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EXPANSION OF EXISTING DATA COLLECTION SYSTEMS TO CAPTURE, STORE AND MANAGE SOCIAL AND ECONOMIC DATA FROM THE FISHERIES SECTOR

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Executive Summary

This report describes an outline methodology for the collection of economic and social data on the fisheries sectors of CARICOM countries. This follows requests from a large number of CARICOM Members to expand the existing data sets (fleet registration, fisher registration, collection of catch and effort data, and fish biology) to include the collection of costs and earnings data. This report identifies the key demands from the national administrations (Fisheries, Planning and Development, and Statistics); the limitations to statistical collection; and the uses of economic data at micro level (individual fishing vessel / processing plant performance, and impact assessments) and at macro level (the value from fisheries to the national economy (Gross Value Added), inputs into fisheries modelling, and the collection of socio economic data).

The report identifies the most appropriate approach to the issue of data collection. The proposal is to conform to a generic model, as opposed to a series of specific national approaches. This is largely because of the general similarities in Costs and Earnings structures in fisheries per se; similarities in terms of strengths and weaknesses of the existing data collection systems applied by the Fisheries Departments; the need to ensure shared quality control; and the need to produce data that are comparable between the CARICOM countries. Comparability is of course essential in areas where there are shared fisheries (shrimp, long lining etc). It is also likely that fisheries that are common to each country will encounter the same kinds of interpretative problems.

The methodology utilizes the strengths of the existing set of data collectors; approaches the issue of questions to fishers in as simplistic a manner as is possible (i.e. without seeking access to specific records which could ultimately alienate them); minimises the sample collection and uses an interpretative model which is easy to input and produces the required outputs with ease. It is not advised to use the existing TIP database to collect all the required economic data, although provision is made for inclusion of catch weight and price data from TIP records where available.

A spreadsheet Model has been developed which can be utilized to produce the required outputs. The Model takes account, when and where identified, of the specific and potential differences that might be encountered in each country, for example differences in the calculation of wage structures. However, it should be recognized that the design of a 'Costs and Earnings' collection and interpretation methodology is an evolving process, and that potential adjustments may be identified. In this respect, it is essential to retain quality control and to properly disseminate potential changes through the CFU network.

The LRS, and specifically the fisher's register provides a useful basis from which to collect socio economic data. Analysis of socio economic data may best be left to a global approach from a support institution such as the University of the West Indies. Financial support for socio economic analysis is likely to be made available from donors such as World Bank / FAO / DFID).

1. Introduction

The Integrated Caribbean Regional Agriculture and Fisheries Development (ICRAFD) Programme main objective is to extend the activities of the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP) to focus on the optimal utilization and sustainable management of marine resources in the CARIFORUM countries, **Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago**. Previous work, under the banner of the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP), has related to the setting up of fisheries data systems in the Member States in order to advance the cause of fisheries management. These data have specifically focused on:

- Catch and effort systems
- Licensing and registration systems
- Biological sampling (weight, length frequency and age data)

This report deals with the issue of collection and collation of economic and socio-economic fisheries data throughout the CARICOM countries. The specific purpose of the report is to develop guidelines and methods for the expansion of each country's present data collection programme in order to obtain data and information on the economic value of national and sectoral fisheries. The basis of discussion in the report draws from field visits by the authors to specific countries, **Antigua and Barbuda, The Bahamas, Barbados, Belize, Jamaica and Suriname** (Appendix 1). For the other countries, additional references are made to literature produced by the CFU and the national fishery agencies (Appendix 2). Richard Banks, Daniel Hoggarth and Graeme Macfadyen of SCALES, Barbados prepared the report.

2. Identification of the needs for economic data

Many of the national fisheries departments have sought to focus an extension of the ICRAFD Programme to include economic data collection.

Demand for such data usually relates to:

1. Identification of economic outputs which demonstrate the contribution of fisheries to national Net National Value Added

2. Identification of policy assessment indicators (changes in economic and socio-economic inputs and outputs as a result of policy (Fishery Management Plans), investment (infrastructure development) and subsidies (e.g. import duty relief or fuel subsidies).

3. Identification of the revenues, costs and profit variables that can be incorporated into bio-economic modelling[1]

In this context, some countries are seeking to utilize economic data for a number of other reasons, notably:

1. Impact assessments

    a) measuring the impact of loss of access as a result of ad hoc developments such as aggregate dredging
    b) measuring the hardship caused as a result of disaster factors such as hurricanes

2. Identification of economic benefit to society and ways and means of maximizing returns to Government

    a) identifying the socio economic impacts on fisher communities, particularly in respect to the effects on income dependency on fisheries as opposed to alternative livelihoods
    b) identifying the potential for charging users (fishers and fishing companies) levies for licenses
    c) identifying the costs and benefits of export promotion (e.g. comparing the benefits of foreign currency earnings against the potential costs to conservation of fish stocks which may already be over exploited)
    d) identifying potential losses in income to the national exchequer as a result of transfer pricing i.e. the transfer of income and profits abroad such that it is of no benefit to the national economy[2].

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[1] It should be said that the latter relates largely to those countries where the data collection system has evolved to comprise a reasonably comprehensive and statistically sound system. It is also true to say that all countries are inevitably seeking to strive towards bio-economic modelling at some stage.

[2] Often where there are joint ventures (shared foreign and national ownership) transfer payments may be made from parent companies (e.g. affiliated processing companies in other countries) to expatriate crews. Companies may also deliberately understate the national sales / export price in exchange for rebates outside the country. This has the effect of understating the profit, for obvious tax advantages, and facilitating additional transfers abroad which might ordinarily have generated additional income to the economy.

The following are the typical economic outputs that are used as indicators of the success of existing or proposed management scenarios:

1. National net value added

2. Private sector profits

3. Returns to labour

4. Returns on investment

5. Costs of production

6. Socio economic dependency of fishermen and their households on fisheries within the coastal community structure.

7. Net foreign exchange earnings

8. Impacts on subsidies and taxes

The following are the typical socio economic outputs used to describe a fishery:

1. The number of fishers described as owners, owner / fishers, skippers and crew

2. Number of full time, seasonal and part time fishers

3. Education (conventional and fishery related) and literacy levels

4. Length of time in the fishery

5. Family status (single, married, common law, other)

6. Age

7. Family dependents

8. Numbers working and numbers working in fisheries and fisheries related activities (marketing, gear repairs, other)

9. The role of women in the household or in the fishery

10. Number of children: male / female

11. The degree of fisher's dependency on fisheries as opposed to other activities

12. Affiliation to fisheries organizations or other associations

13. Nationality

14. If foreign national, percentage of income repatriated

15. Ownership of assets used in fishing

16. Indebtedness (loans outstanding, creditors, interest rates charged, collateral issues and payment conditions)

While the output of this study is intended to be applicable across the region, it is acknowledged that the study outputs are based on knowledge gained during the course of the consultant's interviews in 6 countries. The countries selected were believed to represent a reasonable cross section of examples where data collection (catch and effort, vessel and fisher registration, and biological length / weight frequency) was either very much in hand and improving, or where data collection was proving to be difficult because of poor staffing and demands to service other priority tasks such as training. The degree of success achieved in some countries, as opposed to others was also representative of resources allocated to the tasks in hand and the logistics of having to cover both a small or large number of landing sites.

3. Background to existing data bases

3.1 Summary of data collected

The existing data bases relate to the collection and collation of vessel and fisher registration, catch/effort and biological assessment data, with an extension in some cases to include the collection of socio economic data. Examples of such extensions include fisher status (owner, skipper fisher), education and household dependency on fisheries, time in fisheries, bank loans and ownership of assets. No assessment has been made to date to incorporate economic analysis into the data collection and collation framework. However, some countries, notably the Bahamas[3], Barbados and Trinidad have either undertaken a limited economic data collection exercise, or are in the process of examining the feasibility of doing so. The existing information available on the current databases includes:

(1) Licensing and registration system (LRS)

(A) Fisher Register: Form registration number, fisher identification number, name, address, date of registration and expiry date, date when fisher first registered, emergency contact name, nationality, licence permission, credit / concession;

(B) Vessel Register: Vessel Description: country code, LRS registration number, port of operation and vessel activities / operations;

(C) Processing facility register: Company identification number, name, address, production, type of processing;

(D) Aquaculture facility: Registration details (name, address etc), pond type and number of ponds.

(2) Catch, effort and biological data - Trip Interview Program (TIP)

- Target fishery
- Fishing mode
- Interviews where the specific vessel Id is used
- Agent (interviewee)
- Reporting area
- Sample area
- Total effort
- Total number interviews, by specified landing site
- Total number of crew members
- Days out and days fished
- Frame survey data
- Landing type
- Type of fishing gear used
- Total number of fishing gears used
- Gear description
- Area fished
- Total hours fished
- Min and max depth fished
- Type of species caught
- Total fish quantity for a specific day, month, date, year
- Interviews relating to a specific fishery
- Biological data on specific fishery (gender, maturity and age of species)
- Total number of interviews taken within a month, day, year

[3] Analysis Of The Costs And Earnings in The Bahamian Crawfish Fishery, FAO Project: TCP/BHA/4453

Summary data are available from the TIP and LRS systems and are transposed into Excel for extrapolation, usually into summary catch information. The data are converted from the stratified data definitions and upgraded accordingly into summary species catches.

3.2 Issues and problems encountered

Catch and effort data collection: Most CARICOM countries operate a catch and effort data collection system. The only countries where the systems are in their infancy are St Kitts and Nevis, and Tobago. The quality of the schemes (Appendix 1: 'data collection systems') vary as follows:

- the most comprehensive where almost all data are invariably collected (Suriname, Barbados);
- those where access is good but where data is only partially completed (Belize);
- those based on reasonably good stratified surveys (Trinidad, Jamaica, Dominican Rep, St Lucia and Guyana);
- those where the process is evolving to a stratified data system (Antigua);
- those where data collection is sporadic (The Bahamas);
- those where data collection is almost non existent (Montserrat, Tobago and St Kitts and Nevis).

Fish price data: The main contextual problem with the data gathered in TIP and LRS is the extent to which data collection will have to be extended to include costs and earnings information. The most appropriate form of economic analysis is to identify fisheries by method and to calculate industry outputs as the average costs and earnings of a sample of fishing business 'enterprises' (usually vessels). One problem may arise in respect to the extension of TIP, that most countries fail to accurately record fish prices on landing and fail to allocate the prices to the specific returns being made to the vessels in the sample. Price data is only included as a component part of the data collection process in a limited number of countries (Jamaica), or added at a later stage (Belize). As and when it is added, prices tend to reflect sales to recognized outlets as opposed to private sales / beach sales, which in some countries can be significant.

Licensing and registration: Most countries operate a coherent vessel and fisher registration scheme. Each country either operates the LRS scheme or is the process of introducing it. Each country requires that vessels and fishers register on an annual basis. Not all do, and most fishery registrations are incomplete. Nevertheless, the registration schemes are fairly successful in that over a period of a few years, most of the vessels become registered. However, it may be difficult in many cases to distinguish between active and non-active vessels at any given time.

Biological data collection: The extension of the data base system to include biological data is in its infancy. Most countries are seeking to adopt the CFU inspired scheme in conjunction with the existing data collection activities.

Resources: Most countries lack the financial and ultimately staff resources to cope with an onerous data collection programme. In many countries, the system of data collection is being stretched to the extreme because of resource limitations. A further extension to include additional data gathering could impact on the collection of existing data. It should be said that the enthusiasm and industry knowledge of data collectors encountered during the course of the visits was such that primary economic data collection was well within the means of data collectors, extension officers and/or instructors.

Divergence in data base systems: Not all countries seek to follow the outline prescribed by CFU. Some countries already have systems that are fully operational and work well – Suriname and Trinidad.

Appropriateness of existing data collection to extension for economic and socio economic data: The presence of TIP and LRS is such that the systems, and forms used to input into these systems might be used as the basis for extension to include economic and social economic data collection. In some cases the LRS system lends itself well to inclusion of socio-economic data. TIP requires the input of price data. Neither system, however, is suitable for the incorporation of the collection of input (variable and fixed) costs and output (wages and profit) data. In this respect, an alternative questionnaire and data system need to be designed.

Stakeholder support: The collection of economic data requires a great deal of sensitivity in approach, and must at the outset include support from the stakeholders for such an undertaking. It should be said that all industry organisations and most individual fishers interviewed during the field work supported the purpose of economic data collection. The basic request however was that such data should not focus on individual owners but more on a sector by sector approach in order to secure the confidentiality of individuals. It is also true to say that some resistance was encountered. This was particularly the case amongst some (but not all) industrial fishers, particularly where ownership was exclusive to non-active owners, for example shrimp trawlers in Suriname.

Sensitivity in approach: Any economic data collection process must be simple and user friendly. Particular attention must be paid to not collecting too much data that ultimately will not be utilised[4]. The history of costs and earnings exercises in Western Europe demonstrates such behaviour and in many countries where costs and earnings have featured significantly, programme designers are being encouraged to minimize data requirements, provide that the key outputs can still be realized. Experience has shown that failure to rationalize the requests for information in all areas ultimately leads to survey fatigue.

[4] The history of costs and earnings data collection processes in Western Europe (EU Concerted Action, Promotion of Common Methods for Economic Assessment of EU Fisheries, European Commission, 2001), is such that data requirements have often been too extensive, and much of the input data are rarely used. Where possible therefore, input costs should be amalgamated in order to simplify collection and collation

4. Economic data

Economic data are used to determine the net value of a fishery to the economy or to the individual enterprise. These measures are estimated from information on turnover, inputs (costs) and outputs (profit, wages and value added).

4.1 Turnover (gross revenue or earnings)

Turnover or revenue from fishing is the gross revenue prior to the deduction of costs. It is calculated by applying the trip catch data and multiplying this with the relevant price for each species caught.

4.2 Enterprise inputs (costs)

At the individual enterprise level, i.e. the vessel (or fisher if using e.g. only a speargun), inputs or costs exist in four categories:

1) **costs that depend on fishing effort**: fuel (diesel, petrol, and lube oil), repairs and maintenance, ice, food, bait and occasionally salaried wages;

2) **fixed costs** that arise even when the vessel does not go out to sea (depreciation of hull, engine and gear, truck and insurance, other costs and interest). Depreciation can vary considerably according to the item concerned. Two approaches to depreciation can be made. Either a standard rate can be assumed: interviews with fishermen suggested the following: 10% for vessel i.e. a 10 year life-span, 4 years for truck i.e. 25% per year, 1-2 years for gear, 5 years for an engine; or, fishermen can be asked what the expected life expectancy is for the vessel and other fixed costs;

3) **costs that vary with turnover** (market costs / landings dues and wages (if calculated according to a percentage of turnover); and

4) **wage shares**. It is common practice for wage shares to be calculated after the deduction of variable costs from the turnover (usually fuel, bait, ice, food). The balance is called the 'gross profit'. The distinction often lies in how the gross profit is divided. The usual practice is for gross profit to be divided into half, half being evenly distributed amongst the crew, and half being allocated to the owner, 'the boat shares'. The owner is then required to pay all other costs (repairs and maintenance, boat depreciation, interest and insurance). What may happen is that rather than 50 % of the gross profit being allocated to the crew, a lower percentage might be allocated if there is an additional provision for a skipper, and if the owner chooses to divide the boat share into three – crew, boat and gear, thus allocating one third of the gross profit to each category. One additional variant on this system is that crew might provide their own gear – traps, lines and diving equipment. In this case, the actual net wage to the crew must be adjusted to take account of the depreciation of that equipment. The collection and interpretation of the wage share could be open to debate, given the fact that as only some small variations to the standard system take place, it could be easier to assume the standard system in all cases. This is not a perfect situation, but in practice the results are broadly similar. The alternative is to instruct the interviewer simply to record the appropriate remuneration system and to enter the data into a pre designed spreadsheet accordingly. The latter option is recommended and is taken into account in the formulation of the calculations for a pre-designed model.

4.3 Fish processing

The above definitions refer explicitly to the fish catching sector. Turnover, costs and profits for the fish processing sector are not as definitive as those for the catching sector. This report does not cover the processing sector in depth, focusing instead on the 'primary phase of production i.e. harvesting' as required by the Terms of Reference.

