficult at first but eventually the station was able to work with 30 species. Presently the station concentrates on 7 species of commercial value. Numbers released yearly to the reservoir are between 250,000 and 400,000 fish. Estimations of total numbers produced by the station are approaching 8 million fish, not all of which are released into the Três Marias lake, some small quantities have also been released between Sobradino and Três Marias dams.

6. TECHNICAL ASPECTS OF THE FISHERY ON THE SÃO FRANCISCO RIVER

In this section brief descriptions of fishing operations and types of gear commonly used will be made. Descriptions of actual operations are from previous work done by project personnel who have been working with fishermen's communities during the normal season as this fieldwork was actually carried out during closed season.

Other aspects of this report will include some observations on types of gear and equipment, boats and motors, principal species caught, catch handling, marketing and economic considerations pertaining to fishing operations on both the river and lake.

6.1 Typical fishing operations

River fishery is prosecuted either on a daily basis or as is more common on a multi-day trip basis. For multi-day trips the fishermen travel to known locations by boat and set up camp on the river bank from whence they operate until sufficient fish have been caught and / or the ice taken for that trip runs out. Descriptions of this type of operation can be found in work done by Ana Thé from the University Federal de São Carlos (UFSC) who is working with the project as a researcher into the social aspects of fishery and communities along the São Francisco River.

6.2 Types of gear and boats used

Fishery methods used include drift and fixed gillnets and various combinations of hook and line fishery, mostly gear is set and handled from either wooden or aluminum boats of relatively simple construction.

Fishing gear observed during field visits along the river falls into the following two major categories, a) Gill nets and b) Hook and line. These are illustrated in **Annexes: 7 & 8**. Other gear used includes small mesh gill nets and Cast Nets **Annex: 9**. to capture bait for use with long-lines. Fish traps are also reported to be in use in lower sections of the river towards Bahia State though none were observed during this field trip.

Gillnets observed are of monofilament line, nets are either made from line purchased for this purpose or as in most cases netting is purchased ready made and then cut and hung by the fishermen on polyethylene headlines with Styrofoam floats and foot-lines with lead weights. Most hanging ratios of nets measured were 50% though some nets

had ratios of up to 80% and were in some cases improperly hung with induced twist in the panels which will adversely affect catch efficiency.

Nets are normally set at the surface or mid-water depending on species sought and depth of river found in the area, it also appears that fixed bottom set gill nets are prohibited in the São Francisco River. Nets are set from boats and oriented across the stream, both net and boat float downstream with current for a predetermined period and are then hauled to clear any catch. Unless current is very slow moving it is difficult to set fixed floating gillnets across a river.

Nets set in the river have restrictions applied to lengths allowable, normally overall length of net is restricted to 1/3 the width of the river at the point where the net is set. This has caused some disputes with enforcement agencies especially when it is considered that many river set nets are actually set as drift nets traveling downstream with the current. The river widths can vary considerably from the original setting location to where the net is finally hauled. Some fishermen have reported disputes with authorities regarding this rule. Further spatial separation between fleets of nets is also specified, specifically that no single net shall be set within 100 meTrês of any other net already set.

Hook and line fishery uses two principal methods for fish capture, both methods use live bait. Bait consists of either small baitfish or frogs. Single baited hooks are set from riverbanks, usually tied to tree branches or other fixed anchor point along the riverbank. Other methods of hook and line fishery uses metal “spinners” **Annex: 9.** and various types of artificial baits.

Long lines using multiple hooks, up to 12 hooks, are set in the river anchored at both ends usually with rocks, the outer end of line is normally marked with a floating Styrofoam buoy. As is the case with nets there is a restriction on length of long lines, this being a maximum of one third (1/3) of the width of river at point of deployment. Long lines are set either floating, mid-water to bottom or completely bottom set, depending largely on the species targeted.

Another ***restriction placed on hook and line fishery is that hook sizes shall be such that the capture of juvenile fish is either minimized or eliminated, this generally means the use of large size hooks, no reference to actual size or style of hook is made in the regulations, nor the species to which it would be applicable, though normally large predator species that take baited hooks will be known to the fishermen who would then choose an appropriate hook.

Boats observed at different locations along the river varied from primarily simple wooden canoe style boats (5m Loa x 1.4m Bmld x 0.45m Depth) of hard chine flat bottom construction mostly seen around the Pirapora to Ibiai section of river, these boats are relatively easy to build and maintain and are relatively cheap to buy, some prices quoted were R$400-00 new or R$250-00 for a good two year old wooden boat, these prices compared to the alloy boats of approximately the same dimensions are good. Alloy boats of the same basic dimensions as wooden boats used on the river and lake cost

between R$2,500-00 and R$3,200-00 depending on how they are equipped and whether they are of flat bottom or “V” bottom construction, the latter tending to be more costly.

Wooden boats have the advantage of ease of repair and maintenance at relatively little cost to the owner, Wood is also resistant to scraping and puncture when pulled across rocks or beaches, one disadvantage quoted by fishermen was the weight of wood compared to alloy.

Alloy boats have the advantage of lightweight and smooth hull skin, which translates to slightly more economical operation costs when using outboard (O/B) motors. Disadvantages are initial cost and somewhat less resistance to puncture and scraping damage around rocks. Several boats were observed both on the river and lake that had multiple repair patches to bottoms.

6.3 Species commonly captured

The most common species captured in the rivers are: Curimatã, Dourado and Surubim being fish of prime quality and value whilst other species of fish in lesser demand are Mandi-Amarelo and Matrinchã.

6.4 Catch handling

After capture fish are gutted and placed in Styrofoam boxes with ice where they are kept for several days pending transhipment to one of the market cenTrês such as Três Marias or Pirapora for example. Icing practices are not particularly good, in particular the ratios of fish to ice are not good ie, small quantities of ice, the tendency is to “Save the ice” and not “Use the ice and save the fish”. Ice is transported in block form to fishing locations, which is an excellent way to transport ice as it cuts down on losses. However for use as a proper and efficient cooling agent for fish it has to be ground into small pieces to be effective. Icing practice at present consists of chipping lumps off the main block and placing them in the box with fish but without properly covering the fish. This practice has been proven to be inadequate in tropical conditions and causes early loss of quality and shelf life for otherwise good product. Another problem with the “lumps of ice” is that of pressure point damage to the fish flesh when quantities of fish are stowed or stacked in boxes.

Physical manhandling of fish also damages the product, such as when transferring fish from boat to box or box to box, handling of individual fish after capture has to be minimized to maintain quality. Ideally fish are packed in ice at capture and only removed for final sale or further processing. Ideal situations are difficult to achieve, so the normal chain of handling would involve initial icing at capture, transfer to wholesale / buyer for re-icing with fresh ice from there the fish may be sold retail or transhipped to other locations for retailing or further processing.

Comparing the Styrofoam boxes commonly available to fishermen to the sizes of some fish being caught, it is apparent that many boxes being used are too small and fish are

being damaged from having to force them into those boxes. Whether this is because of cost or other factors is not known. Manufacture of more appropriately sized (longer) boxes should not be too difficult.

Even though tropical fish species are known to have somewhat longer storage or shelf life than those from temperate and cold waters, minimizing physical handling and speedy proper application of ice is still critical to maintain shelf life and above all quality. Quality product equates to value.

6.5 Marketing arrangements

From observations at various wholesale / retail sites in the Três Marias area the treatment of fish on arrival is generally good, ice is either flake or ground up block and applied to fish in insulated boxes, fish are fairly well packed and covered in ice, fish sold from these locations are also shipped properly iced to onward locations or retail. Unsold product is also frozen in cabinet style freezers if it is anticipated that sales will not use up the existing stock within a reasonable time.

Other wholesale / retail sites tend to place the incoming fish directly in freezer units, most freezer units seen are in fact larger domestic type freezers with top loading. Whilst these units are economical to operate they have a disadvantage in that first product in is usually the last out unless carefully packed and monitored by staff. Only two large walk in style freezer units were seen during the field trip. One unit in Pirapora was in fact inoperable due to compressor breakdown. The second unit was privately owned and relatively new in appearance and was being used to store large quantities of ice blocks for use in fishing operations on Três Marias lake.

One reason given by most operators of retail fish outlets for the use of domestic style freezers was the cost of electricity, it was reasoned that with large industrial type units the cost of electricity would be prohibitive, whereas with the smaller freezer units only those in use needed to be connected to power supply.

The emphasis of the present marketing system seems to be on moving the fresh product as rapidly as possible from the fisherman to buyers to retail market. Whilst this is commendable in itself, it can be problematic in times of good fishery or glut situations with prices to fishermen being driven down to uneconomic levels for the fishermen who are obliged to sell product regardless of price, otherwise risk of spoilage and total loss is a distinct possibility.

Under these situations it would be beneficial for groups of fishermen or communities of fishermen to have available temporary storage facilities that would allow either icing of fish for short term or freezing for longer term storage as a way of “evening out” the supply situation.

Both icing and freezing for storage of fish must however be properly carried out under very well controlled conditions. Icing in a haphazard manner only provides poor quality product at correspondingly lower prices. Likewise the practice of freezing fish that have

already begun to deteriorate as a result of being improperly iced only exacerbates the quality considerations, and can in fact be dangerous to health in extreme cases.

6.6 Economic considerations; river fishing operations

A brief analysis of economic aspects of some fishery operations on the river was considered appropriate, see Annexes: 1. & 1a. the operations chosen were ones with a small fishing boat and 15hp motor with standard nets and long line as allowed by regulations, and a second enterprise using a 3.5hp motor. This analysis shows that the 15hp powered boat (enterprise) is not profitable if all factors are considered and applied. The second 3.5hp powered boat is very profitable catching the same quantity of fish, the biggest cost factors being the more expensive 15hp O/B motor and the extra cost of fuel to operate it. It would seem that some short courses could be beneficial to fishermen to show the real costs involved with their fishing operations. Positive benefits should accrue to enterprises by enabling owners to easily pinpoint areas where money is being wasted and / or where savings can be made. These courses could be delivered using actual figures from the fishermen attending.

7. TECHNICAL ASPECTS OF THE FISHERY IN THE TRÊS MARIAS RESERVOIR

7.1 Typical fishing operations

Lake or reservoir fishery is prosecuted either daily or as is more common for the more remote fishing areas on a multi-day basis. For multi-day trips the fishermen travel to known locations and set up a base camp on the lakeshore from whence they operate until sufficient fish have been caught and / or the ice taken for that trip runs out. From interviews with persons involved in the lake fishery there appear to be two types of fisherman operating, the first being individuals or small groups of individuals who operate independently, selling catch to various buyers or individuals for variable rates of return per kilo of fish depending on species. The second group are tied to one buyer who takes all their catch at fixed rates per kilogram regardless of species. These latter fishermen benefit from this arrangement by having a secure market and access to credit for equipment, also ice is generally provided either free of charge or at very substantially reduced rates[7]. Buyers in many instances also arrange for the collection of fish from fishermen's landing sites. The downside to this arrangement is the generally low prices paid for catch and the fishermen are in many cases tied to buyers by debt that is paid off with a percentage of their catch.

7.2 Types of gear and boats used

Fishery methods used include drift and fixed gillnets used by professional fishermen and various combinations of hook and line fishery used by sport fishermen almost exclusively.

[7] Ice is a very substantial cost factor for fishermen, especially if it is used properly and in the quantities and ratios normally considered necessary for good preservation of catch. A few cents difference per kg can make a large impact on overall operating costs for an enterprise.

Fishing gear observed during field visits at the lake revealed the following; gill nets are the primary fishing gear used by the professional fishermen. These are illustrated and described in **Annex: 7a**. Configuration of this gear is practically identical to that used in the rivers the only exception being that of overall length, the lake gear tending to be larger in general dimensions as the restrictions placed on river set gear are not applicable, generally they are set in fleets of 3 x 50m for a total of 150m. It was reported to the consultant that some fishermen set several fleets of 150m nets. Spatial separation between fleets of nets is however specified, in that no single net shall be set within 100 meTrês of any part of another net already set.

Gillnets observed are of monofilament line, nets are either made from line purchased for this purpose or as in most cases the netting is purchased ready made and then cut and hung by the fishermen on polyethylene headlines with Styrofoam floats and foot-lines with lead weights. Most hanging ratios of nets measured were 50% though some nets had ratios of up to 80% and were in some cases were improperly hung with distortions to the panels which will adversely affect catch efficiency. Depths of nets used on the lake vary but are normally about 30 meshes deep. Mesh size minimum, (stretched mesh knot to knot), is regulated at 100mm. Mesh sizes larger than this are quite common, however some nets seen and being used had smaller meshes. Nets are set either at the surface, mid-water or on bottom depending on species sought and depth of lake in the fishing area. Nets are not usually set in waters deeper than 20m. Bottom set nets are not normally longer than 50m.

Hook and line fishery does not seem to be commonly used on the lake, though references to use of hook and line with artificial baits and lures are made in sport fishing information.

Only one (1) long line using multiple hooks was found, this piece of equipment was in use around aquiculture cages for Tilapia where large predator fish gather to prey on smaller fish that feed on fallen detritus and excess feed meal from the cages.

The same restrictions are placed on hook and line fishery in that hook sizes shall be such that the capture of juvenile fish is either minimized or eliminated, this generally means the use of large size hooks that are not easily swallowed by juvenile fish species.

Fish attraction devices, (FAD’s) were observed during one visit to the lake, these devices consist of ground earth from termite mounds to which is added rabbit food, water is added to the mix which is formed into balls of 10cm to 13cm diameter then sun dried until hard. The ball(s) are then dropped in suitable locations to attract fish that can then be caught more easily. It is not known if the same type of FAD is used in the river.

7.3 Species commonly captured

Commercially caught species in the lake vary from those caught in river due to the habitat being very different. Principal species of fish are: Piau-Branco, Corvina, Curimata, secondary common species found in the lake are; Mandi-Amarelo, Traira, Piranha and sometimes escapee Tilapia.

Capture rates or Catch per Unit of Effort for the lake appear to have changed to some degree since 1986 when Dr. Y. Sato. (CODEVASF) estimated that 158 fishermen caught 400 tonnes of fish in approximately 240 days of fishing activity.

Anecdotal information obtained from interviews in November 2004 on daily catch rates per fishing unit claimed an average figure of 15 to 20kg/day/unit on the lake, this may be an optimistic figure and needs to be further verified. Meanwhile the numbers of fishermen is estimated to have more than doubled to about 350 or more at present with an occasional spike in numbers during Piracema period on the river. Using the lower of above reported catch figures (15kg/day) multiplied by 350 fishermen multiplied by 240 days it would equate to 1,260 tonnes per year from the lake fishery, excluding aquiculture, this is just over three times the capture volume reported for 1986. If a lower catch figure i.e. 11kg/day/unit is used this still gives a catch volume of 924 tonnes per year or about 11.5kg per hectare, which is just over double the volume for 1986. This latter figure appears more reasonable given that the Três Marias lake is known as one of the least productive reservoirs in Brazil having very little natural food production.

There needs to be a concerted effort to determine actual extractive catch rates from the Lake in order to be able to manage this fishery in a sustainable manner over the long term. Presently there seems to be too much conflicting data to make management decisions regarding allowable catch rates and numbers of fishermen.

7.4 Catch handling

Post capture fish are gutted and placed in Styrofoam boxes with ice where they are kept for several days pending transhipment to one of the market cenTrês around the lake such as Morada Nova de Minas or Três Marias for example. Icing practices are not particularly good in most cases, however there are some fishermen using crushed ice from the ice plant in Morada Nova. Mostly however ice is transported in block form to fishing locations, which is an excellent way to transport ice as it cuts down on losses. However similar problems with handling and icing of fish are still consistent with those found in the river fishery and described in section 6.4 above.

7.5 Marketing arrangements

From observations at wholesale sites in the Morada Nova and Três Marias areas the treatment of fish on arrival is reasonably good, ice is either in flake form or ground up from blocks and applied to fish in insulated boxes, fish are mostly well packed and covered in ice, fish sold from these locations are also shipped properly iced to onward locations for retail or further processing. Unsold product can also be frozen in cabinet style freezers if it is anticipated that sales will not use up the existing stock within a reasonable time.

One fish buyer in Morada Nova has what appears to be a relatively new commercial “walk in” freezer storage unit of approximately 11.5 m^3 that is presently used to store block ice. This same operation has a mechanical block ice grinder into which full size

blocks can be placed and then ground to small pieces. Ice is sold by weight and reported by owner as mostly used by fishermen, both commercial and sport fishery, with a small percentage used domestically in the town.

Electric power costs for operation of the ice plant and freezer unit was reported to be approximately R$2,500.00 per month. When compared to the facility in Pirapora where electrical cost are about the same, but only for ice making, it seems to prove that the more modern freezer units can be quite efficient.

7.6 Economic Considerations of Fishing Operations on Três Marias Lake

Typical fishing operation on the Três Marias lake were analyzed in some detail to ascertain profitability or otherwise of these operations, the results in **Annexes:2 & 2a.** show that profitability is highly variable and is greatly influenced by fuel consumption of engines being used, cost of ice, price paid to fishermen per Kg of fish and whether the financial arrangements are set up to allow payment of the enterprise costs before dividing profit or paying crew.

It is suspected by the consultant that most enterprises do not apply basic bookkeeping practices to keep track of actual costs of operation. Despite the longer season on the lake it appears that the fishery may be handicapped by the lower prices paid for most lake fish. It is not known whether this is a function of buyers being able to manipulate the market due to the somewhat scattered and sometimes remote fishing locations, or simply that most species in the lake are not as sought after by the market as are premium river species like Surubim.

If the higher daily catch figures i.e. 20kg/day/unit obtained from fishermen interviewed are actually consistent for the whole lake it could indicate an annual yield from the lake by 300 fishermen of 1,440 tonnes. This seems somewhat unrealistic considering that the total extractive catch figures for all continental extractive fishery in M.G. is only 7,714 tonnes. This could possibly indicate that some regions of the lake are more productive than others. Productivity levels in other reservoir lakes i.e. Tucurui reservoir, are reported to vary considerably by location so it would be reasonable to assume that this could be similar in the Três Marias reservoir, this could be investigated to verify or disprove this possibility.

8. AQUACULTURE OPERATIONS

Brazil has embarked on a policy to raise the levels of aquaculture production, both from coastal operations and continental fresh water production. It was reported by FAO in a 2001 report[8] that the National Development Bank (BNDES) “under the new government policy, is financing a line of credit to aquaculture equivalent to US$132 million over the next five years”. It is not known if the fund has been fully utilized at this time (2004) but the time frame for this line of credit is getting short, (assuming start in 2001 it should be

[8] Information on Fisheries Management in the Federative Republic of Brazil; FAO, September 2001. This doc also comments on need to revise some Brazilian regulations regarding fishing and aquaculture agribusiness. (//www.fao.org/fi/fcp/en/BRA/body.htm).

in place until 2006), this may explain some of the projects being proposed for aquaculture in the Três Marias Reservoir. Given the usual time lag in project proposals, analysis and approvals the time frame available to access this line of credit with specific projects is critically short even if there are still funds available.

Other lines of credit are available through PRONAF for artisanal fishery and "family aquaculture, opening new prospects for the development of these socio-economic segments".

The federal government has also proposed that up to 1% of continental waters in the country may be utilized for aquaculture development. As an example taking the Três Marias Lake with a surface area of about 80,000 hectares the area permissible for aquaculture would be 800 hectares. However direct application of the 1% figure is not in any way guaranteed for any stretch of water regardless, there are strict guidelines and requirements to be met for all aquiculture project proposals before any approvals are granted.

The Southeast region of Brazil as designated by IBAMA for fishery statistics includes besides the State of Minas Gerais the states of Espirito Santo, Rio de Janeiro and São Paulo. The latest continental aquaculture production data available (2002) for this region shows São Paulo at 20,545 tonnes, Minas Gerais 7,687 tonnes, Rio de Janeiro 5,863 tonnes and Espirito Santo with 2,437 tonnes. Nationally the Southeast region ranks second in total production with 36,532 tonnes behind the Southern Region of Parana, Santa Catarina, and Rio Grande do Sul with 75,916 tonnes. Nationally Minas Gerais ranks in seventh place of 27 states.

8.1 River aquaculture

Two basic types of river aquaculture are practiced one simply has a series of mesh cages floating in the river and anchored or otherwise fixed to the river bottom, the second is a system that uses river waters either pumped or diverted to "raceways" adjacent to the river. Raceways are basically fixed structures of concrete through which water flows to maintain the fish being kept inside by wire screens.

During field visits around Pirapora a visit was made to an Aquaculture Co-operative established in a small arm of the river. Tilapia is being grown in floating mesh cages moored in the river. There have been some problems with stock "fingerlings" that have not grown properly, thought to be likely from poor quality brood stock at point of origin, or it could simply be the feeding regime or cage stocking densities causing sTrêss to fish with consequent poor growth.

Another problem encountered that caused a major financial setback in the operation was the escape of 10,000 fish in 2002 and another 20,000 in 2003. This unfortunately is one of the major concerns for the environment and native fish species. However escapee exotic species, whether they are foreign species or species introduced from other areas of Brazil are now a fact in many river systems and there appears to be very little that can be done to mitigate this problem. Similar instances of this scenario are

common in many other places around the world and causing problems with native species. There are no simple remedies other than prohibiting introduction of exotic species completely.

The state of Bahia that also shares the São Francisco River with M.G. has fresh water aquaculture production of 15,903 tonnes and an extractive fishery of 15,335 tonnes per year respectively. Minas Gerais produces 7,687 from aquaculture and 7,714 tonnes from extractive fishery, there would appear to be considerable scope for improvement of present production figures from aquaculture.

An interesting notation found in Estadistica Pesqueira Nacional 2002 regarding the São Francisco River in the state of Bahia indicates that the river waters are being used for "raceway" cultivation systems to produce from one operation about 240 t of Tilapia per month (2,880 t/yr.) all destined for export to the American market. This would indicate that similar operations with proper environmental safeguards could be used in the M.G. section of the river São Francisco.

8.2 Reservoir aquaculture

The only lake based aquaculture site visited during this trip was a cooperative based in Três Marias that operates a site on the eastern side of the lake in a relatively sheltered arm. Plans of the Cooperative call for an expansion of the operation to produce 10,000 tonnes of fish per year. An operation of this size would probably require at least 7,500 cages of standard dimensions (2m x 3m x 1.5m deep) surface area just to produce the volume required on a one time basis, if fish grow out in 6 months or less there would not be so many cages required. Some extra cages may be needed for general maintenance procedures. In all, such an operation could occupy between 8 and 10 hectares of surface area when allowing for spaces between cages needed for general maintenance and feeding operations. Each cage should be able to hold between 1800 and 2000 Tilapia of 700g to 750g sizes, which appears to be the average size found in retail fish markets.

9. CATCH HANDLING PROCEDURES

9.1 Fish handling at point of capture

Use of ice by fishermen to preserve catch is practiced but not properly understood by them. Current practice seems to be "Save the ice" rather than "Use the ice and save the fish". This may be a function of ice cost or simply a lack of understanding of the importance of proper use of ice for preserving fish. Most fish when caught are gutted and placed in Styrofoam boxes with a few lumps of ice chipped off blocks. Only when the fish reaches the buyer or wholesaler are proper icing technique sometimes applied, alternatively if not iced the fish is placed in freezer cabinets. Freezer cabinets are in general of domestic type, very few commercial "walk in" units were seen during field trips. One possible reason for the proliferation of smaller cabinet style freezers is the cost of power to the consumer. This was a recurring comment made to the consultant during this trip.

9.2 Transport and subsequent handling

Transportation of fish from landing sites on lake or river either frozen or fresh is primarily by road transport iced in insulated boxes. Trucks and Taxis are commonly used to ship fish over fairly long distances in country. Refrigerated vans dedicated to fish transport may be used for extra long distance shipments, but none were seen during this trip though there is reported to be a unit of this type in Três Marias.

Collection of fish from more remote fishing sites around the Três Marias lake could ideally be addressed by a collector boat with refrigerated hold. Size and capacity of such a vessel would be wholly dependent on the number of users and their production rates. Ownership, operation, maintenance and repair of such a vessel would most likely have to be in private ownership to ensure continued operation. Attempts at cooperative ownership for this type operation have not had a good history in other parts of the world. Such a vessel besides simply collecting fish can also carry food supplies, fishing equipment supplies and an ice-making machine on board. If it were possible for a community or communities of fishermen to band successfully together and operate such a boat it could be an ideal situation provided that the final marketing arrangements are also in place, otherwise the boat could become just another storage facility rather than a true collector boat.

10. PROCESSING / HOLDING FACILITIES, SOME OBSERVATIONS

Only one processing plant was seen during this visit, located at the Funil Dam fishing community, this plant is new and unused. The design is thought to be one of a series being produced by the Ministerio da Agricultura, Pecuaria e Abastecimento (MAPA) though this is not indicated. It is anticipated that MAPA will have a “Manual of Fish Plant Design” ready for publication in January 2005, meanwhile many draft plans are readily available from the ministry.

Observation of the Funil plant reveals that it is to rely on cabinet style freezer units for longer term preservation of catch rather than commercial style cooler / freezer units. There does not appear to be provision for an Ice Making machine at this plant or provision of facilities for storage of fish packed in ice ie; cool room. Should there be large quantities of fish landed simultaneously or over a short period of time this shortage of holding room could be problematic.

During meetings in Brasilia with various Government Ministries and Superintendencias it was found that SEAP have in place a program to place up to 33 ice plants in qualified Municipal cenTrês around the country, a pre-requisite for obtaining the ice plants was to provide between 5% and 20% of “in-kind” contribution i.e. land, building or labour. None have been placed up to present. This could represent an opportunity for the project to work with a community to obtain one of these plants to use as a pilot component within the project, especially if storage facilities can be combined with the ice plant it could be used to help average out the peaks and lows of fish production to alleviate the lowering of prices associated with glut situations.

11. MARKETING AND INSPECTION ARRANGEMENTS

The Ministry of Agriculture, (Dept. of Inspection of Products of Animal Origin) is ultimately responsible for food safety inspection, this includes fish products.

Ministry personnel report that the Hazard Analysis and Critical Control Points (HACCP) protocol is in use for all export bound products, the ministry would also like to make HACCP a requirement not only for federal levels as at present but also at State levels. From past experience HACCP techniques can and should begin from the moment of capturing the fish and continue through the whole chain of handling, storage, initial processing, transportation, secondary processing, packaging and final delivery to customer.