5. Economic analysis

5.1 Enterprise outputs

There are four specific outputs that can be used to determine the effectiveness of fishing operations. These are:

1) **Net profit, also referred to as 'economic rent'**. Profit is the remaining amount following deduction of all costs, including wages but excluding depreciation from the turnover (sales).

2) **Gross value added (GVA)**. GVA is the net profit from fishing plus any wages paid to the crew. This represents what can be deemed as disposable income from the enterprise.

3) **Net value added (NVA)**. NVA is GVA less depreciation. NVA might be used to show the relative success of one fishing method against another in respect to specific enterprise of the average 'value added' per fisher.

4) **Return on investment**. This is calculated by dividing the net profit by investment costs to show percentage rates of return. A high return illustrates that the venture is profitable. This should be distinguished from long-term return on investment as defined by discounted net present values (NPVs) and internal rates of return (IRRs) (See section 5.7).

Table 1 illustrates the calculation of the turnover, costs, profit and value added for a fishing vessel with a 50:50 share of the gross profits (turnover less variable costs) between the owner and the crew. In summary:

Gross profit	=	Turnover – variable costs
Net profit	=	Gross profit – wages – fixed costs
Gross value added	=	Net profit + wages
Net value added	=	Gross value added – depreciation
Return on investment	=	Net profit / total asset values

5.2 Net value added

5.2.1 Calculation of Net Value Added

Following the calculation of enterprise outputs, it is appropriate to determine specific national economic outputs. These can be derived by taking the sum of individual enterprise outputs and raising according to the total number of fishing vessels (enterprises) assigned to each pre defined fishing method. The fishing method is usually a function of target fishery and size of vessel and should be referred to as a fleet segment (See section 6.1.1). This will produce the basic Net Value Added (NVA) per segment. Making separate calculations for each segment, enables comparisons to be made between the artisanal and industrial fisheries, and between the catching sector and the processing/marketing sectors. Appropriate calculations could similarly distinguish the economic contribution of sport fishing where it forms an integral part of fishing activity (Bahamas and Antigua).

Net Value Added (NVA) should however also take into account adjustments for subsidies and taxes. Each of the cost items presented above may entirely or partially be incurred in hard currency. For example, fuel paid for in foreign exchange, equipment such as echo sounders, hulls, engines. In almost

every CARICOM country, rebates were provided to fishermen to account for import taxes. The import tax represents an income to the Government, and as such should be accounted for at some stage. A loss of government tax from the rebates should be added to the Net Value Added from each sector.

In addition, national income accounting requires a calculation of net value added (NVA), the sum of all NVAs making up the calculation for National Sector Value Added , the measure of the sector's contribution towards the country's economic production. Net value added is determined by accounting for depreciation after the calculation of Gross Value Added.

Table 1. Calculation of turnover, cost, profit, value added and return on investment for a typical Jamaican canoe.

Catch / anum (kgs)	1	35,280	
Average price ($ / kg)	2	30	
			1*2
Turnover	3	1,058,400	
Variable costs			
Fuel	4	258,720	
Ice	5	105,840	
Transport	6	147,000	
Bait	7	30,000	
Food	8	98,000	
Total variable costs	9	639,560	sum (4:8)
Gross profit	10	418,840	(3-9)
Wage share	11	209,420	(10)/2
Fixed costs			
Repairs & maintenance	12	69,500	
Insurance	13	0	
Other costs	14	10,000	
Total fixed costs	15	79,500	sum (12:14)
Net profit	16	129,920	3-(9+11+15)
Gross value added	17	339,340	(11+16)
Depreciation	31	55,500	31
Net value added	32	283,840	17-31
Return on investment	33	41%	16/21

Calculation of depreciation			
Fixed asset value			
Vessel	18	170,000	
Engine	19	140,000	
Gear	20	3,500	
Total value	21	313,500	
Life span on gear (years)			
Vessel	22	10	
Engine	23	5	
Gear	24	1	
Rate of annual depreciation (%)			
Vessel	25	10%	18/22
Engine	26	25%	19/23
Gear	27	100%	20/24
Annual Depreciation			
Vessel	28	17,000	18*25
Engine	29	35,000	19*26
Gear	30	3,500	20*27
Total Depreciation	31	55,500	sum (28:30)

5.2.2 Calculation of National Net Value Added

Crew remuneration, salary, interest, and profit might be transferred abroad. This is a common practice where joint venture vessels are active within a country. These payments represent a loss to the national economy.

National Net Value Added (NNVA) is a measure of the income that stays in the country. NNVA is calculated simply by deducting any transfers abroad from the Net Value Added figures.

5.2.3 Gross Foreign Exchange Earnings

For many developing countries, foreign exchange earnings are of particular importance for economic growth because they allow importation of essential production inputs such as oil and machinery. Net contributions of foreign exchange can therefore be valuable indicators of alternative management

regimes. Gross foreign exchange earnings are the sum of the wholesale values of landings that are exported. Net foreign exchange earnings are net of costs that accrue in hard currency including transfers abroad of wages and salaries.

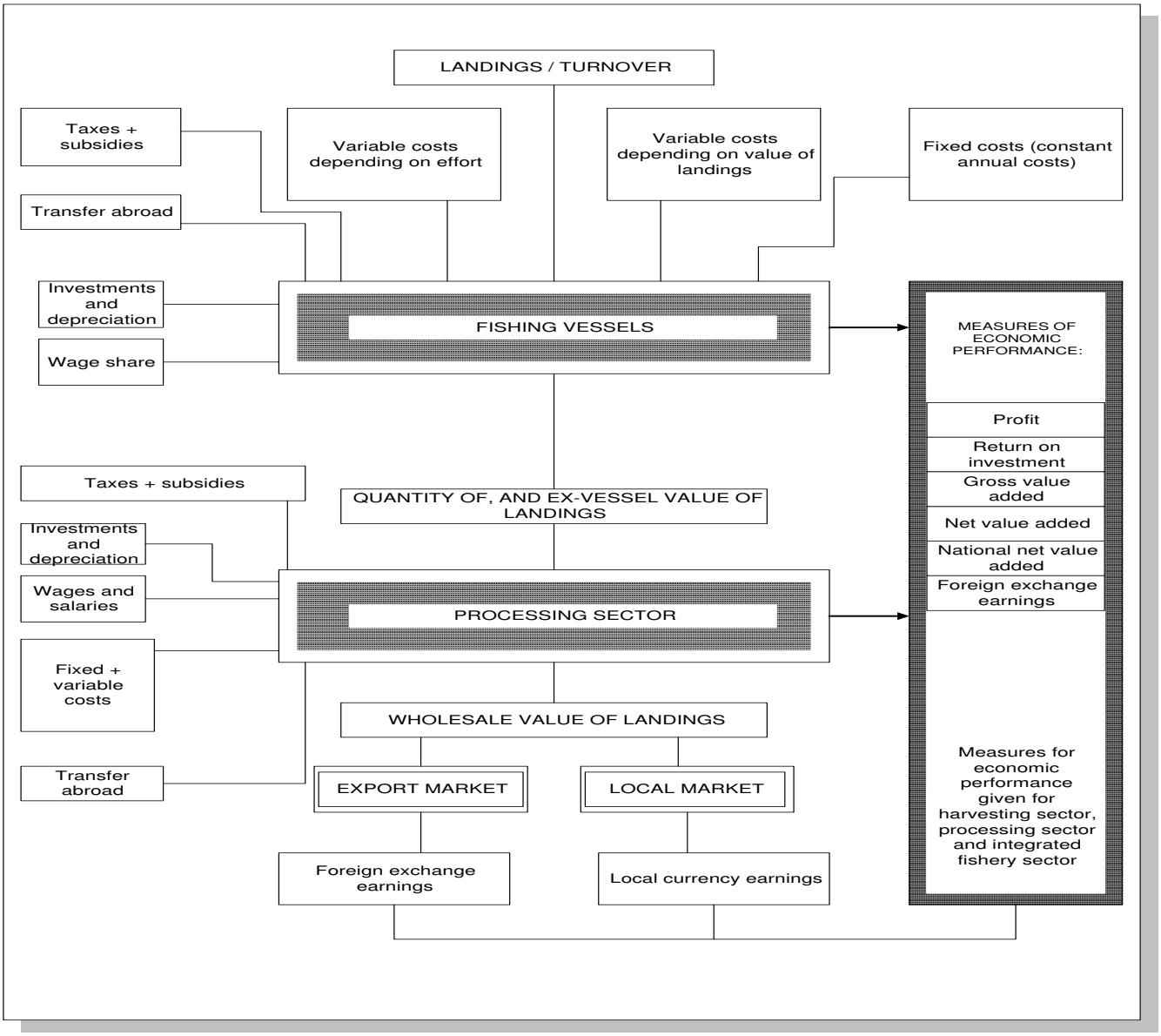

Figure 1. Schematic diagram of inputs and outputs from economic models.

5.3 Bio-economic modelling

If the quality of the data in each country is sufficiently robust, policy makers can utilise bio-economic modelling. Bio-economic modelling can predict production yield, net economic profit, gross and net value added in response to a series of management measures. Particular management measures applied in the context of economic modelling can include effort control, the effect of mesh size restrictions or the impact of closed areas. This use of bio-economic modelling requires a good subset of catch data, and

biological data. The biological technical model always precedes the economic model. It accounts for the dynamics of the living resources (reproduction, growth and mortality due to natural causes of fishing). It also describes the dynamics of fishing boats – how fishing effort is converted to fishing mortality, and how fishing mortality creates catches. In effect, it establishes the physical relationship between fishing effort and fish production.

The biological sub model should also contain some elements that are of an economic nature, specifically value. The economic sub model introduces harvesting costs and various measures of economic performance. The economic model calculates the variable costs and fixed costs of harvesting as a function of fishing effort, landings and value of the landings. It then calculates various measures of economic performance including profit, employment, national net value added according to a number of optimal scenarios: Maximum Economic Yield, Maximum Sustainable Yield and so on.

A number of different models[5] exist which require biological and economic inputs. It is not proposed to outline the basis for such models in this report, merely to identify the required inputs:

- biomass and value of the biomass
- age groups and recruitment
- natural and fishing mortality
- fleets and effort
- gear selectivity
- movements of animals & fishing pattern
- total annual landings
- ex vessel value of total annual landings
- effort per year and number of vessels
- input costs specified against those related to turnover, effort and those that are constant
- the opportunity cost of labour and capital[6]

Bioeconomic modelling allows the policy makers to assess the biological and economic consequences of applying different management measures including effort control, gear regulations, closed seasons, the effects of economic incentives and equating balances in exploitation, artisanal versus industrial. The outputs illustrate the following:

- changes to economic rent / profit
- changes to gross and net value added
- changes to employment

[5] BEAM 4: FAO COMPUTERISED INFORMATION SERIES No. 403; Seijo, JC; Defoe O; Salas, S: Fishery bioeconomics, 1998: Theory, modelling and management

[6] Opportunity cost of labour and capital makes the assumption that labour and capital costs for the sector should be discounted if there is underemployment and there are few alternative occupations for fishers or their assets (e.g. vessels being used as transport ships)

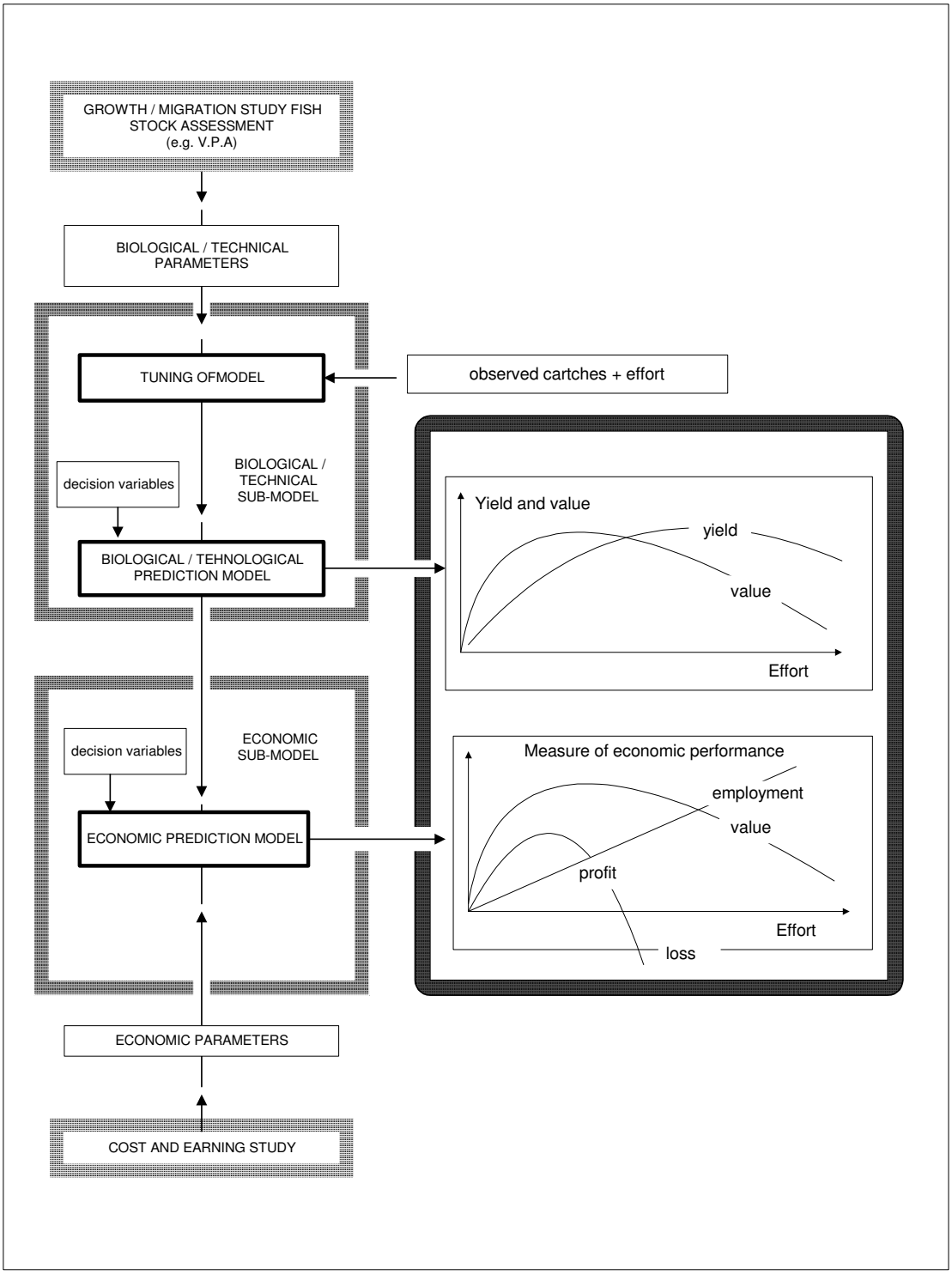

Figure 2. Schematic diagram showing inputs and outputs to bio-economic modelling (source BEAM4 manual).

5.4 Impact assessments

A common desire throughout fishery departments is to respond to a series of political questions that require examination of the short-term impacts on fisheries. Stakeholders and Fishery Departments alike raised the needs to analyse the impact of hurricanes and the impact of loss of access – e.g. due to the closing of areas as 'MPA's or for aggregate dredging. With the appropriate data, assessments such as these are easy to calculate and present very visible support for the principal of economic data collection if the argument relates to financial compensation.

The principal of economic loss as a result of loss of access is to take account of the reduction in revenue caused by the displacement (usually resulting in lower catch rates and fewer trips within a restricted period), the change in some costs, i.e. those relating to turnover, those that are fixed, and those that relate to fishing effort. The assessment of loss is to take account of the loss in net value added to the sum of enterprises affected, following the reassessment of revenue and costs against historic revenues and costs. Such an exercise is simplistic to the extent that it ignores the fact that vessels might choose to fish elsewhere. In which case, it is possible that such transference of effort will automatically impact on others, previously not affected by the issue. Table 2 illustrates an example of how to calculate loss as a result of both a decline in catch and a decline in fishing days. Some costs are a direct reflection of effort or days at sea (fuel, ice, food, repairs and maintenance); some are a reflection of catch (transport); some are fixed (insurance and depreciation[7]). The calculation of the loss is determined by deducting the new net value added figure, taking account of the adjustments to the wage share and the adjustment to net profit less depreciation, from the historic value added.

Calculating the impact on profitability associated with hurricanes requires an assessment of the following:

- fixed gear losses – vessels and gear (largely pots), and adjusting the depreciation rates for the lost equipment to 100%;
- equating loss in fishing revenues against the specific unit losses; and
- taking account of the specific costs of reparation (to vessels).

5.5 Costs and benefits of different taxation strategies

Policy makers may wish to examine a number of taxation issues affecting individual enterprises and the segment as a whole. These include:

- Adjustments to the fuel and capital rebates and the impact on enterprise profit and national income
- A licence levy and impact on individual profits and rates of return. Setting a levy requires that the rate is sufficient not to prejudice reinvestment. Or, if profits are too high a levy should be imposed in order to prevent a 'klondyke' into an open access fishery. The advantage of an appropriate model is that it can also show to administration what the likely tax income would be as a result of testing a number of charging scenarios.

[7] If making an assessment such as this it is always best to identify which costs are a function of what. For example a cost such as transport could also be linked to effort, turnover or catch.

Table 2. Impact assessment of economic loss as a result of loss of access.

Catch / anum (kgs)	1	35,280		Catch / anum (kgs)	34	25,000	
Average price ($ / kg)	2	30		Average price ($ / kg)	35	30	
Number of days	44	200		Number of days	36	175	
			1*2				34*35
Turnover	3	1,058,400		Turnover	37	750,000	
Variable costs				*Variable costs*			
Fuel	4	258,720		Fuel	38	226,380	(4/44)*36
Ice	5	105,840		Ice	39	92,610	(5/44)*36
Transport	6	147,000		Transport	40	104,167	(6/1)*34
Bait	7	30,000		Bait	41	26,250	(7/44)*36
Food	8	98,000		Food	42	85,750	(8/44)*36
Total variable costs	9	639,560	sum (4:8)	*Total variable costs*	43	535,157	sum (38:42)
Gross profit	10	418,840	(3-9)	*Gross profit*	45	214,843	(37-43)
Wage share	11	209,420	(10)/2	Wage share	46	107,422	(45)/2
Fixed costs				*Fixed costs*			
Repairs & maintenance	12	69,500		Repairs & maintenance	47	60,813	(12/44)*36
Insurance	13	-		Insurance	48	0	13
Other costs	14	10,000		Other costs	49	10,000	14
Total fixed costs	15	79,500	sum (12:14)	*Total fixed costs*	50	70,813	sum (47:49)
Net profit	16	129,920	3-(9+11+15)	*Net profit*	51	36,609	37-(43+46+50)
Gross value	17	339,340	(11+16)	*Gross value*	52	144,031	(46+51)
Depreciation	31	55,500	31	Depreciation	53	55,500	31
Net value added	32	283,840	17-31	Net value added	54	88,531	52-53
				Total loss	55	195,309	32-54

In most fisheries, the issue of subsidy has in the past led to excessive over-investment. However, within an island context, withdrawal of subsidy could have extensive socio economic effects on fishery dependency, particularly where there is under employment in particular economies. This illustrates the need to gather socio economic data that will identify the extent of dependency and where fishing communities might be close to the poverty threshold. It is quite possible for example, to retain a subsidy in respect to capital allowances or expenditure rebates for specific artisanal communities.

5.6 Use of indicators

The Model produces economic assessments for gross, gross and net national value added. Provided that the Model is updated annually, it will be possible to compare the economic results from one year to the next. Whilst this is a useful comparator, what may be more appropriate is to take management decisions, such as closed seasons, to predict the likely economic impact (through modelling), using projected outputs in terms of profits and labour (economic output indicators), and assessing the results against the annual returns from the costs and earnings survey. Economic / labour outputs in excess of the predicted results will show a favourable outcome. In which case it will be important to determine why the outputs are beyond expectations. A negative result will require an assessment as to why the targets were not achieved, i.e. were they too ambitious, or where there other reasons (such as non compliance, environmental factors) which severely distorted the expected results. With these assessments in hand, the policy evaluators will be able to set management objectives which might overcome the negative outputs.

In Western economies, value added per segment is used to gauge the extent to which industries have benefited from particular policy strategies. This is to some extent over simplistic, but positive economic growth coupled with a well-managed fishery is indicative of a successful industry.

5.7 Evaluating the costs and benefits of different strategies

Cost benefit analysis is used as a mechanism to gauge whether infrastructure investments (costs) might be justified. The existence of primary micro economic information allows policy makers to gauge benefits in terms of additional income generated from an investment, against the costs of the investment.

The type of benefits that might accrue would include:

- Price increases as a result in quality improvements (Improved marketing facilities)
- Leisure time savings as a result of time savings to fishermen where the distance between the fishing site and landing site is reduced
- Reduction in damage to vessels as a result of investments that avoid buffeting or allow fishermen to take fishing vessels out of the water in rough conditions
- Other cost savings e.g. fuel if repair facilities are provided which are closer

The costs are those actually made for the investment concerned. The rates of return, Net Present Values (NPVs) and Internal Rates of Return (IRRs) are discounted so as to show the rates in real terms, taking account of inflation.

5.8 Spreadsheet model of economic activity by segments

A generic Excel model showing the links between enterprise data and the calculation of Net Value Added for the Fishery Sector has been prepared to accompany this report. The model, 'Outline Spreadsheet' illustrates the approach required in interpreting costs and revenue data,. It produces economic outputs in the context of average expectations per segment (Segment 1, Segment 2, Segment 3 and Processing) and an amalgam of these (Economic Summary). The spreadsheet demonstrates the calculation of inputs and outputs for individual enterprises (usually vessels) and the raising of these figures to the national outputs from each sector.

The Model conforms to a generic, as opposed to a specific national approach This is largely because of the general similarities in Costs and Earnings structures in fisheries per se, similarities in terms of strengths and weaknesses of the existing data collection systems applied by the Fisheries Departments, the need to ensure shared quality control, and the need to produce data which are comparable between all the CARICOM countries.

5.8.1 Fishing vessel (enterprise) inputs and outputs

The first three pages of the spreadsheet (Segment1, Segment2 and Segment 3) allow for the entry and analysis of costs and earnings data for up to ten vessels (enterprises), randomly selected from each segment (see Section 6.1). Separate data are entered in each of two fishing seasons (Section 6.1.3). The average costs and earnings for these segments are estimated in columns C to G in the Economic Summary page. For countries with more than three segments, additional pages and columns may be inserted.

The Segment* pages are divided into eleven sections (I to XI) shaded as different coloured blocks. The inputs are made in the cells with bold black outlines, and the outputs are displayed in the blue shaded cells. The specific calculations are coded from A to BK.

Block I stores the reference data for the sample: the data collector code or name, date of collection, landing station, boat type, boat ID and average number of fishers.

Block II calculates 'revenue' or earnings, as the product of species catches and prices / kg. The total revenue is automatically calculated from the input data. Up to 6 species (SPECIES 1- 6) can be placed in the model and renamed according to the species concerned. These apply to both the 'high' and 'low' season. The user should overwrite SPECIES 1-6 to represent the actual species landed,

Block III outlines the questions and outputs referring to the calculation of variable costs. These relate to fishers' identified inputs (FUEL, ICE and BAIT) and prices per unit (lb (or kg)); fish landed (LANDING DUES (%) and TRANSPORT to the market (if applicable); and running charges (LUBE OIL and FOOD). Users may need to change cost / fish landed if costs relate to AVERAGE CATCH REVENUE.

Block IV identifies specific inputs required to calculate the wage shares. These inputs determine the relative wage shares (depending on the share remuneration system used), and ultimately the wage outputs as calculated by deducting wages (Block IV) and variable costs (Block III) from Block II (Revenue). The data collector determines the share distribution. All shares, V:Z, should equate to the sum of the shares, U. Crew, skipper, net and engine shares are shown. Other extra shares may be added if needed (cook, engineer). This system is widely used throughout the Caribbean. The wage shares are automatically calculated from the share distribution (cell AA). As and when the remuneration system differs, the data entries can alternatively be made in cells AD or AF. If so, enter'1' in cell U and zero in cells V:Z.

Block V refers to the calculation of repair / replacement costs. These costs are treated separately from variable costs since they are deducted after the derivation of the wage share.

Block VI identifies the number of trips and the average number of days per trip. Two periods are chosen to reflect a bi-annual variation, high season / low season. Variations may be used to refer to fishing activity during open and closed seasons, changes in fishing area, or changes in fishing method.

Block VII identifies other annual fixed costs (INSURANCE and LOAN INTEREST). These costs are divided by the TOTAL NUMBER OF TRIPS IN SPECIFIED SEASON. 'High' and 'low' season inputs are required. No cells should be left empty, but zero is sufficient if users are working off one collection per year (when there is no seasonal differentiation). In many cases insurance costs are only incurred by industrial vessels and not by smaller vessels.

Block VIII summarises the 'net trip indicator' outputs, net profit and gross value added per trip before calculating the cost of depreciation. As and when there are no costs, data entries require a '1' to be entered into each fixed asset life expectancy row.

Block IX calculates annualised depreciation costs for the fixed assets (vessel, traps etc), based on their initial costs and life expectancies.

Block X is used to define other income. It is known that some vessels, at least for a small proportion of the year, undertake other duties as well as fishing. Whilst this has no bearing on fisheries related issues (and modelling fishing activity), it does relate to income generation.

Block XI summarises the annual costs and outputs for each vessel in the sample.

5.8.2 Fish processing inputs and outputs

The 'Processing' page allows for the entry of economic data on up to six processing plants. The section is largely input orientated. Information is invariably available from published management accounts and can be incorporated with ease.

Block I refers to the interviewer, location, date and company details (employees and operational days).

Block II estimates total annual sales by species type. These data may require a breakdown or estimates to be provided by the processing company. In some cases, customs export data will largely reflect total factory sales.

Block III refers to total raw material prices. As with sales, estimates may be required, However, in some cases the sum of direct vessel sales to individual processing companies are available.

Block IV refers to the input of processing costs. These are usually available direct from the Company accounts. Depreciation is usually a stated cost.

Block V refers to the economic outputs: net profit, gross value added and net value added.

Block VI refers to transfers abroad.

5.8.3 Economic outputs

This 'Economic summary' page estimates the average revenues and costs from the samples and provides estimates of national outputs for each segment.

Block I refers to input data (number of vessels / factories / operational days) which are required to raise the sample to the total net value added for each sector.

Block II estimates the average costs and outputs for vessels in the sample.

Block III converts the average costs per segment (Block II) to national estimates using the total population figures (Block I).

Block IV identifies the economic outputs for each segment, which are totalled on the right to give the fishery sector net value added.

Block V identifies the data which are invariably used as inputs for bio-economic models: total species caught, costs that are dependent on effort, costs that are dependent on turnover and fixed costs. Various economic models may require other inputs. These can be extracted from the data in the Model.

6. Approaches to costs and earnings data gathering

There are two principal approaches to gathering data in costs and earnings exercise. One is to require respondents to complete a questionnaire, by deriving from his / her own records or accounts, summary input and output costs, profit, depreciation and so on. This task is time consuming for the respondents, data collectors, and more often than not alienates the stakeholders. Moreover, it requires direct inputs from specific stakeholders who may be concerned about issues of confidentiality and tax implications. Many fishermen do not pay taxes in developing countries.

The approach commonly adopted therefore is to calculate inputs from existing data (for example from TIP) if available, or alternatively by asking a series of questions– number of crew, trip length, crew share system – that can be used to calculate what the inputs and outputs are. This approach requires that specific fleet segments be identified. Each segment is based on a target fishery, fishing gear used and size of vessel. Table 3. below illustrates the specific segments that are likely to appear in the CARICOM countries.

The attached model (Outline Spreadsheet) provides the generic methodology by which data can be collected and collated. The outputs relate to trip length and are raised to produce estimates for each fishing segment on the assumption that all the active vessels within the fishery have been identified.

6.1 The approach

6.1.1 Vessel segments

Assessment is made on the basis of the key types of fishing vessels within the region. Since these vessels target specific fisheries, extrapolated data can not only produce estimates of value added and illustrate the contribution by fishing method to the economy, extracted input costs can also be used for bio-economic modelling. Adjustments to micro economic data can also be used to assess the impacts of loss of income.

Most fishing operations are small-scale using open, outboard powered vessels under 12 ft in length and simple fishing gears such as traps (pots), handlines, longlines, gill nets, beach seine and trammel nets. These small-scale fishing operations have only one to three crewmembers that take day fishing trips in waters near their home community or fish from the beach. Most fishers are full-time with limited non-fishing sources of income, but on occasions, alternative occupations or movement in and out of fisheries on a seasonal basis can be significant. To a lesser extent, larger boats are used for conch and lobster in the Bahamas and Jamaica (possibly also Dominican Republic); for shrimp and groundfish off the north coast of South America; and with specialized gear to target large pelagics (Barbados). The fishery can be generally classified as open access, as anyone who cares to fish can do so and there is little control over access or effort.

32 different segments can be identified as key fisheries within the CARICOM region (Table 3). The number of distinct groups per country ranges from 3 to 20, Suriname having the greatest number of different fisheries segments. Appendix 3 illustrates the distribution of segments identified.

Table 3. Summary of different segments identified in the CARICOM countries.

Trap fisheries	No. of countries		No. of countries
Traps (< 12 ‘) (unmechanised)	13	**Cast net**	2
Traps (< 12 ‘) (mechanised)	13	**Drift net**	
Traps (12-30’) (unmechanised)	12	< 10 m	2
Traps (mechanized)	12	> 10 m	2
Traps > 30’	4	**Chinese seine**	
Scuba / free diving		< 10 m	2
Scuba diving (conch) (<10 m)	8	> 10 m	2
Scuba diving (conch) (> 10 m)	4	**Bank net**	1
Scuba, hooker & free diving (< 10 m)	6	**Seine net < 10 m**	1
Scuba , hooker & free diving (> 10 m)	4	**Shrimp trawl**	
Handline / troll		< 10 m	1
<20’	15	10-12 m	1
20-30’	9	Twin / multi rig	2
30>	8	Seabob	2
Long line		**Finfish trawl**	1
< 25 ‘	11	**Bank net / pin seine**	1
25-34’		Beach seine fisheries	2
35 +’	5	Sea urchin	1
Gill net	4	Mixed	++
< 25 ‘			
> 25’	6		
	3		

Source: Appendix 3

The segments above show that each fishing method might involve vessels of different sizes and classes. However, each of these sub groups will exhibit similar fishing patterns. The same fleet segments are recommended for each country to allow for comparisons. It becomes especially important to be able to agree fleet segment definitions where there are jointly managed fisheries, for example shrimp trawl or migratory pelagic fisheries (long line).

If vessels use more than one method, they should be either assigned to a general category (mixed or polyvalent), or where the method forms the majority, be assigned to a specific fleet segment. The definition of the division between mixed and specialised segment is an issue that should be decided collectively between countries.

Whilst a distinction needs to be made according to method, having identified specific segments, it becomes comparatively easy to prepare specific costs and earnings returns on a segment-by-segment basis. However, this may be something that will evolve during the course of the exercises. For the moment, it is proposed to work with the same basic template for all the segments.

6.1.2 Sample size

The amount of resources applied to gathering costs and earnings data can be as extensive as the time and expense dedicated to the collection of catch and effort data. However, the limiting factor as identified in Section 3.2 (Resources) is the human data collection constraint. As a counter to this, the data sets need to

be sufficiently robust to be able to produce net value added information. This requires that each segment is identified and where regional disparities exist, such as the differences found in the North and South of Jamaica, or amongst the different islands of the Bahamas, a more extensive segmented approach, that shows regional differences, may be required. There are no definitive rules to sampling economic data. The resource constraint suggests that provided that the fisheries are consistent, each segment should yield a response rate of 10 vessels[8]. If the sample total number of vessels falls below 10, then the target should be around 4 vessels per segment. Where vessel numbers fall below this figure, the data manager has the choice of either ignoring the segment all together (for example marginal segments), or achieving full census coverage.

6.1.3 Time frame

The required time scale for sampling may be annual, or if there are seasonal distinctions bi-annual. The Model caters for 2 sub seasons. This can be altered to allow for more variation.