Besides HACCP the federal government also uses Codex Alimentaris for international exports of food products.

The Ministry would like to develop regulations that would follow the product from capture to consumer. This would however cross various lines of presently existing jurisdiction. Existing inspection regimes can already take place on three levels, Municipal inspections, State inspections and Federal inspections. The only inspections that cover Inter-state and International exports are Federal. Municipal and internal State inspections are apparently applied on an ad-hoc basis as occasion demands.

There is a case for application of HACCP at all levels of the production, handling, storage, processing and retail chain that would be backed up by federal and state authorities, training for application of the system will be necessary at all levels.

12. TRAINING FACILITIES

Two training cenTrês were visited during the field trips, the first one in Três Marias originally built as a small scale fishery training centre and the second being a site and empty building being proposed as a future fishery training school by the Municipality of Formiga, M.G.

That there is a requirement for some form of training in various aspects of fresh water fishery is not in doubt. What has to be determined is on what scale, what level of instruction and which methods will be most useful to existing fishermen and to those young people possibly considering a career in fisheries.

There are two options, short courses and longer term training programs, the former would be from one day to no longer than one week duration per course, or if due to course content it is necessary to extend length of courses they would be designed as a series of modules and presented over longer periods as required or convenient.

The latter long-term program is anticipated to be technical fishery training combined with the standard secondary academic education stream ie, from 9^{th} to 11^{th} Grade, commonly known as Secondary Technical Education Schools. This type of program is

common in many countries and has the advantage of allowing graduates to eventually choose between embarking on a career in fishery or related areas or to simply enter the University stream.

12.1 Centro de Apoio ao Pescador, (CAP) Três Marias. M.G

The training centre is located in the municipality of Três Marias on a 35 Hectare site situated on the banks of the Rio São Francisco close to the eastern side of the highway bridge at Km 284 that carries Highway (BR 040) over the river. It is also just downstream of the CEMIG hydroelectric dam as well as being adjacent to several fishery communities on the river and lake.

Physical facilities at this time consist of a main building with classroom facilities, library, laboratory and small-scale pilot processing plant and an outdoor covered area suitable for net and gear making or other subject instruction. A separate building houses the administrative centre. Other buildings also planned included; an Information and Interpretive Centre, Museum, Restaurant, Dormitories and a Mechanical shop for boat and engine repair. These were not finished in the original project, but would be of great benefit to the centre if they could be completed.

Other facilities include in ground ponds for aquaculture operations including fish breeding, grow out ponds and “pay to fish” ponds. At river side there is a concrete slipway for boat landing and catch discharge etc. There is also an area for garden / horticulture.

The main building requires some modification to the interior, particularly it will require provision of extra ventilation to allow free flow of air through the building, in conjunction with extra ventilation there is also a need for some form of roof edge extension to minimise direct sunshine entering the building and causing considerable heat build up during both AM and PM periods due to orientation of the building.

Management of the centre is vested in the “Fundacão Ambiental São Francisco” a department of the Prefeitura Municipal de Três Marias. Technical and research inputs to the centre are from several sources including UFMG, and UF São Carlos in cooperation with World Fisheries Trust (WFT) of Canada, Estacão de Hidrobiologia e Piscicultura da CODEVASF de Três Marias and the fishery community. There is also a long list (24) of partner companies and groups who can be called on for help should the occasion arise.

Some of the courses that have been offered by CAP include; Environmental Education, Tourism / Fishery Guide, Aquaculture, Strengthening involvement of women in fishery, Re-stocking of fish and replanting river bank flora, and Dissemination of practical methods for conscientious use of natural resources especially water and Research programs in conjunction with National and International organizations.

The Cento de Apoio ao Pescador with some modification to the main building, as outlined above, can be used primarily for short courses of practical nature with appropriate theory focused on fishermen’s groups and communities. Other no less

important functions of CAP will be as a centre for “training the trainers” courses and as a base for operation of extension services to the fishing communities in the region. CAP also has experience in development of training materials at various levels that will be of assistance when developing short courses as part of the WFT project inputs.

12.2 Proposed Fishery School Site, Preifetura de Formiga, M.G.

While not actually included in the project this proposed school site was included in field visits at the direct request of the Mayor elect of Formiga, M.G. Considering that such an institute if opened would likely have influence around the region including the CAP in Três Marias it is deemed that contact with them will be mutually beneficial, perhaps to the extent of preventing wasteful duplication of efforts.

This site and buildings were originally constructed as a Rural Agricultural Institute project with German assistance and have not been used for some while. Buildings are reported to be about 10 years old and comprise; 8 classrooms, Library, Laboratory, male and female dormitories with total capacity for 100 persons and recreational facilities. The building area is completely fenced with chain link. The buildings are located on a 15 Hectare site about 15 minutes outside Formiga. The site has a small river running through the property that could possibly be used for small-scale aquaculture training operations. It was not possible to access the buildings during this visit due to the poor state of the access road. According to the Mayor elect other buildings are also available, one in Formiga town consisting mainly of classroom space and a second building close to the Reservoir Lake. Neither of the latter two sites were visited at this time.

The municipality envisages the school as being a Secondary Technical School specializing in fishery related subjects with an emphasis on Aquaculture. This is entirely feasible, provided that proper planning and needs assessments of possible demand both by prospective students and possible employers are carried out before any major investment is made.

Proposed plans are to make such a school into a regional institute serving an area much greater than Formiga, which would also help to ensure success for such an institute.

Establishment of such an institute would also be in line with the Federal Government’s long term plans for promotion of aquaculture both for internal consumption and potential for export earnings.

Given a normal three (3) year academic program leading to university entrance upon graduation, any technical streams need to be carefully planned so as not to interfere with the required academic program for university entrance, if that is the final direction the student decides on after graduation. This type of institute exists in many countries around the region, several are known to be operating in Central America and there is a very good possibility this type of school already exists elsewhere in Brazil, thus providing working models that can be used to design a suitable program for this school without having to start from scratch.

Another benefit of the longer-term (3 year) program is the opportunity for the institute to invite input and open liaison with industry in the region. It is also beneficial to have industry represented on the board of directors. This liaison provides valuable input from them on the actual requirements of the industry. Other benefits are the possibility of inserting “work terms” in the program between school terms, this benefits the student and allows the prospective employer to assess the trainee/student for possible employment after graduation.

With a thorough needs assessment, analysis and subsequent development of a suite of courses or programs with appropriate curricula there is no reason why such an institute would not ultimately be beneficial for the continental fishery of Minas Gerais in both extractive and aquiculture operations.

12.3 SEAP / IBAMA / Extension Services

SEAP have a section that identifies training needs for Aquiculture and Artisanal fisheries and then has the capacity to develop not only the program but also the didactic materials required for instruction of such programs. They do not however have the capacity or sufficient staff to actually deliver the programs and materials, this is contracted out to third parties for presentation. Most courses and materials are developed in modular format, allowing presentations of content over varying lengths of time depending on the particulars of each situation.

One recent successfully completed program was conducted in the north and south of Brazil with 40 selected participants in each, this was a “Train the Trainers” approach specifically to develop trainers for field work in such areas as Rapid Rural Appraisal (RRA) techniques, Conflict resolution and Organization of Community Groups. Also included were modules on the philosophy and policies of SEAP.

As part of the ongoing commitment to extension services SEAP have set in place two programs of benefit to fishing communities, the first is the opening of twenty (20) networked “TelecenTrês” around the country with three (3) trained operators for each site. These cenTrês allow the rapid exchange of information, discussion and ideas throughout the network. The Bank of Brazil donated equipment for the cenTrês.
The second program is for Literacy Development, this program is targeted directly at fishing communities where it was found that a larger than average percentage of persons were either illiterate or partially so, likely from starting work in the fishery at an early age.

In Minas Gerais the Empresa de Assistencia Tecnica e Extension Rural[9] (EMATER) is also involved in fieldwork and extension services and could well be a source available to the project.

[9] Contact person for extension services: Valter Bianchini. (31)3349-8190.

IBAMA are also involved in training programs and extension services to the fishing communities, sport fishermen and for school children. In keeping with the mandate of IBAMA most materials are developed with environmental concerns prioritised. Materials can be developed to suit specific needs or programs. All information and materials developed are presented whenever possible in simple understandable formats. An excellent example of course material development is the Manual for Training of Fishing Guides[10] which covers all aspects of training for prospective "Fishing Guides".

13. RECOMMENDATIONS / CONCLUSIONS

How many fish are in the river? : Considering that there are apparently no accurate estimates or figures available on the actual numbers or biomass of fish in the river, and noting that the extractive catch rates in M.G. has only risen by a moderate amount in the last 10 years despite an apparent steep rise in the numbers of fishermen / fishing effort, it seems that trying to significantly increase catch rates in the river could cause considerable damage to existing stocks by over-exploitation. It is recommended that efforts be made, in conjunction with project partner institutions and where appropriate with governmental agencies, to mount a research component to try and accurately determine fish populations in a representative section of the São Francisco river. Some work in this area has been attempted in the past with little success according to Dr. Y. Sato at CODEVASF, he indicated an interest in revisiting the subject with new technology.

How many fishermen?: It is recommended that the project in cooperation with the Federacão de Pescadores of M.G. and other competent authorities i.e. IBAMA make an effort to get reliable figures on the actual numbers of fishermen along the river from Três Marias north to Ibiai or the northern limit of the project influence. In conjunction with this survey an accurate count of fishermen on the Três Marias reservoir should also be undertaken.

Catch figures: It is recommended that the project in conjunction with the Federacão de Pescadores, UFSC and in conjunction with IBAMA launch a data collection effort to try and definitively establish accurate catch figures per fishing enterprise in both lake and river.

Restricting access/numbers of fishermen: Before any recommendations can be made regarding improving extractive fishery production on the river it may be necessary to restrict access or maintain only the present numbers of fishermen until reasonably accurate estimates of the biomass and species actually present can be made.

Increasing catch, river: It would be relatively easy to increase catch levels by improvements to fishing gear though this could cause depletion of stocks of some species to unsustainable levels. Some signs of overexploitation of some species, notably Surubim, are evident from fishermen's reports that "more effort is needed to catch less fish of smaller sizes than previously was the case" Some of this may also be

[10] Trenamento para Guias de Pesca; 2003. for Programa Nacional de Desenvolvimento de Pesca Amadora (PNDPA).

attributable to changes in habitat and the encroachment and accompanying polluting effects of municipalities, agribusiness and industrial plants along the river. Major improvements to fishing gear are not recommended at this time.

Improving yield: Instead of trying to improve catch volume it is recommended that efforts be made to preserve more of the actual catch by introduction of better handling, icing procedures and processing starting from initial capture and following through the chain to customers. By some estimates the spoilage rates could be higher than 20% during high production periods.

Shelf life of fish, study: It is recommended that a practical study be initiated to adequately demonstrate shelf life of various species of commercially utilized fish from river and reservoir. There are various references in many publications to tropical species having longer usable shelf life than temperate or coldwater species. An initial study using ice only and various methods of stowage etc. should be made. In the longer term a study could be made that includes freezing of fish and effects on flesh at various temperatures for optimising freezer temperatures, the lower the temperature the more costly it is to operate.

Pollution mapping: With the increasing numbers of municipalities, industries, aquaculture agribusiness and farming agribusiness facilities being built around the river basins with varying polluting effects. It is recommended that an inventory of all existing sources and potential sources of pollution and the type of pollutants be made and mapped. This mapping should include seasonal lagoons and other water sources that are essential to those species that require them for spawning activity. IBAMA would be a logical partner as well as UFSC.

Fishing Gear trials: Notwithstanding observations above it may still be possible to conduct some experimentation with various configurations of hook and line and other alternative fishing gear for the lake fishery in particular. It is generally conceded that fish caught by hook and line are usually of better quality than those of same species caught in gill nets, fish are generally alive when brought aboard. Better quality can be promoted to raise prices per Kg. for fishermen.

Master Fisherman, instructor: It is recommended that a Master fisherman be contracted or seconded to assess the present gear in use on both river and lake and conduct experiments with reconfiguration of existing gear and with various configurations of gear not presently in use, within the limitations of regulations. Other training should also be given to fishermen and those involved in making nets for fishermen on basic principles and calculations for making properly proportioned nets suitable for capture of specific species.
The master fisherman should have wide experience with small-scale artisanal fishery operations in continental waters and have a thorough knowledge of not only the gear in use in M.G. but also gear used in other parts of Brazil and if possible overseas in similar fisheries.

Aquaculture: Aquaculture is being actively promoted by the federal government and is in fact already a major producer of fish and crustaceans, this trend will continue for the foreseeable future. Small-scale rural “pond based” aquaculture operations can be of benefit to poor or marginal families when properly approached and with good basic technical assistance. The project could have beneficial influence in the immediate area by providing guidance, technical assistance and training for those persons who see small-scale pond aquaculture as a means to supplement income or simply provide food for family. Aquaculture of native species is well established in many parts of Brazil and has potential for M.G.