6.1.4 Survey population size

The extent of coverage of a segment may be as much determined by budget as by management priorities. Analysis might be restricted to what is practical with a restricted time frame. However, based on the interviews a governing factor faced by all fishery departments were to respond to the requests from Central Government to appropriately value the sector. For this reason, and in view of budgetary constraints it is presumed that all segments will have to be covered.

6.1.5 Data collectors

The success rate in achieving responses will vary a great deal according to whom is deployed as the data collector. Data collectors who are familiar to fishers will achieve markedly higher response rates than for example students who have no experience in the fishing industry or familiarity with the interviewee. The latter option is in fact likely to be more costly since inexperience might also reduce the quality of the returns.

6.1.6 Questionnaire

A sample questionnaire, dedicated specifically for the collection of costs and earnings data, as opposed to socio economic data is shown in Appendix 4.

6.1.7 Summary of data collection and analysis steps

The recommended approach for economic data collection and analysis will require the following generic steps:

1. Identify national fishery segments maximising comparability within region.

2. Identify segments to be sampled, depending on objectives of analysis.

3. Randomly select target vessels and landing sites as appropriate.

4. Identify strengths and weaknesses of existing data – prices and catch information and how these can be overcome.

[8] The CFU March 2003 workshop determined all segments should be represented by a sample size of 10.

5. Identify separate fishing seasons / alternative target fisheries if appropriate.

6. Train data collectors.

7. Commence enterprise interviews using Questionnaire in Appendix 4. Target 10 vessels/enterprises per segment in each of two or more fishing seasons ('main' season, 'off' season etc) as appropriate to segment.

8. Seek data from processing plants as required for spreadsheet Model.

9. Identify questionnaire / sample / interviewer weaknesses and the reasons for any failures to achieve the required outputs.

10. Compare shortcomings internally (between data collectors) and produce an outline of specific ideas for improvement.

11. Enter data into 'Outline spreadsheet' Model, adding extra pages for segments etc as required. Data manager to screen data entries and ensure results correct.

12. Share analysis with other CARICOM countries.

13. Rectify any shortcomings, preferably consistent with the approaches adopted elsewhere.

14. Produce and collate outputs as required.

The consultants advise a generic approach to the issue of data collection and collation. The inputs and outputs do not vary greatly from one segment to the next, and it is important from a comparative perspective to ensure that the outputs are consistent. The suggested approach and methodology will inevitably encounter problems: costs and earnings data collection must be seen as an evolving process. The data system and approach will require monitoring and adjustment until it is working well in all countries.

6.2 The variables

6.2.1 Fishing seasons

The model seeks to differentiate between a high season fishery and low season fishery. Additional seasons can be added if it is perceived that significant month-by-month variations exist within each fishery. Seasonal differentiation is put into the model because fishermen identified seasonal variations in fisheries. Some fisheries – conch and lobster, also have closed periods, at which time, fishing effort is diversified into other fisheries.

6.2.2 Area fished

Vessels will diversify their activities from one area to another. This may be linked to the fishing seasons.

6.3 The data

6.3.1 Catch data

Catch data can be derived in one of two ways. Direct questions can be asked to the respondent in respect to specific or average catches per trip. The preferred approach would be to extrapolate representative data from TIP, for the specific vessels interviewed for two periods that are deemed to represent changes to seasonal catch averages.

6.3.2 Fish prices

Price data are required to provide estimates of turnover. The usual practice is to seek average price information from fishers or from processors. If extrapolating price data, it is important to derive a weighted average price that takes account of both the average weight of the species caught and the differential price paid according to market outlet – direct beach sale, or direct to processor. Adjustments can be made to the model to cater for this.

If weight frequency data were available, and prices vary by size category, it would be appropriate to use prices that correspond with such categories.

6.3.3 Derivation of input costs

The approach to identifying input costs is to ask questions in respect to costs that can be associated with the most easily identified time period. Most variable costs – fuel, food, ice, harbour charges, bait, and market charges are easily recognizable on a trip basis because they form an integral part of the operating costs and wage remuneration system. Fixed costs occur on occasions and can be identified over longer time periods.

6.3.4 Derivation of labour shares

The remuneration system can be calculated in a number of ways. Wages may be based on a percentage of gross profit after deduction of variable costs; an extra proportion of this, usually 1 share may be allocated to the skipper. On occasions, vessel owners might pay fishers a fixed percentage of the turnover, or alternatively a fixed wage, irrespective of the turnover.

6.3.5 Derivation of depreciation

The most significant problem in respect to depreciation is deciding on the appropriate life period of an asset. There are no conventional amortisation periods because the life expectancy of an asset in an artisanal fishery can change considerably. The biggest variations occurred in trap fisheries. Pot theft or substantial losses caused by hurricanes could seriously distort the life span of the asset. The approach taken in the model is for the respondents to relate their own expectations to amortisation time scales.

6.3.6 Processing costs

Processing costs are usually derived from the management accounts produced from each company. The key variables, if seeking to gross up average turnover / cost estimates are operational days and employment. This issue may be somewhat academic as each country has a limited number of plants, economic data is regularly published, and as such it will possible to incorporate actual revenue and cost data into the model. Sales data (conch, lobster and shrimp) can also be derived from the national export returns.

6.3.7 Additional vessel income

Many fishers use their vessels for other functions. Examples might include charter parties for angling, boat taxis during fishing competitions, transportation between islands etc. This income (and the costs incurred) should be itemized separately. There is provision to do this within the Model. However, if vessels are significantly involved in angling, as is the case in countries such as Bahamas, Antigua and Trinidad & Tobago, the basic format of the model can used to assess the economic contribution from angling. Specific questions that are not appropriate, such as labour remuneration, can simply be ignored.

6.4 Other issues

6.4.1 Data collectors responsibilities

The data collector will be responsible for selecting the fisher, interviewing and transposing the data onto the spreadsheet. Fishers should be randomly selected from a sampling frame listing all the boats in the segment.

6.4.2 Safekeeping of data (confidentiality)

All responses will be treated as confidential. The name of the respondent will not be placed on the form. Information will be retained in a safe place.

6.4.3 Methodology / strategies for data collection

Sample selection will be decided by the interviewers / Fishery departments based on their experiences of typical fishers in the region.

6.4.4 Reporting and training needs

Summary reports will be kept to show the extent to which the segment sample has been covered, and the successful hit rates of each of the interviewers.

7. Socio-economic issues and questions

7.1 Issues

In addition to the economic data requirements and collection methods described above, countries in the region may also find it useful to consider the collection of socio-economic data. While the need for such data was rarely highlighted in the country visits (the exception being Trinidad) as being among the priorities for staff in Fisheries Departments, data can be useful for a number of reasons:

Firstly, to highlight and measure absolute and relative levels of poverty, between fishing communities and compared to other sectors. Clearly this is important, both from the perspective of developing appropriate policies and interventions that benefit the poorest and most socially excluded. Such data can thus help to motivate support for the fishing sector from both central government and external donor agency funds.

Secondly, socio-economic data collection sheds light on aspects relating to the distribution of wealth and benefits within the fishing community itself. An understanding can therefore be gained about gender equality, indebtedness, credit arrangements etc, and how the wealth generated from fishing is shared between different groups. Again, this is important to inform the policy process and provide information on which the impacts of interventions can be gauged. For example, if government attaches a greater weight to the benefits accruing to small-scale fishermen and crew members than to large-scale fishermen, social benefits would increase as a result of changes in the sharing system which increases the share of the crew, or as a result of a fisheries regulation which allocates more coastal resources to small-scale fishermen by banning trawlers close to shore, even if total fishing effort is not reduced and total fishing income has not increased.

Thirdly, socio-economic factors can play an important role in determining the success of many fisheries management regimes. For example, attempts to limit access are more likely to be successful where employment opportunities are available in other sectors, or where possibilities exist to earn as much in other sectors. In theory, fishermen will stay in the fishery as long as they earn an income at least as high as the opportunity cost of their labour and capital. However, in practice, even when fishermen are earning less than they could in other occupations, many do not leave fishing i.e. there is not perfect mobility of labour and capital. Socio-economic data can help to inform us why this is the case e.g. a lack of occupational and geographical mobility may result from isolation, low education, cultural taboos, inability to liquidate assets, indebtedness etc. Many fishermen simply prefer the fishing lifestyle to land-based jobs.

The collection and analysis of socio-economic data is especially important to focus attention on the issue of poverty in small-scale fishing. While economic growth has helped to reduce the number of poor people in the world, the positive impacts of growth on poverty have been less than expected, in part because of inequitable distribution of the benefits, population increases, and the effects of the HIV/AIDS epidemic. As a result there has been a re-focusing on poverty from many governments and donor agencies. The 1990 and 2000 World Development Reports published by the World Bank, the 1995 UN World Food Summit for Social Development, and the UN Millennium Declaration adopted in 2000[9], all considered poverty alleviation as a principal priority.

In the past, while many development interventions were implicitly aimed at reducing poverty, most were not explicitly focused on improving the living conditions of poor people but aimed at accelerating economic growth through technology and infrastructure development, and market-led economic policies.

[9] The Millennium Declaration contains the commitment to halve, by the year 2015, the proportion of the world's population whose income is less than one dollar a day.

The lack of an explicit focus on poverty and socio-economic issues may in part explain why many interventions have been neutral in their impacts on poverty, and some may actually have been detrimental.

It is increasingly acknowledged that poverty is a very complex, multi-dimensional concept, has many determinants, and is about much more than just low earnings i.e. income poverty. An explicit emphasis on poverty is therefore necessary to better define and understand it, both so as to be able measure progress towards poverty alleviation targets, but also to gain an improved awareness of whom it affects, and what are the most effective strategies for tackling it. Poverty in small-scale fishing communities, as in other sectors, is difficult to measure. While there are many studies on poverty in farming communities and the urban poor, there are few empirical studies focussing on fisheries. Those that have been undertaken have often focussed just on income, and on the fishers themselves, rather than on a broader concept of poverty in fishing households and communities.

There is now an acceptance that poor fishers and their dependents are not a homogenous, unchanging group of people. The level of absolute and relative poverty, within and between small-scale fishing communities, varies considerably by area, country, and region. Despite the certain existence of poverty traps within fishing communities, people move in and out of poverty, as well as becoming more or less poor. Fishing communities are often relatively cash rich, compared to farming communities, mainly because they deal with what is often a relatively high value commodity., They remain vulnerable, however, to sudden changes or losses of earnings. These changes in well-being mean that vulnerability is perhaps as important as poverty as an issue, and while related, is different from poverty. Some factors may be important determinants of poverty, but not of vulnerability, and vice versa.

Small-scale fishing communities are vulnerable to many events, the outcome of which may be poverty. Examples include: climatic/natural events such as yearly and seasonal fluctuations in stock abundance, poor catches, bad weather, and natural disasters such as cyclones and hurricanes; economic factors such as market price fluctuations, and variable access to markets; and the dangers of working at sea. But those in small-scale fishing communities may also be vulnerable to poor health and other wider determinants of poverty. There is an important need to better understand what makes fishers vulnerable to events and factors that result in poverty, what makes improving livelihoods difficult, and what are the solutions.

Socio-economic data collection can help with such an understanding, and with the hard choices that may have to be made when identifying solutions to poverty, as there can inevitably be trade-offs. Unfortunately, in the fisheries sector there is often a lack of empirical work on the costs and benefits of such trade-offs, but some examples include:

- low prices for domestic consumers to increase protein intake vs. higher prices for fishers to increase incomes;
- exports vs. national consumption;
- supporting production through credit vs. sustainability issues; and
- equity vs. efficiency of different management regimes.

7.2 Socio-economic questions

There is a huge amount of socio-economic data that could of course be collected, but as mentioned above in relation to economic data, it is important to bear in mind the practical constraints of financial resources for data collection, time commitments of staff, and the willingness of fishing communities to provide information.

Because fishing is usually one of a number of household strategies aimed at supporting sustainable livelihoods, it is usual for socio-economic data collection to take the household as the unit of analysis. Appropriate questions and data requirements include:

1. Number of household members

2. Occupations of those in the household, by gender, and the role of individuals in the fishery, and in other occupations: full owner, co-owner, skipper, crew

3. Work status: Full time, part time, seasonal. State number of days per year in fisheries

4. Absolute amounts, and % of household income derived from fishing and non-fishing (in cash and non-cash forms), and % from different types of fishery-related activities e.g. catching, processing, support services

5. Age of household members by gender: < 16, 16-35, 35-50, 50-65, 65 + (or variants as specified by national labour departments of the central statistics offices)

6. Nationality of household members

7. If foreign national, percentage of income repatriated

8. Description of assets, fishing and non-fishing
   - Human (e.g. training, literacy, education: none, elementary, primary, secondary, post secondary, college/university)
   - Social (e.g. membership of fishing and other organisations)
   - Physical (e.g. house, material durables, etc)
   - Economic (e.g. fishing boat etc)
   - Natural (proximity to inshore stocks, etc)

9. Household expenditure by category and amount (e.g. food, health, education, social etc)

10. Household consumption levels, by category and amount

11. Number and amount of loans outstanding

12. Source of loans: commercial bank, development bank, processor, co-operative, fishermen's association, money lender, family, friends

13. Interest rate charged

14. Period of loan

15. Security for the loan

16. Market sales outlets: % to processor / co-op, % sold on beach market, % consumed in household, % sold privately (hotel and other own distribution network)

17. Key threats to household incomes?

18. Household strategies to deal with vulnerability, in terms of:
    - Ex-ante risk management
    - Ex-post management e.g. after hurricanes

7.3 Analysis of socio-economic data

The costs of collection will be minimised if the socio economic data are collected as part of the fisher registration. The number of responses to the questionnaire will be governed by the success of the fishers register in each country. Failure to have a comprehensive register of fishers and fishing vessels will simply mean that data collection will have to be undertaken by another means. The costs of such an approach will be prohibitive and will require the use of a dedicated team of data collectors. This approach is not recommended.

If incorporated as part of the fishers register / LRS data base, the time factor in answering questions is unlikely to be a major problem given the fact that some countries are already collecting socio economic data in some form or another. A dedicated survey would be prohibitive in cost terms.

It is suggested that analysis of the data be co-ordinated either through a central organisation, CFU or at least as part of a joint project which can be jointly funded by an external agency. The Donors (FAO, World Bank, DFID) are likely to be supportive of such work and may well provide the funding. Providing that the Fishery Divisions followed a standard questionnaire template, the costs of analysing such data should be minimal. Analysis could be subcontracted to the University of the West Indies, thus ensuring adequate co-ordination and supervision of students.

8. Country issues and the application of the Model

The approach adopted in this report has been to establish a common model for socio-economic data collection and analysis. It is possible that this may be amended to suit the specifics of a given fishery segment, or particular variations that are likely to take place from country to country. However, it is recommended that consistency be retained in the methodology and outputs. The following sections describe a number of key issues relevant to the application of the model in the study countries.

8.1 Antigua & Barbuda

8.1.1 The demand for data

The national policy makers have set two specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are:

- Identifying the relative economic importance of the segments (value added), including the sport fishery and employment dependency on fisheries.
- The need to measure the appropriateness of structural investment decisions

8.1.2 Specific issues

The country's data collection could be said to be in a transition phase, moving to a stratified sample. Two key constraints lie in the inability to comply with the current data collection demands and also the reliance on the Health Ministry to collect data in Barbuda. These problems are likely to persist and what is clear is that the Department will require strengthening if it is to seriously consider undertaking an extension in data collection to allow for the required economic analysis. This was the request of the Department of Planning, Central Statistical Office and Caribbean Central Bank.

A summary of the specific problems found in the country is as follows:

- Lack of knowledge of the exact number of active fishermen (part time status of many fishers, not sure which vessels are active and which are not)
- Lack of knowledge of the state of the stocks
- Under staffing of MALF
- Fisheries division is too multi faceted
- Fishermen are not organised
- Poor infrastructure and fish handling
- Marketing deficiencies
- Limited equipment and technical skills
- Socio-economic problems – mobility in and out of the sector, low status of fishing, fishing as the last resort
- Lack of finance
- Poor knowledge of fishery systems and management – no limited entry system
- Some inadequacies in sampling (non trap fisheries) and difficulties in some areas outside St Johns
- Inadequate availability of price data
- Not all fishermen / fishing vessel owners renew licenses on an annual basis (as such data sources might not be sufficiently comprehensive)
- Some sales / transfers at sea to French registered vessels which may go unrecorded.

8.1.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 6 specific fishery groups that form the main component of the island's fishing activity. In essence, this requires that a return of around 10 vessels per sub set be attained. A specific sub sample may also be required for the Barbudan lobster trap fishery. The sample set is therefore likely to comprise of the following:

- Antiguan spiny lobster trap fisheries (vessels under 30')
- Barbudan spiny lobster trap fisheries (vessels under 30 ')
- Antiguan spiny lobster trap fisheries (vessels over 30 ')
- Reef fish trap fisheries (vessels under 30 ')
- Scuba diving for conch
- Handline fisheries (over and under 30 ')
- The sport fishery / trolling

With the exception of the Barbudan lobster fishery, it is presumed that the fisheries are typically representative of an average vessel irrespective of location. It should also be noted that if the outputs are to meet with the required demands (net value added for the sector as a whole), accurate annual vessel registration is required so as to determine the size of the fishing population. This is particularly important in respect to Barbuda as the island's fishing population fluctuates from one year to the next.

It is recommended that the Ministry also seek to obtain on an annual basis, financial returns from the fish processing sector. This is a pertinent issue as processors are losing access to suppliers as a result of transfers between indigenous vessels and vessels from the French Islands. This inevitably results in a loss in value added to the sector.

8.1.4 The costs of collection

Assuming a target sample size of 70 vessels, surveyed on a bi-annual basis (once per main fishing season) at a survey rate of 5 vessels per sampler per day, the economic survey would cost the equivalent of 28 person days plus transport.

8.2 The Bahamas

8.2.1 The demand for data

The national policy makers have set four specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are:

- Identifying the relative economic importance of the segments (value added), including the sport fishery and employment dependency on fisheries.
- Impact assessments of Marine Protected Areas (MPAs), hurricanes etc.
- Identification of fisheries dependencies amongst the different islands in the Commonwealth.
- Exploration (with stake holders) of the consequences of management actions, potentially using bio-economic modelling.

8.2.2 Specific issues

The Department of Fisheries, Ministry of Agriculture and Fisheries lacks the political support for institutional strengthening including staffing. This means that the activities of the Department are heavily compromised by competing demands. The data collection system applied is woefully insufficient to

produce meaningful data. There is no stratified sampling system, the collection of data is sporadic and the statistical analysis is compounded by the fact that despite an extensive national census of fishing activity, the Department has no means of accessing the data because the manager of the system is now absent from the Department. Consequently, it is all but impossible to produce estimates of the numbers of fishing vessels and fishers in the Commonwealth. Furthermore, only vessels requiring trap permits are required to register. This represents an incomplete picture.

A summary of the specific problems found in the country is as follows:

- Government is highly responsive to political lobbying so the possibility of obtaining support for data collection and subsequent fishery management programmes based on a coherent analytical framework is very unlikely (even though the majority of fishers support the concept).
- Industry is very disparate so it is difficult to educate fishers in the need to explore management strategies and the arguments for a comprehensive data collection programme.
- A frame survey has been undertaken but the results have been coded by the author who is no longer in the Department, so the Department has no idea of how to extrapolate the data and the size of the industry.
- Under staffing of Fisheries Division, and inadequate coverage on some islands.
- No stratified sampling programme aimed at capturing data from specific fishing vessels typical of specific islands.
- Price data are available at the factory level, but prices are not indicative of private sales.
- Not all fishermen complete annual registration forms. Comprehensive forms are only available for those requiring trap permits (crawfish and stone crab) and compressor permits.
- The number of registered vessels may not reflect the actual active number. As such it might be difficult to estimate the true value / value added in each fishery.
- The calculation of wage shares is highly variable throughout the industrial fleet. The analysis will probably need to make an assumption that wages are calculated according to standard procedures (wages to reflect revenue less variable costs).

8.2.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 10 specific fishery groups that form the main component of the Commonwealth's fishing activity. In essence, this requires that a return of around 10 vessels per sub set be attained. The sample set is therefore likely to comprise of the following:

- Lobster trap vessels fishing 3-6 week trips (Freeport, Coral Island, Spanish Wells, Grand Bahama) (70-100')
- Lobster trap / casitas vessels fishing shorter trips and acting as carriers for smaller vessels (Spanish Wells, Freeport, Coral Island) (50 ')
- Small inshore lobster trap vessels (4-8 m)
- Diving vessels for lobster (Spanish Wells, Long Island, Grand Bahama) (40-60')
- Diving vessels for conch (Freeport, Spanish Wells) (30-60')
- Stone Crab pot vessels (Freeport, Coral Island) (50')
- Seine net vessels (70') – Spanish Wells
- Finfish trap vessels (Freeport, Spanish Wells)
- Multipurpose vessels
- Other small craft spread throughout the islands (traps, diving, finfish and lobster traps, seine nets)
- Trolling vessels

The above groups are very specific to particular locations. A wider sample may well be desirable if the Department were to seek to establish comparative fishery dependencies throughout the Commonwealth. This is a task that should be undertaken at some stage since some of the peripheral islands have a very high dependence on fishing as compared to other economic activities.

8.2.4 The costs of collection

Assuming a target sample size of 90-100 vessels, surveyed on a bi-annual basis (once per main fishing season) at a survey rate of 5 vessels per sampler per day, the economic survey would cost the equivalent of 40 person days plus transport.

The Department has the advantage of having an in house economist with the capacity to utilize the models as recommended by CFU. The draw back is that the data requirements are considerable given the large number of different fisheries that exist. It is unlikely therefore, that the Department of Fisheries will be able to focus annually on all fishing methods. It is therefore probable that the Department may have to focus analysis on two or three of the specific fisheries in each year.

8.3 Barbados

8.3.1 The demand for data

The national policy makers have set three specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are

- Identifying the relative economic importance of the segments, value added and employment dependency on fisheries.
- Establishing an appropriate licensing charge to fishers using economic data.
- Need to measure the economic consequences of MPAs.

8.3.2 Specific issues

The data collection system is fairly comprehensive aided by the requirement for larger vessels to land through primary markets (Bridgetown, Oistins and Speightstown). Data are also collected regularly from 10 other active secondary fish landing sites. Random sampling is done at tertiary sites (19 in total). Under the CFRAMP programme there has been an improvement in the quality of fish landing statistics. To date, catch, effort and biological data (yellowfin tuna, dolphinfish and wahoo) are being collected. Data collected are entered into the TIP database. Whilst the database is designed to function to store fisheries data, it depends heavily on the skill and time of the staff to extract basic information. The Department estimates that around 75 % of landings are recorded.

The data are reasonably comprehensive which allows for an accurate assessment of individual catches. This is likely to be enhanced as a result of a move to a logbook system.

Price data are available from the landing sheets but are not presently extracted.

Stakeholders are supportive of the need to record economic data.

The analytical capacity of the Department of Fisheries is quite strong. There is no immediate desire to go down the road of bio-economic analysis. This is in part constrained by the limited number of personnel. The Department also has a good working relationship with the University of the West Indies. UWI could provide a useful means by which economic data can be analysed.

8.3.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 13 specific fishery groups that form the main component of the Island's fishing activity. In essence, this requires that a return of around 10 vessels per sub set be attained. The sample set is therefore likely to comprise of the following:

- Reef fish trap fisheries (under 6 m)
- Deep slope
- Scuba, hooker and free diving
- Handline / Troll (3 groups including 20'. 20-30' and >30)
- Long line / troll (3 groups including 25, 2534, > 35
- Gill net (2 groups including < 25', > 25')
- Trolling
- Mixed fisheries (2 groups <25 ', > 25')

8.3.4 The costs of collection

Assuming a target sample size of 130 vessels, surveyed on a bi-annual basis (once per main fishing season) at a survey rate of 5 vessels per sampler per day, the economic survey would cost the equivalent of 52 person days plus transport.

8.4 Belize

8.4.1 The demand for data

The national policy makers have set three specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are

- Identifying the relative economic importance of the segments, value added and employment dependency on fisheries.
- Identifying the need to examine the impacts of conservation measures
- Identifying the potential economic and socio-economic trade offs between one fishing method (shrimp trawling) and artisanal fisheries

8.4.2 Specific issues

Catch, landings, morphometrics and biological data on lobster, conch and some commercial finfish has been collected since 1992. Licensing and registration was implemented in 1998. Fishers are required to complete an annual form and pay a licensing fee. Not all renew licenses on an annual basis as required. Catch and effort data are collected from the cooperatives' purchase slips, random sampling at primary market sites and sampling once/twice per month at tertiary sites. Catch, effort (days at sea, method and area) and biological data are input into TIP and fishers/vessels registration into LRS. However, effort data are not completed with great regularity. Staff shortages are a problem particularly in respect to ensuring compliance with effort data, collecting biological data, and monitoring landings into the other markets. In order to enhance the fisheries management capabilities of the Department, the government sees the need to hire additional staff, training, the need for accurate and reliable databases, the inclusion of fishers in the collection of data and the encouragement of co-management as priority areas.

Co-operative catch data are accurate as the co-op members (the fishers) are paid according to what they land. Effort data (days, method and area) may, however, be missing from some slips. Price data is only

partially recorded. Two thirds of the payment is reserved until sale. The Department of Fisheries calculates price equivalents based on cross checking with export records.

Industrial fishing is developing, with, in some cases partial joint venture ownership with foreign companies, e.g. from Honduras. These comprise 10 Gulf of Mexico type shrimp trawlers fishing in the southern parts of the country. The Department of Fisheries has attempted, without success, to introduce a logbook system for these vessels.

Finfish are caught either in a direct fishery (handline / gill net) or as a by catch in the trap fisheries. These fish are either landed whole or as 'fillet'.

Prices offered for lobster and conch are flat rate (no distinction being made for size and quality). Prices for shrimp are based on grade. Prices for finfish are classified according to type of fish: snappers, groupers, hogfish, mackerel (Class A); barracudas, jacks (Class B); grunts, snooks, mullets, porgy, queen trigger fish. doctorfish, tarpon (Class C).

Around 70 % of all catches are perceived to be accurately recorded. It is possible to determine an average catch per vessel based on the number of fishers per vessel Price data is available but not applied through TIP. Fish is landed as whole or 'fillet', in which case average prices will have to be recorded in whole weight equivalent.

Information on processing is available on a per kg basis, but production relates to several species. Isolating processing costs per species type would prove problematic.

A summary of the specific problems found in the country is as follows:

- Fishers are mobile between vessels. Each fisher may belong to a specific co-op and it is not unusual for fishers on a vessel to dispose of the proportion of the catch through the different co-operatives. As such, data collected from each co-operative does not represent individual vessel gross sales.
- The number of registered vessels may not reflect the actual active number. As such it might be difficult to estimate the true value / value added in each fishery.
- Considerable improvement is required in ensuring compliance with basic effort data collection, and additional sampling effort is needed at non co-operative landing centres. The Department of Fisheries needs to overcome problems of demarcation and work sharing.

8.4.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 6 specific fishery groups that form the main components of the country's fishing activity:

- Lobster trap vessels
- Conch diving vessels
- Handline
- Castnets
- Gillnets
- Shrimp trawl

It should be noted that the data show no clear-cut differences in vessel sizes (trap and conch vessels). Similarly, a significant of vessels number alternate between fisheries. Furthermore, Belizean vessels

operate in 6 different fishing zones. As such, it may be appropriate to expand the sample to analyse some of these differentials.

The Fisheries Department lacks the capacity to utilize investigative techniques without the support of either a dedicated specialist or the support from another agency such as CFU staff or UWI.

8.4.4 The costs of collection

Assuming a target sample size of 80 vessels, surveyed on a bi-annual basis (once per main fishing season) at a survey rate of 5 vessels per sampler per day, the economic survey would cost the equivalent of 32 person days plus transport.

8.5 Jamaica

8.5.1 The demand for data

The national policy makers have set four specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are:

- Identifying the relative economic importance of the segments, value added and employment dependency on fisheries.
- Identifying the need to examine the impacts of conservation measures.
- Identifying the potential economic and socio-economic trade offs between one fishing method (offshore) and artisanal fisheries.
- Identifying the impact of disasters or fisher exclusion (MPAs / Harbour and hotel dredging.

8.5.2 Specific issues

The Division developed its data collection programme in 1995. The programme was developed for coastal pelagics, demersal, offshore pelagics, lobster and conch. The Division now has up-to-date statistics on catch, effort and socio economic data readily available. However, the Division is faced with many problems, such as, under funding and lack of personnel, logistics, transportation, and inadequate legislation.

Data gathering is focused on the southern part of the island (data used for the north coast are now 3 years old) where production forms the largest component of the landings. Stratification is based on gear type, vessel type, beach size and operational ranges of vessels working from each location. Data collectors visit landing sites twice per month to capture catch & effort and biological data. Fishers are interviewed upon arrival at the landing site; the information is recorded on the data sheets. In cases where fishers were not interviewed, this information is recorded on the summary sheets. Information from both sheets are used to estimate total landings.

Prices are collected as and when catches are recorded.
Estimates of total landings are based on:

- % active vessels / gears from sampled sites
- total fish landings at known sites
- estimates of cpue for sampled sites
- estimates of active vessels/gears that went to sea multiplied by cpue for un-sampled sites
- summation of sampled and un-sampled sites.

A summary of the specific problems found in the country is as follows:

- Need to simplify method of raising total landings
- Estimation of total landings mixes gear activity and boat activities, there is a need to sample by gear type.
- Principal weakness appears to be limited staff compliment and the current failure to record landing / effort data in the north of the island.
- The Fisheries Department lacks the capacity to utilize investigative techniques without the support of either a dedicated specialist or the support from another agency such as CFU staff or UWI

8.5.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 14 specific fishery groups that form the main component of the country's fishing activity. This is without any differentiation for the fisheries in the north and south of the island. The following sample set is recommended:

- Trap fisheries (3 groups: < 12', 12-30', 30'+)
- Scuba and free diving vessels (Conch) < 30 '
- Scuba and fee diving vessels (Conch) > 30 '
- Scuba and hooker diving vessels < 30 '
- Scuba and hooker vessels > 30 '
- Handline /troll (3 groups: < 20', 20-30', 30'>)
- Long line fisheries
- Shrimp trawl
- Pelagic coastal fisheries

As with the Department of Fisheries in the Bahamas, the Division may have to be selective as to the groups of fishing vessels that it seeks to extract data from. The disadvantage of this is that a lack of comprehensive coverage, even if restricted to the southern part of the island may fail to achieve the desired outcomes specified by the policy makers.

8.5.4 The costs of collection

Assuming a target sample size of 140 vessels, surveyed on a bi-annual basis (once per main fishing season) at a survey rate of 5 vessels per sampler per day, the economic survey would cost the equivalent of 56 person days plus transport. There may also be a requirement to include survey of fishers in the North of the island where distinct regional differences occur.This will enlarge the sample.

Given the potential demand for data within Jamaica, it would be recommended that the Division consider recruiting an in house economist for the tasks at hand.

8.6 Suriname

8.6.1 The demand for data

The national policy makers have set five specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are:

- Identifying the relative economic importance of the segments, value added and employment dependency on fisheries.
- Identifying the need to examine the impacts of conservation measures through bio-economic modelling.
- Identifying the potential economic and socio-economic trade offs between one fishing method (offshore) and artisanal fisheries.
- Identifying the importance of export promotion against the potentially conflicting goal of conservation.
- Identifying net value added against national net value added (including transfers abroad).

8.6.2 Specific issues

The fishery is divided into industrial (offshore), coastal, brackish water, fresh water fisheries and aquaculture.

The data systems in place include records of catches by species, gear, and location caught. There is no recorded price information. The data available are comprehensive covering an estimated 95 % of the total (non-sampled catches include beach seine catches along the coastal belt). The efficiency of the data collection system is aided by the fact that there are only a small number of landing stations (6 in Paramaribo and other centres at Nicuw Nickerie (north), Boscamp (south), and that the number of data collectors (13-15) relative to landing sites is large. Additional data (for the larger vessels) is collected from the 18 fish processing plants that record sales (in quantities by species and by grade) as and when the vessel discharges to the plant. There is no need to provide a facility, as per Jamaica, to raise data to reflect deficiencies in data collection.