Training and Extension Services: It is recommended that a series of short courses be devised and implemented for fishermen, buyers, processors, retailers and those involved in transportation of fish. Subjects for short courses would include but not be limited to:

- Capture techniques;
- Icing of Fish;
- Economics of Fishing Enterprises;
- Basic Book keeping for fishing enterprises; (This is actually also partly addressed in the Economics of Fishing Enterprises but should be presented as a separate entity slanted to “Shore side” operations and marketing).
- Nets and Gear Technology;
- Boat/Engine operation and water safety;
- First aid for fishermen;
- Engine Maintenance & repair;
- Boat Maintenance and Repair;
- Aquaculture, basic pond based Aquaculture Techniques;
- Fish Smoking Techniques;
- Salt/Dried Fish;
- Drying Fish;
- Pickling Fish;
- Other processing methods;
- Hazard Analysis and Critical Control Point, (HACCP) for fishermen, buyers, transportation interests, marketing, processing and retail personnel.

Pilot ice plant and storage facility (Incubator CenTrês): It is recommended that after consultative processes with a willing community group or municipality and input from the Federacão de Pescadores that the project assist in getting a pilot ice plant, fish storage and processing facility established to help cut down loss of earnings and product during glut periods. Data from this pilot plant will be used to assist other communities wishing to establish similar operations.

Cooperation with the Ministerio do Trabalho e Emprego would be of benefit, especially considering their program that identifies the São Francisco basin as prospective recipient of 20 freezer / ice plants. During discussions at the MTE it was mentioned that they would be interested in cooperating with the project in setting up a pilot plant and

providing management training[11]. This may be a tie in with SEAP who have funds to pay for ice plants and equipment, with municipalities providing site and power needs.

Refrigeration Technician: It is recommended that training and/or identification of refrigeration technician(s) be investigated to precede construction of a pilot plant. This person will be essential to continued operation of such a plant unless the users would anticipate providing a budget for securing services of technicians as and when needed for routine service and repairs.

Primary / Secondary Education: Working with local education authorities introduce educational materials and programs with emphasis on sustainability, community inputs, environmental concerns, pollution reduction, recycling, respect for others and their common resources.

This type of education program is not limited to fishermen's families only, but should be started in primary and secondary schools with the cooperation of local education authorities. This approach has already been applied in a fishery/mollusc bi-lateral project in southern Chile with excellent results in the communities affected. IBAMA should also be willing to cooperate having already begun work in this area.

[11] Discussions at Ministry of Labour, Brasilia 16 Nov.2004 with Sr. Luciano Moura Canez. Dept. de Fomento à Economia Solidaria.

ANNEXES

Annex: 1. Analysis, Fishery Enterprise, Canoe & 15hp O/B motor, São Francisco River.

Annex: 1a. Analysis, Fishery Enterprise, Canoe & 3.5hp O/B motor, São Francisco River.

Annex: 2. Analysis, Fishery Enterprise, Canoe & 5hp O/B motor, Três Marias Reservoir.

Annex: 2a. Analysis, Fishery Enterprise, Canoe & 3.5hp O/B motor, Três Marias Reservoir.

Annex: 3. Analysis, Fishery Enterprise, Alloy Boat & 15hp O/B motor, Funil Dam.

Annex: 3a. Summary Table and Notes for Annexes 1 to 3 inclusive.

Annex: 4. Retail Fish Prices Belo Horizonte M.G.

Annex: 5. Equipment costs.

Annex: 6. Boats, Alloy and Wood.

Annex: 7. Gillnet; River.

Annex: 7a. Gillnet; Lake.

Annex: 8. Longline; River.

Annex: 8a. Longline; Lake.

Annex: 9. Other fishing gear.

Annex: 10. Aquaculture cages.

Annex: 11. Size limits, commercial fresh water fish species.

Annex: 12. Noticia; Falsos Pescadores.

Annex: 13. Block Ice Grinder

Annex: 14. Travel Schedule / Work Plan

Annex: 1.

CANOE FISHERY, ANNUAL COST OF ENTERPRISE: São Francisco River.
GEAR: Gill Nets & Long Lines.

Exchange Rate: US$1.00 : Br. R$2.87 **(All values given in Brazilian Reais)**

GENERAL DATA

Canoe construction material: **Wood.**		
Dimensions (MeTrês): 6.00 Loa x 1.4 Bmld x 0.45 Depth		
Engine HP: **(Yamaha O/B)**	**15**	
Engine hours run per day. (As reported by user)	**3**	
Ice Box Capacity M3:	**1.50**	
Number of Crew/Fishermen	**2**	
Fishing days / year	**180**	

I. INVESTMENT COST.

a) Canoe and Insulated Ice Boxes.		$500
b) Motor. (O/B 2 Stroke)		$5,000
c) Cost of Nets. (3 nets per canoe)		$1,200
d) Cost of Longline equipment. (2 Longlines)		$160
e) Total investment.		**$6,860**

II. ANNUAL FIXED COSTS.

a) Depreciation.		$1,570
Years for canoe. (10 yrs usual so 100/10 = 10%)	10%	
Years for motor, O/B. (5 yrs usual so 100/5 = 20%)	20%	
Nets, % per year. (Estimate 30% minimum per year, but check locally)	30%	
Longline % per year. (Estimate 100% replacement)	100%	
b) Insurance. n/a		$0
e) Financing costs. n/a		$0
f) Total fixed annual costs.		**$1,570**

III. ANNUAL VARIABLE COSTS.

a) Canoe hull, annual repair & maintenance costs, (estimate)		$100
b) Fuel costs.		$9,527
HP for this calculation see **General Data** above.		
Gasoline/oil mix, cost per litre	$2.46	
Gasoline consumption, in liTrês per day @ 450g/hp/hour.	21	
2% of total for losses,	0.42	
c) Lubricants.		$76
Cost per litre.	$7.00	
Oil changes per year, (estimate every 50 hrs x 1 litre average cap.)	11	
Allowance for losses & leakage.	0	
d) Filters, fuel.		$20
Cost per filter.	$5.00	
Changes per year.	4	
e) Salaries.		$797
Crew share split, in this case 50% of Net income (**VI.**)		
f) Ice.		$864
Cost per Kg.	$0.30	

Number of multi-day trips annually. (Equivalent of 180 days)	36	
Quantity reported used per trip in Kg. (4 x 20kg blocks)	80	
g) Repair & Maintenence, Engine.		$500
[10% of **I.b)**] figure derived from estimates commonly used in similar fresh water fishery ops., can vary considerably by actual use & region.		
h) Repairs to nets. [30% de **I.c)**] monofilament.		$360
i) Repairs to Longline [50% de **I.d)**]		$80
j) Food supplies.		$720
Cost per person per day.	$2.00	
Total person/days. (fishing days per yr. x Number of fishermen)	360	
k) Port charges etc. (Usually only for Industrial Operations)		$0
l) Loading & unloading charges. (Usually only for Industrial Ops.)		$0
m) Permits. (Port clearances etc.) (Usually only for Industrial Ops.)		$0
n) Costs of bait. (Longline Operations).		$0
o) Miscellaneous costs.		$360
Average of R$2.00 per/person/day	$2.00	
p) Cost of fish kept for personal consumption & given away.		$720
Personal consumption & given to others in Kg./day	1.00	
Average value per Kg. (assume lower value fish)	$4.00	
q) Total, Variable Costs.		**$13,303**
IV. TOTAL, ANNUAL COSTS.		**$14,873**
Total fixed + Total variables.		
V. ANNUAL INCOME. (Gross)		**$13,500**
a) Annual capture in Kg.	2,700	
Average capture per day in Kg.	15.0	
Number of fishing days per year.	180	
Average value of fish per Kg. (Net & Longline in river=higher value species)	$5.00	
Note: River fishery can be single or multi-day trips, Adjust if/as reqd.		
VI. NET INCOME.		**$1,593**
Gross income (**V.**) less costs of gasoline, oil, Ice, food supplies and fish consumed and/or given away.		
VII. NET PROFIT (DEFICIT) OF ENTERPRISE.		**($1,373)**
Calculated from total income less total costs per year.		
VIII. PROFITABILITY.		**-20.02%**
Net profit/Total investment x 100%		
[**VI.** / **I.e)** x 100%]		
IX. BREAK EVEN POINT. (VOLUME in Kg)		**2,975**
Annual capture in Kg. per enterprise for break even point, calculate as follows: Total annual costs / price per Kg.		
X. COST OF FUEL IN R$ TO PRODUCE 1 Kg. FISH.		**$3.53**
Calculation: Total cost fuel / total capture)		
XI. ANNUAL SALARY PER CREWMEMBER.		**$398**
In this case: 50% of Net income(VI) / Number of crew. Adjust % as Reqd.		

Annex: 1a.

CANOE FISHERY: ANNUAL COST OF ENTERPRISE: São Francisco River.
GEAR: Gillnets & Longlines.

Exchange Rate: US$1.00 : Br R$2.87 **(All Values are given in Brazilian Reais)**

GENERAL DATA

Canoe construction material: **Wood.**		
Dimensions (MeTrês): 6.00 Loa x 1.4 Bmld x 0.45 Depth		
Engine HP: (BRANCO air cooled outboard)	**3.50**	
Engine hours run per day. (As reported by users)	**3.00**	
Ice Box Capacity M3:	**1.50**	
Number of Crew/Fishermen	**2**	
Fishing days / year	**180**	

I. INVESTMENT COST.

a) Canoe and Insulated Ice Boxes.		$500
b) Motor. (Motor Branco 2 Stroke 3.5 HP)		$1,300
c) Cost of Nets. (3 nets per canoe)		$1,200
d) Cost of Longline equipment.		$80
e) Total investment.		**$3,080**

II. ANNUAL FIXED COSTS.

a) Depreciation.		$750
Years for canoe. (10 yrs. Usual so 100/10 = 10%)	10%	
Years use for motor, O/B. (5 yrs usual so 100/5 = 20%)	20%	
Nets, % per year. (Estimate 30% minimum per year, but check locally)	30%	
Longline, 100% year, (Estimate 100% replacement)	100%	$80
b) Insurance. n/a		$0
e) Financing costs. N/a		$0
f) Total fixed annual costs.		**$830**

III. ANNUAL VARIABLE COSTS.

a) Canoe hull, annual repair & maintenance costs,		$100
b) Fuel costs.		$2,223
HP for this calculation see **General Data** above.		
Gasoline/oil mix, cost per litre	$2.46	
Gasoline consumption, in liTrês/day. @ 450g/hp/hr	5	
2% of total for losses,	0.10	
c) Lubricants.		$54
Cost per litre (Sump oil)	$5.00	
Sump oil changes per year, (estimate every 50 hrs)	11	
Allowance for losses & leakage.	0	
d) Filters, fuel.		$20
Cost per filter.	$5.00	
Changes per year.	4	
e) Salaries.		$4,370
Crew share split, in this case 50% of Net income (**VI.**)		
f) Ice.		$864
Cost per Kg.	$0.30	

Number of multi-day trips annually. (36 trips equivalent to 180 days)	36	
Quantity reported used per trip in Kg. (4 x 20kg blocks)	80	
g) Repair & Maintenence, Engine.		$130
[10% of **I.b)**] figure derived from estimates commonly used in similar fresh water fishery ops., can vary considerably by actual use & region.		
h) Repairs to nets. [30% de **I.c)**] monofilament.		$360
i) Repairs to Longline [50% de **I.d)**]		$40
j) Food supplies.		$720
Cost per person per day.	$2.00	
Total person/days. (fishing days per yr. x Number of fishermen)	360	
k) Port charges etc. (Usually only for Industrial Operations)		$0
l) Loading & unloading charges. (Usually only for Industrial Ops.)		$0
m) Permits. (Port clearances etc.) (Usually only for Industrial Ops.)		$0
n) Costs of bait. (Longline Operations).		$0
o) Miscellaneous costs.		$360
Average of R$2.00 per day	$2	
p) Cost of fish kept for personal consumption & given away.		$900
Personal consumption & given to others in Kg./day	1.00	
Average value per Kg.	$5.00	
q) Total, Variable Costs.		**$9,140**
IV. TOTAL, ANNUAL COSTS.		**$9,970**
Total fixed + Total variables.		
V. ANNUAL INCOME. (Gross)		**$13,500**
a) Annual capture in Kg.	2,700	
Average capture per day in Kg.	15	
Number of fishing days per year.	180	
Average value of fish per Kg.	$5.00	
Note: River fishery can be single or multi-day trips, Adjust if/as reqd.		
VI. NET INCOME		**$8,739**
Crew salary calculation: Gross income (**V.**) less costs of gasoline, Oil, Ice, Food and fish consumed & given away.		
VII. NET PROFIT (DEFICIT).		**$3,530**
Calculated from total income less total costs per year.		
VIII. PROFITABILITY.		**114.59%**
Net profit/Total investment x 100%		
[**VI.** / **I.e)** x 100%]		
IX. BREAK EVEN POINT. (VOLUME in Kg)		**1,994**
Annual capture in Kg. per canoe for break even point is determined as follows: Total annual costs / price per Kg.		
X. COST OF FUEL IN R$ TO PRODUCE 1 Kg. FISH.		**$0.82**
Calculation: Total cost fuel / total capture)		
XI. ANNUAL SALARY PER CREWMEMBER.		**$2,185**
In this case: 50% of Net income(**VI.**) / Number of crew. Adjust % as Reqd.		

Annex: 2.

CANOE/BOAT FISHERY: Annual Costs of Enterprise; Três Marias Reservoir
GEAR: Gill Nets.