The data analysis is linked to a series of spreadsheets which are completed by the data collectors (boat type, gear, days at sea, fishermen, landings by species (kg)) or to returns completed by one of the 18 processing plants, as and when larger vessels land to them.

The principal problems are two fold. (1) that the data from processors reflects a number of different combinations of species and species grades (2) that all data lacks price information.

The completeness of the current data sets allow for the formulation of average catches per vessel by weight. However, the fact that first sale quayside prices are not collected, poses a problem. This will have to be rectified both in respect to collection at landing centres and as and when the returns are complete by fish processors.

Information on processing costs and returns is available from some of the companies. There is however a major concern as to the reliability of some of the returns provided by the joint venture processing companies, which attempt to show substantial losses. Given this fact, the fact that vessels are owned by Japanese / Korean companies and the crew are paid in foreign currency in Japan / Korea, it seems highly probable that the shrimp sector transactions involve a transfer pricing which will show domestically that all sectors are unprofitable when in fact the returns are much greater. This issue can only be explored as and when returns are made and compared against other returns. However, it will be important when determining a sample for this sector, that the sample contains vessels under different ownership structure (including local / Government ownership) so that inconsistencies in the data can be identified.

A summary of the specific problems found in the country is as follows:

1. No recording of first sale price data.

2. Transfer pricing between joint venture owned companies.
3. Inconsistency in data presentation (species groups) from transfers between processors and industrial fishing vessel owners.
4. The calculation of wage shares is highly variable throughout the industrial fleet.

8.6.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 15 specific fishery groups that form the main component of the country's fishing activity:

- Shrimp multi rig trawl
- Seabob trawl
- Finfish trawl
- Handline / trolling fisheries (3 groups: < 20', 20-30', 30'+)
- Longline (3 groups: < 25', 25-34', 35>)
- Gill net (2 groups: < 25', > 25')
- Driftnet (2 groups: < 25', > 25')
- Chinese net (2 groups: < 10 m, > 10 m)
- Seine net (1 groups: < 10 m)
- Bank net / pin seine

The distinction over and under 10 m should be interpreted as the difference between open and decked Guyanese launches.

8.6.4 The costs of collection

Assuming a target sample size of 170 vessels, surveyed on a bi-annual basis (once per main fishing season) at a survey rate of 5 vessels per sampler per day, the economic survey would cost the equivalent of 68 person days plus transport.

8.7 Trinidad and Tobago

8.7.1 The demand for data

The national policy makers have set three specific goals in respect to their expectations of the economic outputs resulting from the costs and earnings study. These are:

- Identifying the relative economic importance of the segments, value added and employment dependency on fisheries.
- Identifying the need to examine the impacts of conservation measures through bio-economic modelling.
- Examining social impacts of policy measures, e.g. on poverty alleviation.

8.7.2 Specific issues

Trinidad has one of the strongest stratified data collection systems in the Caribbean. Tobago, however, has one of the weakest. The only major problem associated with the data systems are that the data collection system is primarily focused on the artisanal fleet, vessels commonly referred to as pirogues. Data collected includes: Vessel Registration Number; Times departed and returned; Number of crew; Gear type

used; Weights of "species" landed (grouped by "Local Names" as given in Appendix 1); Ex-Vessel price per "species", and Area Fished. Price and catch values are available for the artisanal fleet

The quality of the data collected for the industrial fleet is not as robust as that collected for artisanal vessels. The process for upgrading landings is present which is indicative of global activity, but effort data are generally lacking. The Government proposes to introduce a logbook system.

At the time of writing the report, there was little knowledge of the economic activities of the processing sector.

The completeness of the current data sets allows for the formulation of average catches per vessel by weight and value for the Trinidad artisanal fleet. It is not altogether clear as to whether equivalent values can be produced for industrial vessels, but it is presumed that price information is readily available from the 8 export orientated processing companies in the country.

Information on processing costs and returns is not collected as a matter of course but sales turnover is available from export prices and accounts vary produced for each company.

Trinidad's Fisheries Division has the in house capability of analysing and interpreting data for economic purposes. Small-scale economic analysis has been conducted by the Division on previous occasions (assessing the impact of fuel subsidies).

In contrast, Tobago requires considerable logistical strengthening before it is capable of undertaking extensive analysis. It would appear that the data collection system requires stratification so that reasonable estimates can be made for its artisanal fishery sector.

8.7.3 The sample

In respect to the issue of costs and earnings, the segment definitions (Appendix 3) identified 11 specific fishery groups in Trinidad and 3 in Tobago:

Trinidad:
- Trap fish (3 groups:< 12', 12-30', 30')
- Handline / trolling (< 20', 25-35', > 35')
- Gill net (2 groups: < 25', > 25')
- Seine net
- Multi rig shrimp trawl
- Shrimp trawl < 10 m
- Shrimp trawl 10-12 m

Tobago:
- Trolling < 10 m
- Seine / gill net < 10 m
- Reef fish trap, 10 m

8.7.4 The costs of collection

Assuming a combined target sample size of 48 vessels for both Trinidad and Tobago, bi-annual surveys (once per main fishing season) at a survey rate of 5 vessels per sampler per day would cost the equivalent of 56 person days plus transport (44 for Trinidad and 12 for Tobago).

8.8 Other CARICOM countries

8.8.1 Proposed sample sizes

The identification of segments for the countries not covered by the country visits may not reflect what the specific fishing segments are per country. However, a snapshot review of the literature (Appendix 2) suggests that there are a significant variety of fishing segments in each of the countries. A snapshot view of the data would tend to suggest that Guyana's activities mirror those of Suriname, up to 17 segments; Dominican Republic, 16; Haiti, 13, St Lucia, 10, Grenada, St Vincent, 8-10; Dominica, St Kitts & Nevis and Montserrat, around 4-6 segments each. On this basis proposed manpower requirements would vary from around 16 to 80 man-days per annum.

9. Strengths, weaknesses, opportunities and threats to the approach proposed

Following the definition of the study approach and identification of specific country needs and concerns, it is useful to focus on a SWOT analysis, namely:

- Strengths: What benefits are likely to result from the approach
- Weaknesses: What are the underlying constraints that are likely to be encountered
- Opportunities: what features may be capitalized upon
- Threats: What elements might hinder the data collections process

Table 4. SWOT analysis for the proposed data collection approach.

Strengths	**Weaknesses**
• Simple approach to data gathering and facilitating availability of data • National estimates of fishing industry contribution to GDP • Production of inputs and outputs which can be used for different economic models • Production of data which can be used to assess the impact of tax incentives, or tax penalties • Comparators between fishing methods in each country and between fishing methods from island to island	• Potential that target outputs cannot be achieved because of weaknesses in vessel registrations, inadequate staff resourcing, budgets • The inputs and outputs may not reflect the true financial position
Opportunities	**Threats**
• Outputs which can be utilized for policy purposes	• Survey fatigue • Potential problems with interviewers reluctance to become involved in seeking economic data • Fishers reluctance to contribute

10. Conclusion

Fishery Departments (FDs) will be hard pressed to instigate a costs and earnings data collection exercise to a level that will fulfil the aim of identifying the sector's Net Value Added as a contribution to Gross Domestic Product. This will be a particular problem where the number of segments identified is high and the FDs' resources are low. Some FDs are better resourced than others and will be capable of undertaking such a task (e.g. Suriname / Trinidad). Ironically, despite comparatively poor resources some of the smaller FDs will be reasonably placed to undertake a costs and earnings exercise when the segments are comparatively small in number. Countries having a high number of fishing segments face the stark prospect of not being able to achieve their desired aims, but may instead have to focus on a more limited survey to cater for their specific fishery management requirements, i.e. focusing on fisheries where there are urgent management issues, or where there are international obligations to undertake the work (joint management issues). In many ways, this should be the driving force to decision making as opposed to satisfying requests for data e.g. from planning departments. The experience in all the Caribbean countries is that very few of the other non-fishery sectors are in a position to produce GVA figures. The irony though is that FDs need to produce GVA estimates so as to demonstrate significant sectoral value, relative to others, and thereby gain support for increased funding. Therefore FDs may realize the benefit of a wider survey, even as a one off, because it will ultimately illustrate the significance of their sector.

Careful attention needs to be paid to the choice of appropriate personnel to undertake the tasks of data collection, collation and reporting. Such a task is best allocated to a junior economist. However, few FDs have the resources to provide for such a role.

The second option, and the one facilitated for in the manual and the model template, is for the FDs to use their existing network of data collectors and analysts. The key advantage to this is their acceptability to the fishers.

The consultants advise a generic approach to the issue of data collection and collation. The inputs and outputs do not vary greatly from one segment to the next, and it is important from a comparative perspective to ensure that the outputs are consistent. The suggested approach and methodology will inevitably encounter problems: costs and earnings data collection must be seen as an evolving process that will require monitoring and adjustment to achieve long-term success.

Collection of socio economic data requires a wider focus on different communities. The fisher's register provides a cost effective means of achieving a good response to the extent that all fishers, or at least those registering will provide a robust database.

It is suggested that the research work in some countries will best be undertaken by researchers or students under supervision. Funds are likely to be available to support such supervision in view of the development focus of Donors such as FAO, World Bank and DFID.

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11. References

Babb-Echteld Y and Chin-A-Lin T, Statistics and Research, Fisheries Department, Ministry of Agriculture, Animal Husbandry and Fisheries, Suriname, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Barrett A, Nevis, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

BEAM 4: Fao Computerised Information Series No. 403 (Undated)

Bethel G, Analysis of the Costs and Earnings in the Bahamian Crawfish Fishery, Field Report, FAO Project: Tcp/Bha/4453 (Undated)

Braynen M, Department of Fisheries, BAHAMAS, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

CFRAMP, CFRAMP Progress and Financial Report. Report No. 37. January to June, 2000. 60pp.

CFRAMP: Second Workshop Of Regional Experts To Review And Test The Alpha Version Of The Upgraded Tip And Lrs Software Programs, November 6-9, 2001; Kingston, Jamaica

Charlier P, A Draft Fisheries Management Plan for Suriname, Fisheries Department, Ministry of Agriculture, Animal Husbandry and Fisheries Suriname, December 2000

European Commission, EU Concerted Action, Promotion of Common Methods for Economic Assessment of EU Fisheries, 2001

Ferreira L, Fisheries Division, Ministry of Agriculture, Land and Marine Resources, Trinidad, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Grant S, Brown M, Edmondson D, Mahon R, Marine Fisheries Census of Jamaica. 1998

Grant S: WBS 300: Fisheries Data Management Program, Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Guiste H, Ministry of Agriculture, Planning and the Environment, Dominica, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Heyliger S, Fisheries Division, Ministry of Agriculture, Fisheries, Co-operatives, Lands & Housing, St Kitts, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Haughton M: Opening remarks, Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Joseph W, Department of Fisheries, Ministry of Agriculture, Forestry and Fisheries, St Lucia, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Lovell T and Horsford I, Fisheries Division, Ministry of Agriculture, Lands & Fisheries, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Marin A and Neal D, Department of Fisheries is part of the Ministry of Agric & Fish, Shrimp Technical Report Capture Fisheries Unit, FDTR-CFU-SMP01-2001

Masters J and Reynolds S, Ministry of Agriculture, Fisheries Division, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Nolasco R R, General Fisheries Resources, Ministry of Agriculture, Dominican Republic, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

O'Garro M, Ministry of Agriculture, Lands, Housing and the Environment, Montserrat, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Parker C, Fisheries Division, Ministry of Agriculture and Rural Development, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Perez J, Department of Fisheries is part of the Ministry of Agric & Fish, Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Potts A, Tobago Fisheries, Department of Marine Resources and Fisheries, Division of Agriculture, Land and Marketing, Tobago House of Assembly, 1998

Potts A, Functions And Interests As An Environmental Stakeholder: Department Of Marine Resources And Fisheries, Draft, 2002

Rennie J and Finley J, Ministry of Agriculture, Land, Forestry and Fisheries, Grenada Extracts from the Workshop: Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Seijo, JC; Defoe O; Salas, S: Fishery bioeconomics,: Theory, modelling and management, FAO 1998

Wiggins S and Maison D, Ministry of Fisheries, Crops and Livestock, Guyana, Fisheries Management Data System Terminal Workshop, November 25-28, 2000, Castries, St. Lucia

Appendix 1. Country mission reports

The terms of reference to the CFU funded study 'Expansion of Existing Data Collection Systems to Capture, Store and Manage Social and Economic Data from the Fisheries Sector' requires completion of country reports. The forgoing is a summary of the principal points of reference for each country, highlighted both in the TOR and under instruction by Dr Milton Haughton, CFU, Belize.

The purpose of the country visits were to:

1. Identify specific needs of each of the Fisheries departments and other organisations - usually Planning ministries, central statistics offices, development banks together with the stake holders, fishermen's associations, co-operatives and other representative individuals.

2. Identify the current process of data collection, the extent of the present data collected and the mechanisms used to collect, collate and present the data

3. To identify the specific strengths and weaknesses of the existing national data collection / collation systems.

4. Identify the characteristics of the fishing industry: fleet segments, fishing patterns (seasonality), landing sites, pricing mechanisms and type of outlets

5. Identify the likely co-operation of stakeholders in respect to an extended data collection programme.

6. Identify input costs to specific fishing methods and the mechanism used to calculate wage shares.

The bulk of the above findings are contained in the report. This section identifies the countries visited, persons met, work undertaken, general observations and findings, problems and difficulties.

1.1 Antigua and Barbuda

The consultant visited Antigua from 9-12 June 2002. Fisheries Division, Ministry of Agriculture, Lands and Fisheries arranged meetings. Mrs. Cheryl Appleton, Chief Fisheries Officer, accompanied the consultant to all meetings.

1.1.1 Persons met

1. Cheryl Appleton (Chief Fishery Officer) Craig O'mard (Extension officer), Ian Horsford (Data Collector), Fisheries Division, Ministry of Agriculture, Lands and Fisheries,
2. Daven Joseph and Lennox Weston, Planning Department, Ministry of Planning, Implementation & Public Service Affaires,
3. Hazel Corbin (Caribbean Central Bank), Frank Jacobs (Chief Statistician), Denese Nickeo (Statistics Division),
4. Hilroy Willet, Antigua and Barbuda Development Bank
5. Sylvester White, Fish Processor
6. Brian Nunes & Franky Nunes (Antigua & Barbuda Fishermen's Alliance)
7. Dale White fishermen
8. Long Line fisherman
9. Conch fisherman
10. Lobster / finfish creel fishermen

Meetings with fishermen took place during a tour of different landing stations throughout the island. There was no visit to Barbuda, but the consultant endeavoured to identify specific characteristics associated with this island including the Health Department, Council of Barbuda, which has responsibility for data collection in Barbuda.

1.1.2 General observations

Fisheries Division: large number of landing sites; low staffing levels for the required tasks; disparate industry and inadequate strategic development support frustrated by dominance of the Ministry of Planning, Implementation & Public Service Affaires, as opposed to Ministry of Agriculture, Lands and Fisheries (MALF). MALF charged with the task of fisheries management.

Ministry of Planning: Naïve development assumptions based on a severe lack of understanding of the fisheries sector. Needing to identify development opportunities (recreational versus commercial, potting versus lining, new fishing opportunities (pelagic species) and training need. Direct responsibility for management of JICA assistance, therefore need to establish a focus on justifying the case for JICA investment initiatives.

Commitment from both ministries is largely towards maximization of employment opportunities.

Central Statistical Office / Caribbean Central Bank: Need for summary data on fishing employment, gross and net value added

Antigua and Barbuda Development Bank: Need for economic data to assess the returns on investment per fishery sector.

Fishing Industry Organisations: The sector is very poorly organized. The most representative of organizations but seemingly a pressure group acting on behalf of both commercial fishermen and charter trollers, was the Antigua & Barbuda Fishermen's Alliance. This group was supportive of the need to demonstrate the importance of fisheries within the national economy.