Exchange Rate: US$1.00 : Br R$2.87 **(All Values are given in Brazilian Reais)**

GENERAL DATA

Canoe construction material: **WOOD**.			
Dimensions (MeTrês): 6.00 Loa x 1.4 Bmld x 0.45 Depth			
Engine HP: (BRANCO air cooled outboard)	**3.5**		
Engine hours run per day (As reported by users)	**3**		
Ice Box Capacity M3:	**1.50**		
Number of Crew/Fishermen	**2**		
Fishing days / year	**240**		

I. INVESTMENT COST.

a) Canoe and Insulated Ice Boxes.			$500
b) Motor. (Motor Branco 2 Stroke 3.5 HP)			$1,300
c) Cost of Nets. (4 nets per boat)			$1,600
d) Cost of Longline equipment.			$0
e) Total investment.			**$3,400**

II. ANNUAL FIXED COSTS.

a) Depreciation.			$790
10 years for canoe. (100%/10 = 10% per yr.)	10%		
5 years for motor, Branco O/B. (100%/5 = 20%)	20%		
Nets, 30% year. (This is usual figure applied, check locally)	30%		
Longline, 100% year		n/a	
b) Insurance. n/a			$0
e) Financing costs. n/a			$0
f) Total fixed annual costs.			**$790**

III. ANNUAL VARIABLE COSTS.

a) Canoe hull, annual repair & maintenance costs,			$100
b) Fuel costs.			$2,964
HP for this calculation see **General Data** above.			
Gasoline/oil mix, cost per litre	$2.46		
Gasoline consumption, in liTrês/day. (Assume 3hrs @ 450g/hp/hour)	5		
2% of total for losses,	0.10		
c) Lubricants.			$72
Cost per litre (Sump oil)	$5.00		
Sump oil changes per year, (estimate every 50 hrs)	14		
Allowance for losses & leakage.	0		
d) Filters, fuel.			$72
Cost per filter.	$5.00		
Changes per year. Depends on fuel quality, estimate same frequency as oil.	14		
e) Salaries.			$3,666
Crew share split, in this case 50% of Net income (**VI.**)			
f) Ice.			$1,152
Cost per Kg.	$0.30		

Number of trips annually. (Equivalent of 240 days)	48	
Quantity reported used per trip in Kg. (4 x 20kg blocks)	80	
g) Repair & Maintenence, Engine.		$130
[10% of **I.b)**] figure derived from estimates commonly used in similar fresh water fishery ops., can vary considerably by actual use & region.		
h) Repairs to nets. [30% de **I.c)**] monofilament.		$480
i) Repairs to Longline [100% de **I.d)**]		$0
j) Food supplies.		$1,920
Cost per person per day.	$4.00	
Total person/days. (fishing days per yr. x Number of fishermen)	480	
k) Port charges etc. (Usually only for Industrial Operations)		$0
l) Loading & unloading charges. (Usually only for Industrial Ops.)		$0
m) Permits. (Port clearances etc.) (Usually only for Industrial Ops.)		$0
n) Costs of bait. (Longline Operations).		$0
o) Miscellaneous costs.		$480
Average of R$2.00 per day	$2.00	
p) Cost of fish kept for personal consumption and/or given away.		$960
Personal consumption & given to others in Kg./day	1.00	
Average value per Kg.	$4.00	
q) Total, Variable Costs.		**$10,936**
IV. TOTAL, ANNUAL COSTS.		**$11,726**
Total fixed + Total variables.		
V. ANNUAL INCOME. (Gross)		**$14,400**
a) Annual capture in Kg.	3,600	
Average capture per day in Kg.	15	
Number of fishing days per year.	240	
Average value of fish per Kg. (Lake fish lower average value)	$4.00	
VI. NET INCOME		**$7,332**
Crew salary calculation: Gross income (**V.**) less costs of gasoline, Oil, Ice, Food and fish consumed & given away.		
VII. NET PROFIT (DEFICIT).		**$2,674**
Calculated from total income less total costs per year.		
VIII. PROFITABILITY.		**78.65%**
Net profit/Total investment x 100%		
[**VI.** / **I.e)** x 100%]		
IX. BREAK EVEN POINT. (VOLUME in Kg)		**2,931**
Annual capture in Kg. per canoe for break even point is determined as follows: Total annual costs / price per Kg.		
X. COST OF FUEL IN R$ TO PRODUCE 1 Kg. FISH.		**$0.82**
Calculation: Total cost fuel / total capture)		
XI. ANNUAL SALARY PER CREWMEMBER.		**$1,833**
In this case: 50% of Net income(**VI.**) / Number of crew. Adjust % as Reqd.		

Annex: 2a.

CANOE FISHERY, ANNUAL COST OF ENTERPRISE: Três Marias Reservoir
GEAR: Gillnets.

Exchange Rate: US$1.00 : Br R$2.87 **(All Values are given in Brazilian Reais)**

GENERAL DATA.

Boat construction material: **Aluminium.**		
Dimensions (MeTrês): 6.00 Loa x 1.4 Bmld x 0.52 Depth. (Wt. 100kg)		
Engine HP: **(Branco O/B)**	**3.5**	
Engine hours run per day. (As reported by users)	**2**	
Ice Box Capacity M3:	**1.50**	
Number of Crew/Fishermen	**2**	
Fishing days / year	**240**	

I. INVESTMENT COST.

a) Boat and Insulated Ice Boxes.		$3,300
b) Motor. (Branco 2 Stroke 3.5 HP)		$1,300
c) Cost of Nets. (4 nets per canoe @ R$400 ea.)		$1,600
d) Cost of Longline equipment.		$0
e) Total investment.		**$6,200**

II. ANNUAL FIXED COSTS.

a) Depreciation.		**$1,070**
Years for boat. (10 yrs usual so 100/10=10%)	10%	
Years for motor, O/B. (5 yrs usual so 100/5 = 20%)	20%	
Nets, 30% year.	30%	
Longline, 100% year		$0
b) Insurance. n/a		$0
e) Financing costs. n/a		$0
f) Total fixed annual costs.		**$1,070**

III. ANNUAL VARIABLE COSTS.

a) Canoe hull, annual repair & maintenance costs,		$330
b) Fuel costs.		$1,976
HP for this calculation, see **General Data** above.		
Gasoline/oil mix, cost per litre	$2.46	
Gasoline consumption, in liTrês/day @ 450g/hp/hour.	3.3	
2% of total for losses,	0.07	
c) Lubricants.		$48
Cost per litre (Lube oil)	$5.00	
Sump oil changes per year, (estimate every 50 hrs)	10	
Allowance for losses & leakage.	0	
d) Filters, fuel.		$29
Cost per filter.	$3.00	
Changes per year, same as oil change frequency.	10	
e) Salaries.		$19,232
Crew share split, in this case 50% of Net income (**VI.**)		
f) Ice.		$1,152
Cost per Kg.	$0.30	

Number of trips annually 48 (Equivalent of 240 days)	48	
Quantity used per trip in Kg. (4 x 20kg blocks)	80	
g) Repair & Maintenence, Engine.		$130
[10% of **I.b)**] figure derived from estimates commonly used in similar fresh water fishery ops., can vary considerably by actual use & region.		
h) Repairs to nets. [30% de **I.c)**] monofilament.		$480
i) Repairs to Longline [100% de **I.d)**]		$0
j) Food supplies.		$960
Cost per person per day.	$2.00	
Total person/days. (fishing days per yr. x Number of fishermen)	480	
k) Port charges etc. (Usually only for Industrial Operations)		$0
l) Loading & unloading charges. (Usually only for Industrial Ops.)		$0
m) Permits. Port clearances etc. (Usually only for Industrial Ops.)		$0
n) Costs of bait. (Longline Operations).		$0
o) Miscellaneous costs.		$480
Average of R$2.00 per day	$2.00	
p) Cost of fish kept for personal consumption & given away.		$600
Personal consumption & given to others in Kg./day	1.00	
Average value per Kg. (Assume less valuable fish)	$2.50	
q) Total, Variable Costs.		**$24,487**
IV. TOTAL, ANNUAL COSTS.		**$25,557**
Total fixed + Total variables.		
V. ANNUAL INCOME. (Gross)		**$43,200**
a) Annual capture in Kg.	14,400	
Average catch / day in Kg. (Using 4 x 50m nets, claims 15kg/net/day)	60.0	
Number of fishing days per year.	240	
Average value of fish per Kg. (Most lake fish reported to be of lower value)	$3.00	
VI. NET INCOME		**$38,464**
Crew salary calculation: Gross income (**V.**) less costs of gasoline, Oil, Ice, Food and fish consumed & given away.		
VII. NET PROFIT (DEFICIT).		**$17,643**
Calculated from total income less total costs per year.		
VIII. PROFITABILITY.		**284.57%**
Net profit/Total investment x 100%		
[**VI.** / **I.e)** x 100%]		
IX. BREAK EVEN POINT. (VOLUME in Kg)		**8,519**
Annual capture in Kg. per canoe for break even point is determined as follows: Total annual costs / price per Kg.		
X. COST OF FUEL IN R$ TO PRODUCE 1 Kg. FISH.		**$0.14**
Calculation: Total cost fuel / total capture)		
XI. ANNUAL SALARY PER CREWMEMBER.		**$9,616**
In this case: 50% of Net income(**VI.**) / Number of crew. Adjust % as Reqd.		

Note: The catch figures given above were obtained from fisherman interviewed at Pontal do Abaete making nets for the Lake fishery. There is no reason to doubt figures given, maybe fishing in productive area of lake.

Annex: 3a.

Costs & Earnings Summary of Various Fishing Enterprises.

	SF River		Três Marias Lake		Funil
Boat Material	Wood, Annex: 1.	Wood, Annex: 1a.	Wood, Annex: 2.	Aluminium, Annex: 2a.	Aluminium, Annex: 3.
Engine HP	15	3.5	3.5	5	15
Fishing days/yr.	180	180	240	240	240
Engine Hrs/Day	3	3	3	2	5
Fuel Cost/Year	$9,527	$2,223	$2,964	$1,976	$21,171
Average Catch in Kg/Year	2,700	2,700	3,600	14,400	4,800
Investment costs	$6,860	$3,080	$3,400	$6,200	$9,600
Annual Fixed Costs	$1,570	$830	$790	$1,070	$1,780
Annual Variable Costs	$13,303	$9,140	$10,936	$24,487	$29,390
Total Annual costs	$14,873	$9,970	$11,726	$25,557	$31,170
Gross Annual Income	$13,500	$13,500	$14,400	$43,200	$33,600
Net Income	$1,593	$8,739	$7,332	$38,464	$9,621
Net Profit or (Deficit)	($1,373)	$3,530	$2,674	$17,643	$2,430
Profitability (%) Annual	(20.02%)	114.59%	78.65%	284.57%	25.32%
Break Even Catch in (Kg)	2,975	1,994	2,931	8,519	4,453
Fuel Cost to Produce 1 Kg	$3.53	$0.82	$0.82	$0.14	$4.41
Annual Salary per/crew	$398	$2,185	$1,833	$9,616	$2,405

Notes to Table:
For details of the above summary figures refer to the appropriate Annexes as shown at the top of each column. It should also be noted that the calculations are based on information given the Consultant by individual fishermen working in the areas as noted, it is suspected that some figures given may be optimistic regarding actual daily catch rates for the Três Marias lake, i.e. Annex: 2a. Consequently the figures for Annex: 2a. should be considered with caution, the only way to verify these is by a longer period of observation than was available to the consultant during this visit.

Analysis of each enterprise above utilises standard practice for fishing enterprises as regards to paying the enterprise investment and operating costs first, then splitting the remaining profit for crew wages. In many cases this split is not considered or understood by the enterprise owner, consequently this becomes part of the crew share, which unfortunately then leaves no money for regular maintenance of vessel, gear and operating costs which finally catch up when major expense for repairs or replacement are necessary and no funds are available.

Boat type or construction material has little influence on the overall profitability or economics of operations, only if loans were involved for alloy boats, then financing costs would be applicable at standard rates of interest, in this case it would not be a significant figure in overall costs, no one was found during this visit with a boat loan.

Gear selection does not appear to be a factor in whether an enterprise is profitable or not, gear selection is limited to gillnets on the Três Marias and Funil reservoirs, the only variable factor with gillnets is in the actual number of nets used per enterprise. Both gillnets and Longlines are used on the river with limits on actual lengths permitted i.e. 1/3 width of river where gear is used. Longlines are not common in the reservoirs, only one partial longline (See Annex: 8a.) was observed on Três Marias reservoir and this was used specifically around aquaculture cages, not in open lake waters as a dedicated fishing method in this area. There may in fact be longlines in use in some specific areas such as river inflows to the lake, however these were not observed during this trip and none were reported to the Consultant.

The predominant economic factors are related to horsepower of engines, hours run per day and related fuel consumption costs. One measure of this is the line showing the cost of fuel to produce 1 kg of fish, the higher this cost becomes the more sensitive is the enterprise to catch rate and price obtained per kg of fish.

Length of fishing season that varies from 180 days/year on the River to 240 days/year on Reservoirs and Lakes also has an influence on profitability.

Other essentials such as ice and food supplies are highly variable in that some fishermen do not pay for ice, (tied to buyers) whilst others pay variable rates depending on location, in any case this would not normally be a “make or break” situation.

Food supplies for crew can be supplied by the enterprise in which case it is deducted from gross revenue or supplied by the crew at their cost, this may vary by location.

Fish given away to others is also a cost that is in many cases overlooked, if catches are low this loss can be considerable when considered against overall costs that remain the same regardless of catch level.