1.1.3 Findings

1.1.3.1 Sector observations

Fishermen are full time and part time. Many move in and out of fishing or have alternative occupations. There are 899 registered fishers and 495 registered vessels.
The Current frame survey is as follows:

Primary gear	**No units**	**%**
Trap	81	52.8 %
SCUBA (conch)	4	3.1
SCUBA and loop	1	0.8
Handline	21	16.3
Gillnet	2	1.6
Trolling / recreational	17	13.2
Beach seine	1	0.8
Longline	2	1.6
Total	129	100

Of the trap fishermen, some may try vertical long line (June to October). Fishing vessels act as vessel taxis during annual angling competition. There are a total of Vendors5 middlemen. Fisher family network might include more than one family.

1.1.3.2 Data collection issues

The first data collection programme began with the assistance from OECS Fisheries Unit. In 1993, the system was upgraded by CFRAMP. In 1998, a second review was done. The Division also identified the need to re-organize its data collection programme to ensure good data for sound management decisions is being collected. Presently, the department is operating with minimum staff and resources. A frame survey has been devised but the MALF rarely comply with the totality required largely because accessing fishermen, particularly outside St Johns is rarely guaranteed. Also the focus of attention is on trap and conch fisheries. Hand lining appears to be largely neglected.

No data collection of catch, effort or biological is being undertaken in Barbuda.

Different prices are paid according to different fish sizes. Price information is documented via processors, but not integrated into existing data systems. Sales prices to processors might not be perceived as standard if domestic sales outside St Johns increase substantially. Exchanges between fishers and French fishermen take place at sea. Fishers are required to state amounts and prices received. Export prices from Barbuda are recorded.

Crew remuneration systems equate to the standard share system such that wages are calculated according to the number of shares (crew and vessel) after deduction of variable costs. However, each crew member usually makes his own traps. Handline fishermen are paid a percentage of individual catch.

1.2 The Bahamas

The consultant visited Nassau, Bahamas from 9 - 12 June 2002. The Department of Fisheries, Ministry of Agriculture & Fisheries arranged meetings. Koji Wright, Statistics Officer, accompanied the consultant to meetings with the various administrative departments and to fish processing factories. Mr. Caswelt Mounts, Fisheries Superintendent, accompanied the consultant to meetings with fishers and fishing vessel owners.

1.2.1 Persons met

1. Michael Braynen (Director of Fisheries), Edison Deleveaux (Deputy Director), Caswelt Mounts (Fisheries Superintendent), Coredell Brennen (Data Collector), Koji Wright (Statistical Officer), Greg Bethel (Economist)

2. Ronald Thompson, ex-Director of Fisheries

3. Charles Stuart (Director), Director of Statistics, Kelsi Dorset (DD in charge of social statistics), Leona Wilson (Assistant Director in charge of Economic Statistics), Department of Statistics

4. George Rodgers & Anthony Woodside, The Bahamas Development Bank

5. Anthony McKinney (Processor), Paradise Fisheries

6. Mia Isaacs (Processor), J&J Seafoods

7. Seine net fisherman, Spanish Wells

8. Conch fisherman, Nassau

9. Alan Brown, Montegue Fishermen's Association

10. Lobster fisherman, Coral Island

Meetings with fishermen took place during a visit to Freeport, Coral Island and Montague landing sites. There were no visits to any of the other islands.

1.2.2 General observations

Department of Fisheries: Large number of landing sites over an extensive area (20 islands) with varying degrees of fishing activity; inadequate staffing levels frustrated by demands to service other priority tasks; a disparate fishing industry with the possible exception of Spanish Wells; poor thought to the existing data collection system; high staff turnover and internal departmental politics which appeared to frustrate co-operation between individuals; and lack of support from the Government because of the national focus on finance and tourism.

The Department shows a strong commitment to establishing fishery coherent management regimes with stakeholder support facilitated by wider consultation.

Director of Statistics: Need for summary data on fishing employment, gross and net value added. There is a lack of information available at present. Household expenditure survey is perceived to be too limited in its focus to provide any useful socio economic data from the fishery sector.

The Bahamas Development Bank: Need for economic data to assess the returns on investment per fishery sector.

1.2.3 Findings

1.2.3.1 Sector observations

Identification of vessel groups reveals:

1. Lobster trap vessels fishing extensive trips, 3-6 weeks (Freeport, Coral Island, Spanish Wells, Grand Bahama) (70-100')
2. Lobster trap / casitas vessels fishing shorter trips and acting as carriers for smaller vessels (Spanish Wells, Freeport, Coral Island) (50 ')
3. Small inshore lobster trap vessels (4-8 m)
4. Diving vessels for lobster (Spanish Wells, Long Island, Grand Bahama) (40-60')
5. 5 Diving vessels for conch (Freeport, Spanish Wells) (30-60')
6. Stone Crab pot vessels (Freeport, Coral Island) (50')
7. Seine net vessels (70') – Spanish Wells
8. Finfish trap vessels (Freeport, Spanish Wells)
9. Polyvalent vessels
10. Other small craft spread throughout the islands (traps, diving, finfish and lobster traps, seine nets)
11. Strong angling sector - trolling

There are 4,000 vessels, 3,400 under 20'.

Casitas – 650,000
Lobster traps – 105,000
Fish pots – 11,300
Stone crab pots – 25,000
Fishing reels - 1000

6 major processing plants throughout the country. Processors are a major provider of credit

The Department issues permits: 57 crawfish and 12 stone crab permits. This represents 79,420 crawfish traps and 18,207 stone crab traps. The permits are renewed annually

902 compressor permits issued, used for harvesting crawfish in the open season – 1 August to 31 March.

1.2.3.2 Data collection issues

Two data collectors in New Providence, plus 1 per island on Andros, Abaco and Grand Bahama. All collectors visit the landing sites to collect catch and effort data on a daily basis. The information is recorded on a Daily Landing Form, which takes note of the fishing area, gears used, the time factor, the number of men involved, the catch, its weight and value by species. All processing plants are required to submit to the Department, a Monthly Purchase Report. Specific draw backs include inadequate coverage on some islands, no data collection presence in Spanish Wells, by far the most significant fishery base, and random, as opposed to targeted, coverage of fishing vessel landings, constraining the ability to calculate average catches for specific fishery segments.

Fish price data available from processors. Processors report no distinction in price according to size.

Biological data collection – no evidence of application. Training only recently just taken place.

1.2.3.3 Suitability for economic data collection

The present data collection system is limited in its ability to identify average earnings for each of the vessel groups. There is no stratified sampling based on fishing method. Vessels are generally surveyed at random, although data collection is stronger on some islands (Grand Bahama) than on others. Additional individual data collected from vessels owned by fish processors. Processors also supply purchase data gathered via purchasing agents.

1.3 Barbados

The consultant visited Bridgetown, Barbados from 13-15 June 2002. Fisheries Division, Ministry of Agriculture and Rural Development arranged meetings. Greig Franklin (Data Collector) and Antoinette Marshall (Data Collector) accompanied the consultant to meetings with the various administrative departments and landing stations.

1.3.1 Persons met

1. Stephen Willoughby (Chief Fisheries Officer), Chris Parker (Biologist), Antoinette Marshall (Data Collector) Greig Franklin (Data Collector) Fisheries Division, Ministry of Agriculture and Rural Development

2. Keith Henry, Director of Bridgetown Public Market, Markets Division, Ministry of Agriculture and Rural Development

3. Robin Mahon, independent consultant;

4. Hazel Oxenford, UWI

5. Bisessar Chakalall, Regional Fishery Officer, FAO

6. Ethelbert Haines, Chief Economist, Ministry of Finance and Economic Affaires

7. Angela Watson (President) BARNUFO (Barbados National Union of Fisherfolk Organisation), Clifton Ifill (Presidents Oistins Fisherfolk Association)

8. Jonathan Morgan, Morgan's Fish House, Oistins

9. Moses boat operator

10. Launch operator

11. Long line operator

1.3.2 General observations

Department of Fisheries / Markets division: The logistics of operating through markets with possible extension to a logbook system provides a good basis for ensuring availability of accurate catch and revenue data. Price data is not presently extracted from market data and should be considered. The links to the market also allow the facility to incorporate price data into the statistical system.

Ministry of Finance and Economic Affaires: Need for summary data on fishing employment, gross and net value added.

Fishermen's Organisations: Very supportive of the need to collect economic data provided that the questionnaires were not too onerous and guaranteed confidentiality.

1.3.3 Findings

1.3.3.1.Sector observations

There are around 900 commercial fishing vessels in Barbados, ranging from 8' to 90', propelled by oar or 5-75Hp outboard engine or 15-470Hp onboard engines. There are 2,200 fishers of which 80% are full-time fishers

Vessel type	**Number of registered vessels**		
	1994	**2000**	
Moses	323	434	3 - 6 m in length, oars or 10 - 40 hp engines – use reef and coastal fisheries, hand lining, trolling, fish traps and cast nets, diving equipment
Launches	353	290	6 - 12 m (inboard engines, 10 – 180 hp) harvesting flying fish and large pelagics, on day trips, hand and troll lines, gill nets and hoops, also use set nets and diving apparatus

Iceboats	54	156	> 12 m, inboard diesel engines, harvest flying fish and large pelagics on trips of 5-10 days. hand and troll lines, gill nets and hoops, also use set nets and diving apparatus
Longliners	10	31	> 12 m in length, inboard diesels fishing tunas and sword fish with a by-catch of large pelagics 12-28 days. Pelagic long line gear
Total	649	911	

1.3.3.2. Data collection issues

The data collection system is fairly comprehensive aided by the requirement for larger vessels to land through primary markets (Bridgetown, Oistins and Speightown). Data is also collected regularly from 10 other active fish landing (secondary sites). Random sampling is done at tertiary sites (19 in total). Under the CFRAMP programme there has been an improvement in the quality of fish landing statistics. To date, catch, effort and biological data (yellowfin tuna, dolphinfish and wahoo) are being collected. Data collected are entered into the TIP database. Whilst the database is designed to function to store fisheries data, it requires heavy dependence on the skill and time to extract basic information. The Department estimates that around 75 % of landings are recorded.

1.3.3.3. Suitability for economic data collection

The data are reasonably comprehensive which allows for an accurate assessment of individual catches. This is likely to be enhanced as a result of a move to a log book system.

Price data are available from the landing sheets but not presently extracted. It is passed to the Planning Division. Therefore, TIP needs to be extended to include price data.

Stakeholders are supportive of the need to record economic data.

1.3.3.4 Problems

- No real problems envisaged. Good and accurate statistics and availability pf support data – prices, ice and fuel

Difficulties encountered

- Do not envisage large-scale difficulties. Fisheries Division did point to the issue of unsuccessful trips where there were no landings and the need to ensure effort and costs for such trips.

1.4 Belize

The consultant visited Belize City, Belize from 1 - 5 June 2002. The Department of Fisheries, Ministry of Agriculture and Fisheries arranged meetings with administrative organizations, institutions and the fishery sector. Dwight Neal (Fishery Director) accompanied the consultant to meetings with the various administrative departments and landing stations.

1.4.1 Persons met

1. James Azutea (Acting Head of Fisheries / Fisheries Enforcement), Dwight Neal (Fishery Director), Jaime Villanueva (co-ops) and Ramon Carcamo (markets), Assistant fishery statistical officers, Department of Fisheries, Ministry of Agriculture and Fisheries.

2. Janet Gibson, Coastal Zone Management Project funded by GEF / UNDP / EU

3. Mr. Noel Jacobs, Meson-American Barrier Reef Systems (MBRS)

4. Adelfino Vasquez, Ministry of Labour, Local Government and Sugar Industry

5. Bruce Flowers, Central Statistical Office

6. Mrs. Barbara Bradley, National Cooperative

7. Robert Usher, Northern Co-operative

8. Mustafa Touré, Belize Fishermen's Association

1.4.2 General observations

Department of Fisheries: Reasonable accuracy of data because of the strong fishermen's co-operative structure. The major weakness lies in the recording of finfish sales and poor co-operation of the industrial shrimp vessels vis a vis collecting data. Staff shortages are also perceived to be a major problem, but the demarcation between enforcement activity and data collection is seen as an unnecessary barrier. This problem exists elsewhere, e.g. Jamaica, but is overcome by ensuring that the same individuals in each port do not carry out the two tasks. Hence, there is no localized conflict of interest

Ministry of Labour / Central Statistics Office: Solely dependent on production data supplied by the Department of Fisheries. The CSO finds the issue of data collection from all sectors within Belize to be a problem, so is grateful for any information received. Need for summary data on fishing employment, gross and net value added. There is very little information available at present. The household expenditure survey is too limited in its focus. The Ministry of Labour is a relatively new organization and is only now finding its feet.

Fisheries Co-operatives: The organizations were neither positive nor negative about the need for economic data. However, the organizations are prepared to assist and make available data from fishing vessels and from the trading co-operatives.

1.4.3 Findings

1.4.3.1 Sector observations

There are 2,662 licensed fishermen, 72% are full-time, while the remaining are part-time. There are 790 licensed fishing vessels, comprising open boats, sail sloops and canoes, 3 - 9 m in length and propelled by outboard engines. There are over 62,000 lobster traps and over 2,000 casitas in Belizean waters. Other gear types include hook-sticks, spearguns, free-dive, gillnets, fish pots, tires, drums and hand-lines. There are also, six fishing zones based on distinct habitats types.

Principal fisheries are artisanal:

- lobster (June – August, November - January);
- Conch, fished exclusively by diving (February - May, in the closed lobster season, other fishermen change to targeting conch)
- Handline
- Castnets
- Gillnets

Additional development into industrial fishing, with, in some cases partial joint venture ownership (Honduras) with foreign companies. These comprise 10 Gulf of Mexico type shrimp trawlers fishing in the southern parts of the country

Finfish are caught either in a direct fishery (handline / gill net) or as a by catch in the trap fisheries. These fish are either landed whole or as 'fillet'.

Prices offered for lobster and conch are flat rate (no distinction being made for size and quality). Prices for shrimp are based on grade. Prices for finfish are classified according to type of fish: Snappers, groupers, hogfish mackerel Class A; Barracudas, Jacks (Class B); Grunts, snooks, mullets porgy, Queen triger fish. Doctorfish, Tarpon (Class C)

1.4.3.2. Data collection issues

Catch, landings, morphometrics and biological data on lobster, conch and some commercial finfish has been collected since 1992. Licensing and registration was implemented in 1998. Fishermen and fishers are required to complete an annual form and pay a licensing fee. Not all renew licenses on an annual basis, as is the requirement. Catch and effort data is collected from the cooperatives' purchase slip, random sampling at primary market sites and sampling once/twice per month at tertiary sites. Catch, effort (days at sea, method and area) and biological data is inputted into TIP and fishers / vessels registration into LRS. However, effort data is not completed with great regularity. Staff shortages are a problem particularly in respect to ensuring compliance with effort data, collecting biological data, and monitoring landings into the other markets. In order to enhance the fisheries management capabilities of the Department, the government sees the need to hire additional staff, training, the need for accurate and reliable database established, the inclusion of fishers in collection of data and the encouragement of co-management as priority areas.

Co-operative catch data is accurate as the co-op members (the fishers) are paid according to what they land. Effort data (days, method and area) may be missing. Price data is only partially recorded. Two thirds of the payment is reserved until sale. The Department of Fisheries calculates price equivalents based on cross checking with export records.

Sales of shrimp are through the co-operatives. The Department of Fisheries has attempted to introduce a log book system but without success.

1.4.3.3 Suitability for economic data collection

Around 70 % of all catches are perceived to be accurately recorded. It is possible to determine an average catch per vessel based on the number of fishers per vessel Price data is available but not applied through TIP. Fish is landed as whole or 'fillet', in which case average prices will have to be recorded in whole weight equivalent.

Information on processing is available on a per kg basis, but production relates to several species. Isolating processing costs per species type would prove problematic.

1.5 Jamaica

The consultant visited Kingston, Jamaica from 6-8 June 2002. Fisheries Division, Ministry of Agriculture arranged meetings. Avery Galbraith, June Masters and Richard Kelly accompanied the consultant to meetings with the various administrative departments. Richard Kelly, Errol Bartley (Chief Fisheries Instructor), Junior Stewart (Fisheries Instructor) accompanied the consultant to a number of Kingston harbour landing stations.