Fishery operations at Funil Dam reservoir (Annex:3) are interesting in that it is reported to be a daily fishery rather than a multi-day fishery as in other areas visited. Fuel costs per year and per kg of fish produced are the highest encountered in the area during this trip, being more than double the next highest. By using 15hp O/B engines for 5 hours/day profits are severely eroded for this enterprise. If the Lake was to become less productive and prices received for fish became lower there would be economic problems for the enterprise purely from the point of fuel consumption. For example if a 10hp O/B engine were used the fuel costs would drop to R$14,114 per/year, return on investment would rise to 62%, fuel cost per 1 kg of fish drops to R$2,94 and crew salaries rise to R$4,169 per/year.
With a 5hp O/B motor the improvement is even more marked with fuel costs per year dropping to R$7,057, return on investment is almost 99%, fuel cost to produce 1 kg fish is R$1,47 and crew salaries are up to R$5,934. per/year.

Spreadsheet Analysis of operations is a valuable tool for education of fishermen and boat owners, allowing them to work with various scenarios on a “what if” basis to find cost saving initiatives that they could institute in their operations.

Annex: 4.

Retail Fish Prices, Belo Horizonte, M.G.

Species	**Presentation**	**Cost Kg. R$**
Surubim, hybrid farmed.	Whole, fresh, HOG[2].	14.90 16.50
Surubim, hybrid farmed	Fillets.	19.90 21.90
Surubim, wild	Steaks.	15.90 17.90
Surubim, wild	Pieces.	13.90 15.90
Dourado.	Whole, fresh, HOG	14.90 16.90
Curituba	Whole, fresh, HOG	11.95
Bagre	Whole, fresh, HOG	11.20
Casudo	Whole, fresh, HOG skinned.	6.95
Traira	Whole, fresh & frozen HOG	6.50
Piau	Whole, fresh & frozen	5.95
Curimata	Whole, fresh & frozen	3.99
Tilapia, farmed	Whole, fresh, HOG	5.99 6.50
Tilapia, farmed	Fillets.	18.99
Other products on offer		
Salmon, farmed (Chile)	Whole, fresh, HOG.	11.88
Salmon, farmed (Chile)	Fillets.	28.90
Bacalao (Ling Cod)	Salt dried, whole piece.	23.80
Bacalao (Saithe)	Salt dried, whole piece.	17.90
Bacalao (Porto)	Shredded	49.90
Fish cake, species not given, locally produced.	Frozen package (200g)	0.90 1.00
Tilapia fillet, sold in Canada, product of China[3].	Frozen individual fillets (400g) 2 per pkg.	28.80

Notes:

1. Prices shown above were obtained from various retail outlets in M.G. including Municipal Markets and Supermarkets. Prices were found to vary even within retail outlets for the same company. Some imported products are included for comparisons.
2. HOG = Head on gutted.
3. Tilapia fillets found in Loblaws Supermarket fish retail outlet in Newfoundland.
4. Prices paid to fishermen varied from low of R$2,50 kg paid by a buyer on Três Marias Lake (buyer supplies ice and pick up service) to an average of between R$2.00 or R$3.00 per kg less than charged to retail customers. Retailers are sometimes reluctant to divulge transaction details.

Annex: 5.

FISHING EQUIPMENT COSTS, MINAS GERAIS 2004.
(Pirapora; Três Marias & Belo Horizonte)

Boats; Wood. (Pirapora)

Flat bottom planked wooden boats, typically built using plank thickness of 19 to 25mm for both topsides and bottom. Heavier plank, 38mm used for transoms.
Basic dimensions; 5 to 6m Loa x 1.4m Beam x 0.45m Depth.

Average cost, new.	R$400.00
Average cost, used.	R$250.00

Boats; Aluminium. (BH)

Flat bottom and modified "V" bottom are typical configurations used on both Rivers and Lakes. Most common sizes for commercial fishermen are 5 to 6m in length. Costs can also vary depending on extras added such as extra thwarts or integral insulated cooler boxes.

Basic dimensions; 5m Loa x 1.4m Beam x 0.52m Depth. (80kg)	R$2,200.00
Basic dimensions; 6m Loa x 1.4m Beam x 0.52m Depth. (100kg)	R$3,000.00
Extra thwarts, each	R$60.00
Integral insulated Ice box	R$80.00

Engines; Outboard (Various centers)

O/B engine costs are also variable depending on where they are sold, larger market centers may be less costly than smaller dealers, costs shown are averaged from different locations and various retailers of fishing equipment. The list does not pretend to be complete. Other makes are available in Brazil, but these were the only ones seen during this trip.

Yamaha	15hp	2 stroke		R$5,500.00
Mercury	15hp	2 stroke		R$5,000.00
Tohatsu	15hp	2 stroke		R$5,000.00
Tohatsu	9.9hp	2 stroke		R$4,000.00
*Yamaha	8hp	2 stroke		R$5,400.00

**This motor was seen on canoe at Três Marias Lake, owner reported cost.*

Branco	4hp	2 stroke	air cooled. (peci-peci)	R$1,900.00
Branco	3.5hp	2 stroke	air cooled.	R$1,300.00
Honda	5hp	4 stroke		R$3,500.00
Branco	3.5hp	4 stroke	air cooled.	R$1,500.00

Fuel & Oil.

Fuel costs are variable depending on location varying between R$2.86 and R$2.07 Litre. The highest was found in Ibiai lowest in Belo Horizonte. Discount B.H. prices and apply averages to locales around project area.

Note: Always check actual cost when making fishing enterprise cost analysis.

Average cost per litre in project area:	R$2.46
Lubricating Oil, average cost per litre:	R$7.00

Ice, block.

Ice costs are variable depending on locale and fishermen's status, independent fishermen tend to pay more per kg than those tied to a buyer or dealer, members of associations also pay less than the public.

Cost per Kg. to fishermen, (Pirapora)	R$0.25
Cost per Kg. to public, (Pirapora)	R$0.30
Cost per Kg. to prof. fishermen/dealers, (Três Marias).	R$0.20
Cost per Kg. to Sport fishermen, (Três Marias)	R$0.30
Cost per Kg. to prof. Fishermen, (Morada Nova).	R$0.25

Fishing Gear. (Pirapora & BH)

Monofilament line is normally sold by weight regardless of diameter. An example reported by one dealer was that 0.5kg of 1mm monofilament line was sufficient for about 5m of netting with 14cm mesh, used by those who prefer to make their own netting. It would seem that buying ready made net panels is more economical.

Monofilament, all sizes	1.0kg	R$68.00
Nylon line, braided, sizes 8 to 19mm	1.0kg	R$19.80
Polyethylene, 4-5mm. net headline w/floats.	1.0m	R$0.50
Polyethylene, 4-5mm. net footline w/lead Wts.	1.0m	R$0.50
Netting, panel 50mesh deep x 11cm mesh.	each	R$42.00

Note: This is mesh only, the headlines, foot lines, floats and lead weights are all extra. It is common to cut nets in half and use 24 mesh depth, net lengths usually 50m hung.

Lead weights, all sizes	1.0kg.	R$8.00
Floats, large (3 ½" x 1 ½") Hard shell	each	R$0.65
Floats, small (2 ½" x 1") Hard shell	each	R$0.55
Floats, #1 small, Styrofoam	each	R$0.13
Floats, #2	each	R$0.17
Floats, #3	each	R$0.23
Floats, #4	each	R$0.30
Hooks, #5 (large), forged steel, Mustad	each	R$16.50
Hooks, #7	each	R$1.60
Hooks, #10/0 (Dourado)	each	R$2.00
Hooks, #15	each	R$3.50

Hooks, #16/0 (Surubim)	each	R$3.55

Styrofoam Fish Boxes. (Três Marias)

40 litre size, with lid.	each	R$20.00
60 litre size, with lid.	each	R$28.00
100 litre size, with lid.	each	R$42.00
120 litre size, with lid.	each	R$48.00
170 litre size, with lid.	each	R$65.00
180 litre size, with lid.	each	R$68.00

BOATS: 2 Typical types **Annex: 6.**

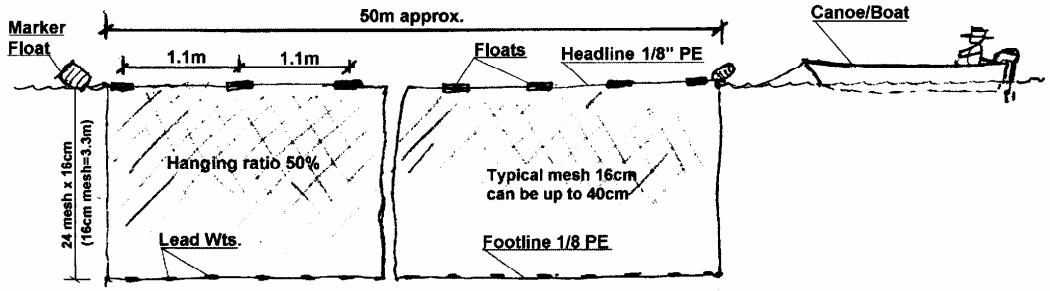
Typical alloy "V" bottom boat, SF River (Loa 6m x 1.4m Bmld x 0.52m Depth)
Some models are also available with Flat bottom configurations.

Typical flat bottom boat, River & Lake. (Loa 6m x 1.3m Bmld x 0.46m Depth)

Note: Both types are driven by a variety of Outboard Motors from the basic BRANCO 3.5hp 2 stroke shown above up to 15hp outboards of mostly 2 stroke type, some 4 stroke models are available but cost more. Manufacturers such as Yamaha, OMC, Honda, Mercury, Tohatsu and others found in local market. It is worth noting that Branco are now producing a 3.5hp 4 stroke O/B engine which should be very economical to operate, the extra cost is about 16% but fuel savings could cover this in 2 years of average use when the lower fuel consumption (about 40%) is factored in.

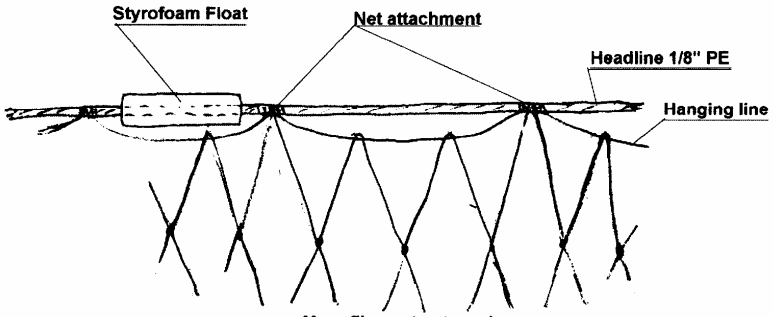
Annex: 7.

GILLNET: Sao Francisco River



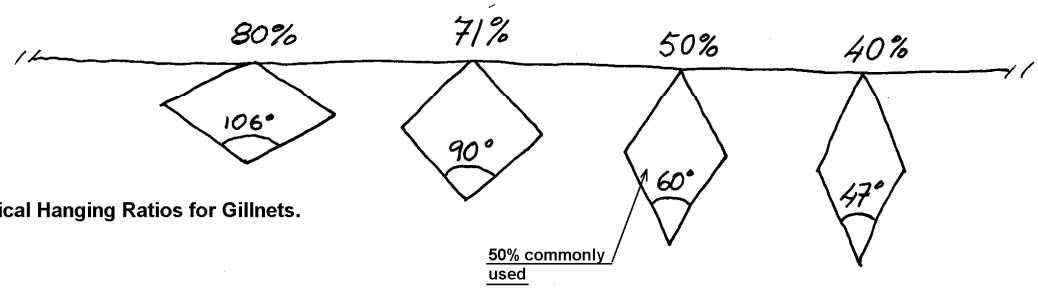
Notes: Length of net is limited to 1/3 width of river where it is used.
Stretched mesh size is also regulated by Federal & State laws.

Not to Scale



Gillnet Detail Headline.

Not to Scale

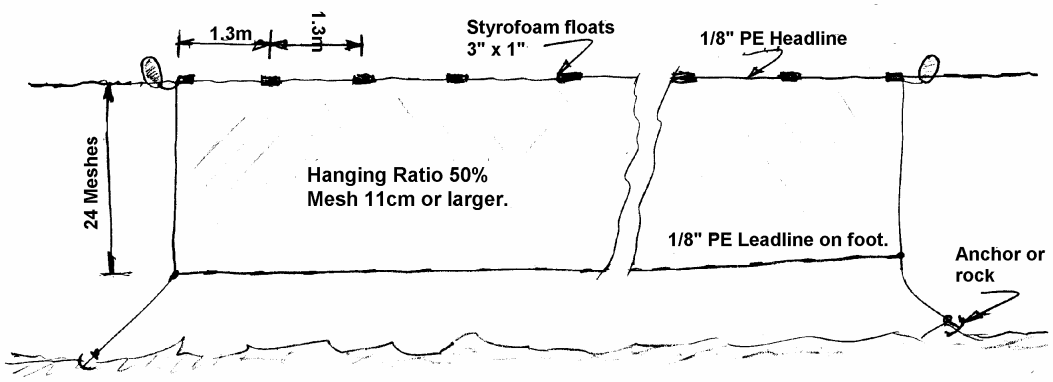


Typical Hanging Ratios for Gillnets.

The hanging ratios for constructing nets to target particular species are usually well known to local fishermen and have been derived over a period of time. This does not however preclude further experimentation with net hanging ratios as long as it is within regulations.

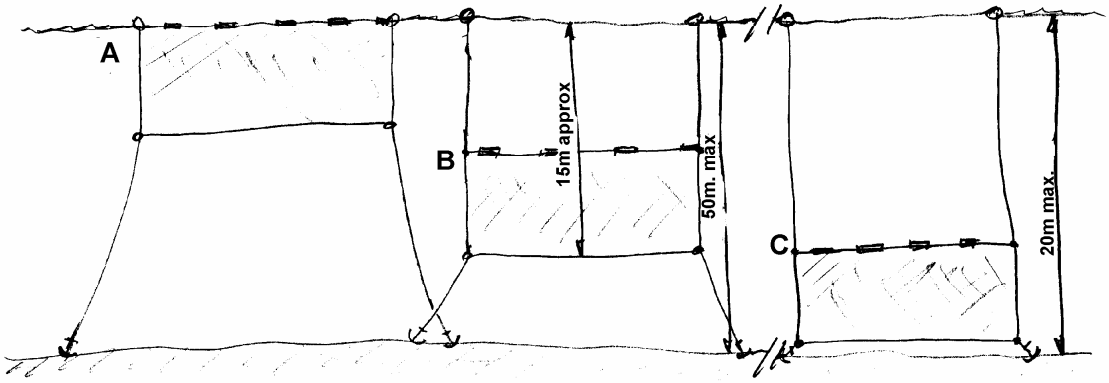
Annex: 7a.

Floating Gillnet: Tres Marias Lake.



-Each net is approximately 50m long
-Typical Enterprise reported to use 3-4 nets, total 150-200m. Some use more.
-Net material purchased ready made 50 meshes deep, then cut in half and hung as shown above.
-Some nets are used as full 50 mesh panels.
-COST: Reported to average R$150.00 / R$200.00 per panel (24 mesh) complete.

Lake Gillnets: 3 configurations.



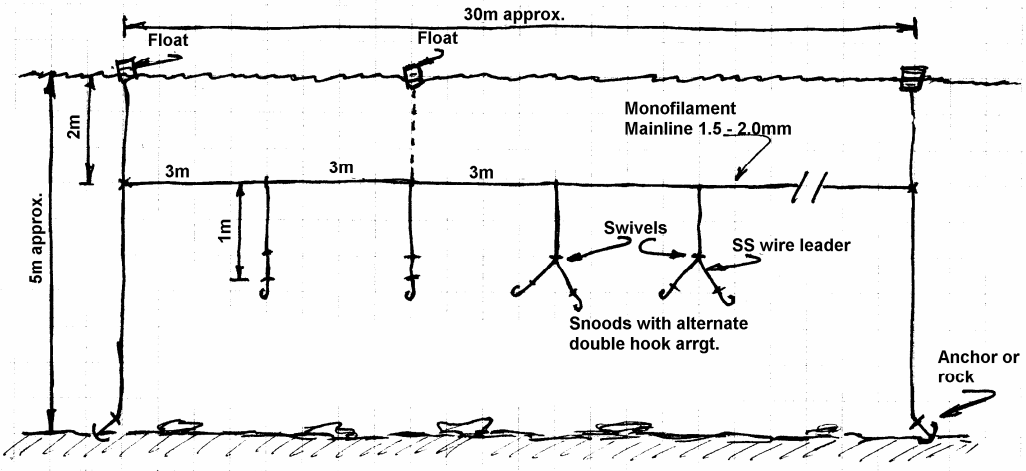
A. Typical floating gillnet, eitheranchored to lake bottom or free floating with buoy at one end and boat at other end.

B. Midwater set gillnet, set at variable depths below surface, reported usually about 15m below surface.

C. Bottom set gillnet, reported not normally used in water depths exceeding 20m, also it is usual to set only one net of 50m length on bottom.

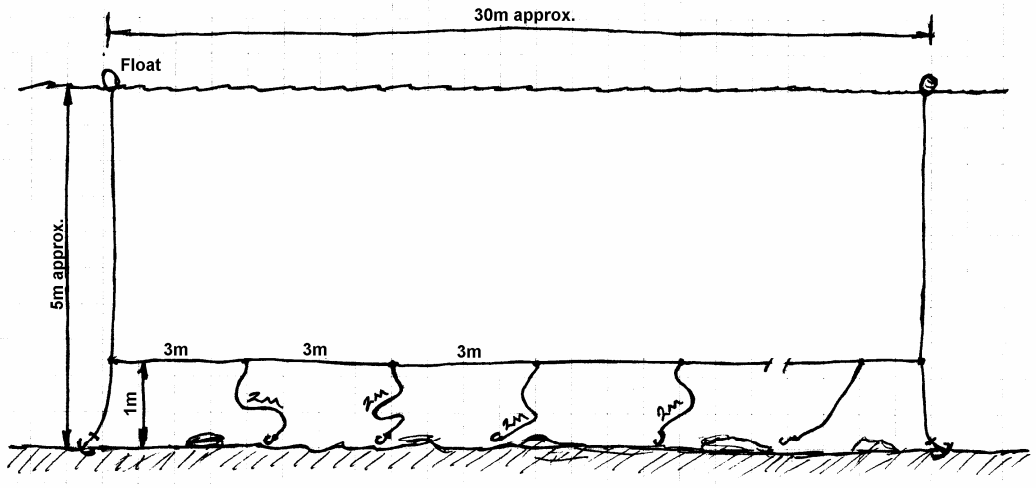
Annex: 8

Midwater Longline: River



-Reported 12-14 snoods per line, uses live bait.
-Target species, Dourado or similar species.

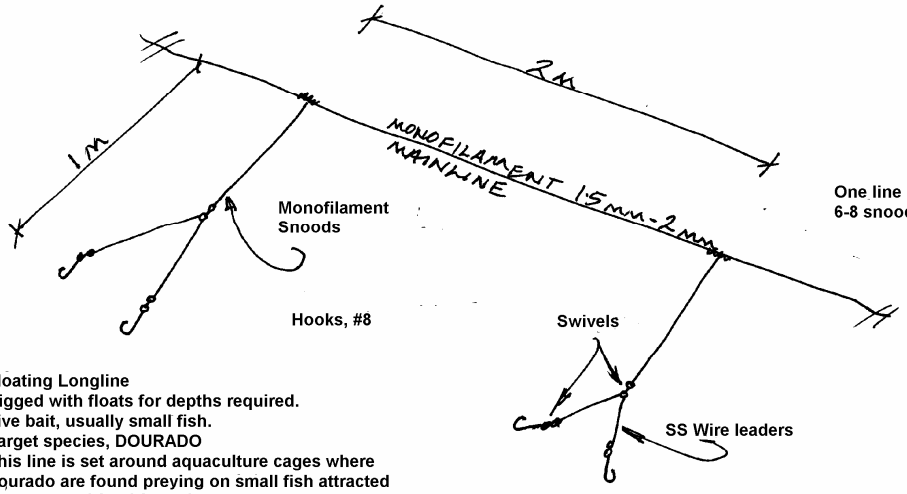
Bottom Longline



-Bottom longline has same configuration as above but is arranged to set on river bottom only, no floats other than those at each end for markers.
-Principal target species, Surubim, Catfish and similar bottom feeders.

LONGLINE: Tres Marias Lake

Annex: 8a.



One line can be rigged with
6-8 snoods and double hooks.

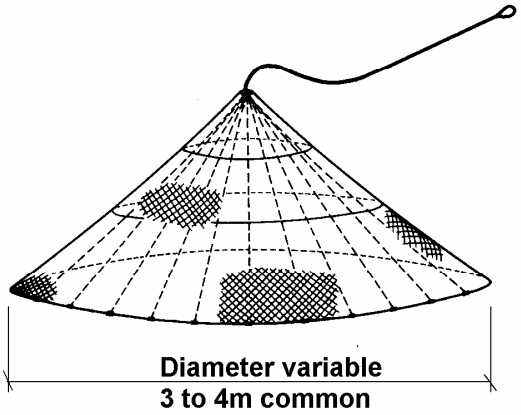
-Floating Longline
-Rigged with floats for depths required.
-Live bait, usually small fish.
-Target species, DOURADO
-This line is set around aquaculture cages where Dourado are found preying on small fish attracted by waste and food from the cages.

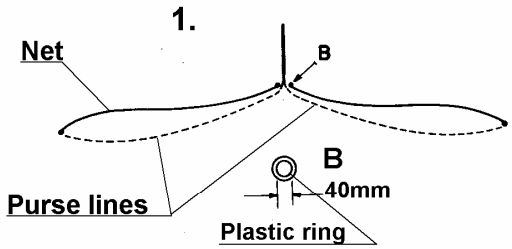
Not to Scale

Annex: 9.

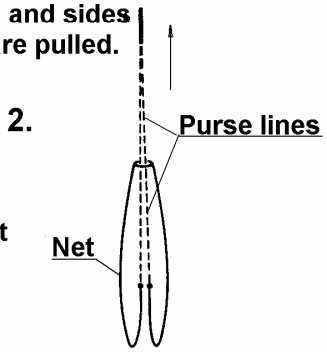
Cast Net: River and Lake

(Pursing type)





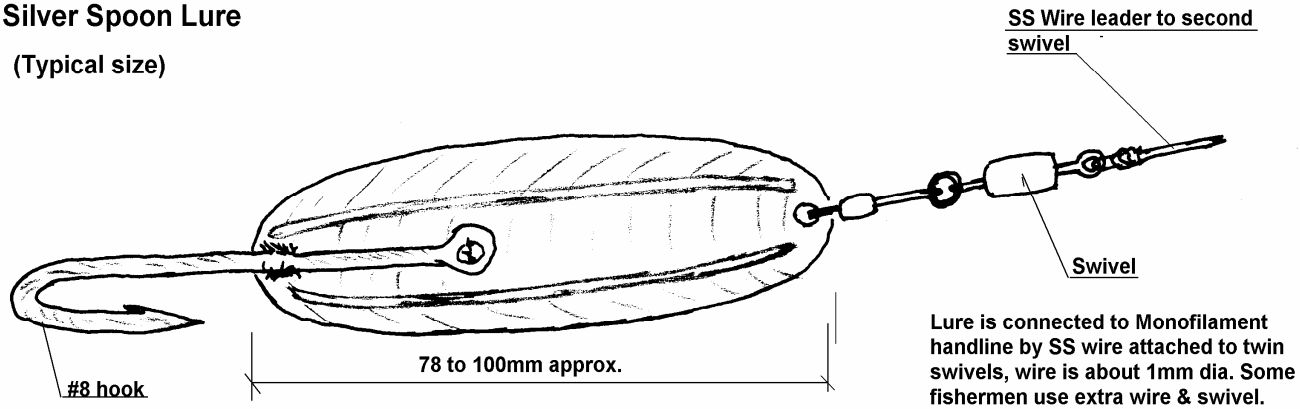
1. Shows net open when casting.
2. Shows net being closed and sides pursing as purse lines are pulled.



-Cast nets are commonly used to catch bait fish for longlines, but are also used in some locations to catch larger commercial fish species, particularly around river rapids.

Silver Spoon Lure

(Typical size)

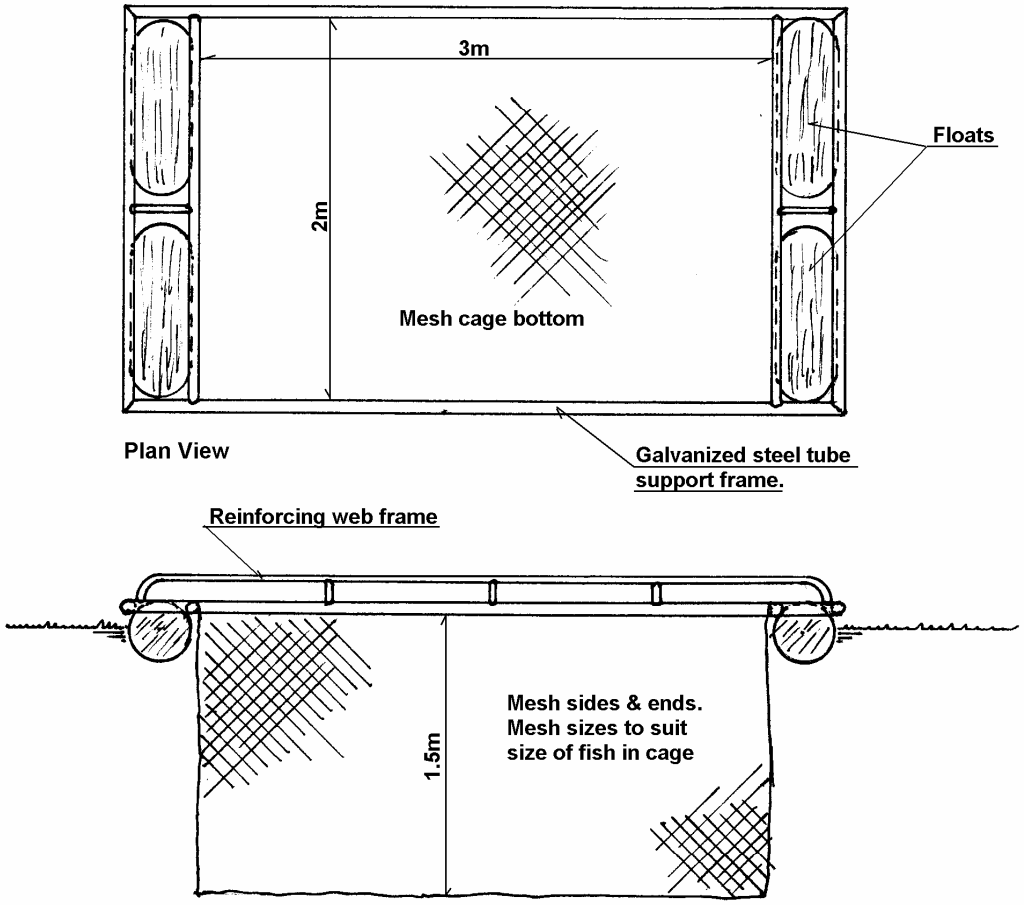


Lure is connected to Monofilament handline by SS wire attached to twin swivels, wire is about 1mm dia. Some fishermen use extra wire & swivel.

Target species: Dourado, Corvina & similar species.

Annex:10

Aquaculture Cage.



-Typical cage size for Tilapia production is shown above, size may vary for other species.
-For 9 cubic metre cage average fish load for specimens of 750g weight is approximately 1800 to 2000 fish per cage.
-Cages may be constructed with large web plastic mesh and lined with smaller mesh net material to prevent escape of small fish.

The above cage is typical of those found on Três Marias Lake and similar in size to those seen in the São Francisco River at Pirapora. Construction of the cages in Pirapora varies in that they are made of larger diameter tubing (2") so the Reinforcing web Frame shown above is not necessary. Other types and configurations are reported to be in use elsewhere but these were the only type measured during this trip.

Minimum Sizes for Commercial Fish Species

Annex: 11.

Tamanhos mínimos de captura de peixes de água doce

NOME VULGAR/ESPÉCIE	Tamanho mínimo (cm)	ÁREAS DE PESCA									
		01	02	03	04	05	06	07	08	09	10
Apapá, Dourada/*Pellona castelnaeana*	50							✓			
Aruanã/*Osteoglossum bicirrhosum,*	50							✓			
Aruanã/*Osteoglossum bicirrhosum,*	44			✓							
Aruanã/*Osteoglossum ferreirae,*	40			✓							
Armado/*Oxydoras kneri, Pterodoras granulosus*	35	✓		✓		✓					
Barbado/*Pinirampus pirinampu*	50							✓			
Barbado/*Pinirampus pirinampu*	60								✓		
Cachorra/*Hydrolycus scomberoides*	50							✓			
Cachara, Surubim/*Pseudoplatystoma fasciatum*	80	✓	✓	✓		✓			✓		✓
Cachara, Surubim/*Pseudoplatystoma fasciatum*	70						✓	✓			
Caranha, Pirapitinga/*Piaractus brachypomus*	40							✓			
Caparari/*Pseudoplatystoma tigrinum*	80		✓								
Corvina/*Pachyurus francisci*	30										✓
Corvina, Pescada-do-piauí/*P. squamosissimus*	30										✓
Corvina, Pescada/*Plagioscion squamosissimus*	25	✓		✓	✓	✓					
Corvina, Pescada/*Pachyurus francisci e P. squamipinnis*	25				✓			✓			
Corvina, Pescada/*Plagioscion* sp.	20				✓		✓	✓			
Corvina, Pescada/*Pachyurus schomburgkii*	20							✓			
Curimatã pacu/*Prochilodus marggravii*	40				✓						✓
Curimbatá/*Prochilodus lineatus*	38								✓		
Curimbatá, Curimatã/*Prochilodus lineatus*	30	✓		✓		✓					✓
Curimatã-piôa/*Prochilodus affinis*	30										✓
Curimatã/*Prochilodus nigricans*	20						✓	✓			
Curimatã/*Prochilodus nigricans*	25		✓								
Dourado/*Salminus maxillosus*	65									✓	
Dourado/*Salminus maxillosus*	55	✓		✓		✓			✓		
Dourado/*Salminus brasiliensis*	60				✓						✓
Jaú/*Paulicea luetkeni*	95								✓		
Jaú/*Paulicea luetkeni*	90									✓	✓
Jaú/*Paulicea luetkeni*	80	✓		✓				✓			
Mandi amarelo/*Pimelodus maculatus*	20										✓
Mandi/*Pimelodus maculatus*	18	✓									
Mandi/*Pimelodus* sp.	15				✓						
Mandiaçu/*Duoplatinus tacniatus*	30										✓
Mandubé, Fidalgo/*Ageneiosus brevifilis*	35							✓			
Matrinxã/*Brycon brevicauda*	30							✓			
Matrinxã/*Brycon lundii*	25										✓
Matrinxã/*Brycon lundii*	22				✓						
Pacu/*mylossoma* spp.	15		✓								
Pacu/*Piaractus mesopotamicus*	45								✓	✓	
Pacu, Caranha/*Piaractus mesopotamicus*	40	✓		✓							
Pacu/*Piaractus mesopotamicus*	30										✓
Pacu-caranha/*Colossoma mitrei*	40										✓
Piapara, Piau/*Leporinus elongatus*	30	✓		✓	✓	✓					✓
Piapara, Piau/*Leporinus obtusidens*	25	✓		✓		✓		✓			✓
Piau-três-pintas/*Leporinus reinhardti*	25										✓
Piau-cabeça-gorda/*Schizodon fasciatum*	30							✓			
Piau-flamengo/*Leporinus fasciatus*	20							✓			
Piavuçu/*Leporinus* sp.	38								✓		
Piavuçu/*Leporinus macrocephalus*	35									✓	
Piracanjuba/*Brycon hilarii*	40	✓		✓		✓					✓
Piracanjuba/*Brycon orbignyanus*	30	✓		✓		✓					
Piraíba, Filhote/*Brachyplatystoma flavicans*	100							✓			
Piraputanga/*Brycon microlepis*	30								✓		
Pirarara/*Phractocephalus hemioliopterus*	80							✓			
Pirarucu/*Arapaima gigas*	150		✓				✓	✓			
Pintado/*Pseudoplatystoma coruscans*	85									✓	
Pintado/*Pseudoplatystoma coruscans*	80	✓		✓	✓	✓			✓		
Tabarana, Tubarana/*Salminus hilarii*	30										✓
Tambaqui/*Colossoma macropomum*	55		✓								
Traíra/*Hoplias malabaricus*	30										✓
Tucunaré/*Cichla* spp.	35						✓	✓			
Tucunaré/*Cichla* spp.	25		✓								

ÁREAS DE PESCA:

1. Região Sul e estados: SP, ES e RJ (PORTARIA IBAMA N° 25/93); **2.** Bacia amazônica (PORTARIA IBAMA N° 08/96; PORTARIA IBAMA-AM N° 01/01); **3.** Bacia do rio Paraná(PORTARIA IBAMA N° 21/93); **4.** Bacia do rio São Francisco (PORTARIA IBAMA N° 92/95); **5.** MT e MS (PORTARIA IBAMA N° 22/93); **6.** Bacias dos rios Araguaia/Tocantins (PORTARIA IBAMA N° 107/98); **7.** Trecho entre as cabeceiras do rio Araguaia - GO até a altura do município de Antonico Rosa - MT e o Parque Nacional do Araguaia - TO (PORTARIA IBAMA N° 106/98); **8.** Estado de Mato Grosso do Sul (DECRETO ESTADUAL N° 9.768/2000); **9.** Estado de Mato Grosso (RESOLUÇÃO CONSEMA N° 001/2000); **10.** Estado de Minas Gerais(DECRETO ESTADUAL N° 38.744/97).

LEMBRE-SE

1) Define-se o tamanho do peixe como sendo a distância entre a ponta do focinho e a extremidade da nadadeira caudal.

2) Esta Tabela não se aplica a peixes oriundos da piscicultura. Nesse caso, é necessário comprovar a origem do peixe.

Source: IBAMA. (Website)

Note: “Surubim” are referred to in the above table as “Pintado” *Pseudoplatystoma coruscans.*

Annex: 12

Noticia: Falsos Pescadores.

Quinta, 11 de novembro de 2004, 12:28 horas.

Geral - Meta é extinguir falsos pescadores
Secretaria quer regularizar profissão

Marcelo Becker (marcelo.becker@diario.com.br)

Agentes da Secretaria Especial de Aqüicultura e Pesca (Seap) começaram a colocar em prática no Estado a Campanha Nacional de Regularização de Pescadores Profissionais. A iniciativa busca principalmente cancelar registros de falsos pescadores que se aproveitam da fraude para conquistar benefícios como o salário seguro defeso concedido pelo governo federal durante o período de reprodução das espécies.

Ontem, os integrantes da secretaria especial estiveram em Imbituba, no Sul do Estado, onde denúncias indicam um grande número de irregularidades em torno dos falsos registros de pescadores. Nos próximos dias a operação também acontecerá em Barra Velha, Norte catarinense.

As primeiras ações preventivas para identificar e cancelar os falsos registros começaram nas cidades de Lucena, na Paraíba, e São Paulo de Potengui, no Rio Grande do Norte.

A estimativa é de que cerca de 40% dos 350 mil registros de pescadores no Brasil sejam fraudados. Pelo menos outros 600 mil pescadores não possuem o registro.

De acordo com o coordenador da campanha e assessor especial da Seap, Carlos Henrique Teixeira Barbosa, todas as cidades brasileiras que possuem colônia de pescadores serão investigadas.

- Queremos acabar com pescadores falsos que apenas têm o registro para receber os benefícios e ao mesmo tempo regularizar os verdadeiros profissionais que estão na cladestinidade para que possam ter seus direitos assegurados - explica.

A busca pelos registros fraudados será feita através do cruzamento de informações de órgãos como o Ministério do Trabalho e Previdência Social.

Se a essas comparações apontarem que a pesca não é a atividade principal da pessoa ou ela possui carteira profissional assinada com outra profissão, o registro de pescador será cassado.

O Ministério Público e a Polícia Federal estão de prontidão e podem participar da operação conforme os resultados obtidos na investigação da Seap.

Todo o trabalho de averiguação dos registros de Imbituba será feito na subdelegacia do Trabalho em Criciúma, no Sul do Estado, e deve durar cerca de 10 dias. Depois disso, os fiscais da secretaria seguem para Barra Velha. O prazo estabelecido pelo governo federal para finalizar essa campanha de regulamentação é de 12 meses.

Publicado : Jornal Diário Catarinense, em 11/11/2004

This is a synthesis of the Official Notice from Seap/MMA, believed to have been published 9 Nov. 2004.

Annex: 13

Ice Block Grinder

Note: This machine is manufactured in Brazil, unfortunately no makers name found. The machine takes 20kg blocks and reduces block to 1cm sized pieces, powered by an electric motor, but could be converted to manual operation by addition of large diameter flywheel with handle.

Annex: 14.

Michael Shawyer
Draft Agenda/Schedule

Things of particular interest: fishing techniques in different environments, fish handling, processing, and marketing; fishing lifestyle, organization, attitudes and interests of fishing community, relevant government programs and policies.

Nov. 2, 2004: Depart Canada (St. John's)

Nov. 3 Arrive São Paulo @ 11:30 am.
Flight to Belo Horizonte
Meet Arley/Hugo; (Thiago)
Car to Ibiai.

Nov. 4 Field visit Ibiai and informal discussions
Van to Barra do Guiacui
Field visit and community meeting, Barra do Guiacui
Van to Pirapora

Nov. 5 AM. Field visits and community meetings Pirapora.
PM. Field visits equipment suppliers.
Evening, Field visit meeting with Colonia de Pesca do Vale, Buritiziero.

Nov. 6 Field visit Pirapora fish retailers & market.
Field visit, river aquaculture operation, Assoc. of Tilapia Growers.
Travel to Três Marias
Community meeting and field visit Pontal

Nov. 7 (Sunday) Community meeting Três Marias, field visit on river
Field visit Pontal do Abaete, fishermen & netmakers.

Nov. 8-9 Meeting Federation, SEAP (Chico), Sebrae, SEMEIA, CODEVASF (Sato):
Field visit on reservoir and Co-Op 3.
Field visit, Vila Albano.
Field visits, equipment suppliers.
Field visit, boat from dam downstream to cataract.
Meeting, Principal shareholder, Co-Op 3.

Nov. 10 AM Field visits Felixlandia and Morada Nova,
Field visit, Biquinhas.
PM Travel to Formiga.

Nov. 11 AM/PM Field visits Formiga and Funil dam & fishermens village.
PM travel to Belo Horizonte.

Nov. 12 Meetings SEAP, IEF, IBAMA, CEMIG at Min of Agropecuaria.

Nov. 13	Field visits fish markets, retail & wholesale and equipment suppliers in BH
Nov. 14	Field visit Central Market, meeting project personnel; Alison, Ana The, Thiago, Hugo, Erica Castro, Arley Ferreira, J. Carolsfeld.
Nov. 15	AM Meeting project team at Hotel. PM Travel to Brasilia.
Nov. 16	Meetings SEAP, MMA, IBAMA, Ministerio do Trabalho e Emprego, Brasilia.
Nov. 17	AM Meeting with Ministry of Agriculture, Dept of Inspection of Products of Animal Origin. Meeting SEAP, Dept of Aquiculture. PM Meeting with Agencia Brasileira de Cooperacão (ABC) representative. PM Departure to São Paulo – Canada.
Nov. 18	Arrive St. John's.