1.5.1 Persons met

1. Andre Kong (Director of Fisheries), Stephen Smikle (Director of the Marine Branch), Avery Galbraith, June Masters (Data analyst), Charlene Thomas (Data collector), Shallene Reynolds (Data entry operator), Laureta Bennet (Data collector), Richard Kelly (Fisheries Officer), Errol Bartley (Chief Fisheries Instructor), Junior Stewart (Fisheries Instructor), Fisheries Division, Ministry of Agriculture

2. Havlan Honeyghan, Jamaica Fishermen's Co-op, Chairman

3. Carol Johnston-Miller, Ministry of Agriculture, Policy and Planning Division.

4. Calvin Thompson, Ministry of Agriculture, Data Bank

5. Barrington Hibbernt, Planning Institute, Jamaica

6. Noel Hunnigan, Greenwich Town Fishermen's Co-op

7. Bonny Francis, Conch vessel owner and fish processor

8. Mrs. Nam, Mr. Robinson, Miss Bernard, Ms. Abisdi, Martin Brown, Laurna Read (Econ / Accounts) STATIN (Statistical Institute of Jamaica).

9. Kirstan, Salises, University of the West Indies

1.5.2 General observations

Fisheries Division: Considerable progress has been made in providing a strong recording system for fishing vessels. The method of grossing up effort / catch data for the fleet is reasonably robust and could well be applied to other countries (e.g. Bahamas).

STATIN / MA Policy & Planning, MA Data, Planning Institute: The departments require economic data to reflect gross and net value added and to determine the relative significance of fisheries as against other national industries. There is a perception that the fisheries are more significant within the national economy than is presently recorded.

Fishermen's Organisations: The industry organizations support the need to record economic data for two basic reasons: to look at impact of MPAs / dredging extraction, and to influence Government decision making. However, a cynical view is that fishermen will be interested in such data if they know that it suits them.

1.5.3 Findings

1.5.3.1 Sector observations

Jamaica has over 20,000 fishermen, of which 12,539 are registered. There are about 9,000 boats of which 3,951 are registered. These vessels range in length from 4-20 m, propelled by outboard, inboard or oars, operating from 187 fishing beaches. There are 6 main fisheries exploited in Jamaica, these fisheries are exploited on the island shelf, inshore and offshore banks. The most important fishing methods are fish traps used to catch demersal, nets (gillnets, seine) for coastal pelagics, line for pelagic species and diving for the capture of conch and spiny lobster.

The numbers of vessels of each type using each of the main gear types.

Wood / Fibre Un-mechanized < 32 ft.					Wood Mechanized < 32 ft				
Nets	Lines	Diving	Pots	Total	Nets	Lines	Diving	Pots	Total
337	404	28	302	1071	392	612	149	784	1938

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All Mechanized 32-75 ft					Other				
Nets	Lines	Diving	Pots	Total	Nets	Lines	Diving	Pots	Total
10	37	8	66	122	2	3	0	1	7

1.5.3.2 Data collection issues

The Division developed its data collection programme in 1995. The programme was developed for coastal pelagics, demersal, offshore pelagics, lobster and conch. The Division now has up-to-date statistics on catch, effort and socio economic data readily available. However, the Division is faced with many problems, such as, under funding and lack of personnel, logistics, transportation, and inadequate legislation.

Data gathering is focused on the southern part of the island where production forms the largest component of the landings. Stratification is based on gear type, number of vessels, beach size and operational ranges of vessels working from each location. Data collectors visit landing sites twice per month to capture catch & effort and biological data. Fishers are interviewed upon arrival at the landing site; the information is recorded on the data sheets. In cases where fishers were not interviewed, this information is recorded on the summary sheets. Information form both sheets are used to estimate total landings.

Data used for the north coast are now 3 years old

Prices are collected as and when catches are recorded. The Fishery Officers are aware of prices as and when they collect the data.

Estimates of total landings based on:

- % active vessels / gears from sampled sites
- total fish landings at known sites
- estimates of cpue for sampled sites
- calculate estimates of active vessels/gears that went to sea multiplied by cpue for unsampled sites
- summation of sampled and unsampled sites.

Specific limitations are :

- Need to simplify method of grossing up landings
- Estimation of total landings mixes gear activity and boat activities, need to sample by gear type.

1.5.3.3 Suitability for economic data collection

- Provided that the total numbers of operational vessels are known, the present system of data collection does allow for reasonably accurate estimates of total national revenue. In this respect, the industry itself has identified that it has a part to play in assisting Fisheries Division.
- Problems
- Principal weakness appears to be limited staff compliment and the current failure to record landing / effort data in the north of the island.
- Difficulties encountered
- Staffing and financing of data collection.

1.5.3.4 Problems

- Inadequacy of resources

1.6 Suriname

The consultant visited Paramaribo, Suriname from 20 - 21 June 2002. The Department of Fisheries, Ministry of Agric & Fisheries arranged meetings. Changaer Ravin (Econ & Finance) accompanied the consultant to meetings with the various administrative departments and to a number of landing stations.

1.6.1 Persons met

1. M. Mahadew (Director of Fisheries), Changaer Ravin (Economics & Finance), Ranu Mamgal (Statistics Division), Mario Yspol (Data analysis) H Morino Madarie, Head of Artisanal Fisheries, Ministry of Agriculture, Animal Husbandry and Fisheries

2. I Soe Agnie (Head of Agricultural Statistics) and S Rosan (Planning Department) Ministry of Agriculture, Rural Development and Fisheries

3. A Gaspar, Cindy Eersel, Mr E Pinas, Ministry of Labour

4. Isami Shirahata, General Manager, Suriname Japan Fisheries Co (Processor)

5. White fish processor

6. Guyana vessel owner

7. Joint venture Korean shrimp trawl company

8. White fish pelagic trawler owner

1.6.2 General observations

Department of Fisheries: The Fisheries Department is well organized with good focus on data collection and fishery management issues. Data analysis is largely restricted to summary information on landings. Suriname is participating in international management initiatives with the surrounding countries (Assessment and Management of shrimp and groundfish on the Brazil-Guianas Shelf (through the FAO / FISHCODE Project in collaboration with CARICOM)), but the Department has been largely reliant on the input of economic data provided by other countries. The Department is seeking to evolve its data management system to TIP and LRS but, as yet, is restricting inputs to a well designed Excel data base system. The Department sees economic data collection and the use of bio-economic modelling as an essential component to its operations, but is equally keen to ensure that the evolution in management is participatory in nature (involving active stake holder involvement). Another specific area of concern relate to the need to exact rentals from the sector to assist management and enforcement, the concern of the operations of joint venture trawlers, particularly vis a vis the secrecy of their operations and potential issues relating to transfer pricing.

Agricultural Statistics and Planning, Ministry of Agriculture, Rural Development and Fisheries: Solely dependent on production data supplied by the Fisheries Department plus export data provided by the Customs Agency. Particular problems encountered in respect to species identification and coding of export data. Would welcome economic data on value added.

Ministry of Labour: Current focus is on foreign nationals on board ships. Current data is confined to larger companies, whereas, the most significant group of foreign nationals (Guyana) is in the artisanal fleet. Also need to focus on:

- Wages
- Work and Safety conditions
- Working hours
- Where SMEs are located
- Workers in specific companies
- Classification of jobs by function

Fisheries Co-operatives: The sector is poorly organized. Only one settlement, Nicuw Nickerie has a coherent organizational structure.

1.6.3 Findings

1.6.3.1 Sector observations

The fishery is divided into industrial (offshore), coastal, brackish water, fresh water fisheries and aquaculture.

In 2000, there were 216 registered industrial vessels and 358 coastal fleets. In 1998, it was estimated that the sector employed an estimated 4,283 (which include foreigners). There are 16 fishery resources being exploited in Suriname, and about 17 different gear types being used.

The artisanal fleet comprises:

Driftnet	64 Driftnet
Zeegnet	8 Seine
Kieuwnet	85 Gillnet
Lijn	16 Long line
Sport	42 Sport
Sleepnet	7 Dragnet
Spannet	15 Gillnet (anchor with sticks)
Fuiknet	253 Chinese seine

OR

O.G.	240 open Guyana type
G.G.	45 gesloten Guyana type

Average crew sizes:

Artisanal canoes:	2
Guyana vessels:	4
Shrimp trawlers:	6
Stern trawlers:	8
Vertical lines:	8 - 12
Driftnet:	4

The industrial fleet

In 1998, 268 trawlers were registered, of which 109 shrimp, 21 seabob and 12 finfish and 126 snapper handliners. Vessels of Penaeid prawns undertake trips of 50 to 100 days' duration. Seabob fleets make shorter trips, 4 to 10 days and finfish vessels make trips of 14 days to 30 days.

1.6.3.2 Data collection issues

The data systems in place include recorded catch, species, gear, and where caught. There is no recorded price information. The data available are comprehensive covering an estimated 95 % of the total (other catches including beach seine catches along the coastal belt). The efficiency of the data collection system is aided by the fact that there are only a small number of landing stations (6 in Paramaribo and other centres at Nicuw Nickerie (north), Boscamp (south)), and that the number of data collectors (13-15) relative to landing sites is large. Additional data (for the larger vessels) is collected from the 18 fish processing plants that record sales (in quantities by species and by grade) as and when the vessel discharges to the plant. There is no need to provide a facility, as per Jamaica, to gross up data to reflect deficiencies in data collection.

The data analysis is linked to a series of spreadsheets which are completed by the data collectors (boat type, gear, days at sea, fishermen, landings by species (kg)) or to returns completed by one of the 18 processing plants, as and when larger vessels land to them.

The principal problems are two fold. (1) that the data provided via the processors reflects a number of different combinations of species and species grades (2) that all data lacks price information.

1.6.3.3 Suitability for economic data collection

The completeness of the current data sets allow for the formulation of average catches per vessel by weight. However, the fact that first sale quayside prices are not collected, poses a problem. This will have to be rectified both in respect to collection at landing centres and as and when the returns are complete by fish processors.

Information on processing costs and returns is available from some of the companies. There is however a major concern as to the reliability of some of the returns provided by the joint venture processing companies, which attempt to show substantial losses. Given this fact, the fact that vessels are owned by Japanese / Korean companies and the crew are paid in foreign currency in Japan / Korea, it seems highly probable that the shrimp sector transactions involve a transfer pricing which will show domestically that all sectors are unprofitable when in fact the returns are much greater. This issue can only be explored as and when returns are made and compared against other returns. However, it will be important when determining a sample for this sector, that the sample contains vessels under different ownership structure (including local / Government ownership) so that inconsistencies in the data can be identified.

Appendix 2. Summary findings from literature research on non-case study countries

2.1 Trinidad and Tobago

The consultant met Dr. Arthur Potts, Division of Agriculture, Marine Affairs and the Environment, Tobago House of Assembly, and Dr. Krishna Gooresingh, Fisheries Division, Ministry of Agriculture, Trinidad on 28 June and 29 June respectively. The visits to Trinidad and Tobago did not form part of the country reviews but some specific conclusions can be drawn from the meetings and literature research.

2.1.1. General observations

Fisheries Division, MAFF, Trinidad: Trinidad represents one of the most advanced countries in respect to data collection and the analysis of industry performance. The Division operates its own independent data base system, as opposed to TIP and LRS, There are 17 beach / landing sites with a permanent collector in each site. The data is transmitted to a fully fledged statistical department and analysed into suitable outputs including: beach landing reports, beach/species selected by group landing reports, beach/fishing method landings reports.

Division of Agriculture, Marine Affairs, Tobago: The data collection system in Tobago is not sufficiently formulated. There are two full time and 2 part time data collectors with a proposal to expand collection. The size of the fleet in Tobago (684) is approximately half that of Trinidad (1,251). However, the landings in Tobago are perceived to be no more than 182 t (Potts, 1998), as compared to Trinidad's 14,000 t. The quality of the data at present makes it very difficult to produce any meaningful statistics.

2.1.2 Findings

2.1.2.1 Sector observations

Trinidad: Specific vessel groups comprise an artisanal fleet operating in open boats 7 - 9 m in length, propelled by outboard engines from 15 - 235 hp, commonly 45 - 75 hp. The main fishing methods are gill nets, handlines, trolling or towing and seining, lining and potting and trawling. The principal species targeted by the artisanal fishery are *Scomberomorus brasiliensis* (carite), kingfish, and Elasmobranchii (*Sphyrna tudes, Rhizoprionodon lalandii, Carcharhinus porosus*, and *C. limbatus).*

A second group comprises shrimp trawlers. These can be broken down as follows:

- Type I vessels are 6.7 - 9.8m in length with two 56-hp outboard engines. They manually deploy one stern trawl and number 13 vessels (Chan A Shing 1999).

- Type II vessels are 7.9 - 11.6 m in length with a 129-hp inboard diesel engine. They also deploy a manually operated net. They total 71 vessels (Chan A Shing 1999).

- Type III trawlers are larger at 10.4 - 12.2 m in length with usually 176-hp inboard diesel engines. These use a single net operated by a hydraulic winch. They are also equipped with electronic fishing aids and communication equipment. There are currently 9 Type III trawlers.

- Type IV vessels are considered industrial vessels and use two (2) nets attached to twin outriggers. The nets are set and retrieved using a hydraulic (double-drum) winch. All local trawlers use four-seamed, flat nets. The vessels are 17.1 - 22.9 m in length, have 365 hp inboard diesel engines and

are equipped with electronic fishing aids and communication equipment as well as some refrigeration. Currently 19 Type IV vessels operate out of Trinidad.

A third group comprises bottom demersal fishing vessels. This group use pots or demersal handlines but can include pirogues and recreational vessels but most are semi-industrial multi-purpose commercial vessels, 14-23 m in length, fishing from 7 to 15 days per trip.

Tobago: There are 684 vessels in Tobago. All are artisanal. The predominant fishing method is trolling but gill netting, diving and potting also occur.

There are 8,000 fishermen in Trinidad, and around 1,000 in Tobago.

2.1.2.2 Data collection issues

Data collected at an enumerated site are raised to obtain estimates of landings at the site for all fishing days in the month (including non-enumerated fishing days). These raised data are then used to estimate the total artisanal landings for enumerated as well as non-enumerated sites in a zone. This second raising is based on results of a census of fishing vessels conducted every few years to determine the number of boats at each landing site. The principal problem is that this data collection system is primarily focused on the artisanal fleet, vessels commonly referred to as pirogues. Data collected includes: Vessel Registration Number; Times departed and returned; Number of crew; Gear type used; Weights of "species" landed (grouped by "Local Names" as given in Appendix 4); Ex-Vessel price per "species", and Area Fished. Price and catch values are available for the artisanal fleet

The quality of the data collected for the industrial fleet is not as robust as that collected for artisanal vessels. The process for upgrading landings is present which is indicative of global activity, but effort data is generally lacking. The Government proposes to introduce a log book system.

At the time of writing the report, there was little knowledge of the economic activities of the processing sector.

As mentioned earlier, the Tobago statistical system is in its infancy.

2.1.2.3 Suitability for economic data collection

The completeness of the current data sets allows for the formulation of average catches per vessel by weight and value for the Trinidad artisanal fleet. It is not altogether clear as to whether equivalent values can be produced for industrial vessels, but it is presumed that price information is readily available from the 8 export orientated processing companies in the country.

Information on processing costs and returns is not collected as a matter of course but sales turnover is available from export prices and accounts are produced for each company.

2.1.2.4 Problems

The only conceivable problem for Trinidad is that some information is not available for the industrial shrimp sector. This is significant in the context that Trinidad is party to joint management decision making in shared fisheries, of which shrimp trawling is one.

It is not possible at present to undertake a large-scale economic survey of Tobago fisheries without having to deploy considerably more resources.

2.2 Guyana

2.2.1 Sector observations

The Offshore Industrial Fishery comprises 126 trawlers. Around half the trawlers are foreign owned. The vessels range from 18.90 to 22.86 m (62 - 75 ft.) in length. Foreign trawlers mainly exploit penaeid shrimp with finfish and small amounts of squid and lobster as by-catch. The locally owned trawlers mainly exploit seabob and various finfish species with small quantities of penaeid shrimp as by-catch.

The Inshore Artisanal Fishery is made up of an estimated 1,331 boats ranging in size from 6-18 metres and powered by sails, outboard, or inboard engines. The fishing gear in use includes pin seines (46), Chinese seines / fyke nets (253), cadell lines / "demersal longlines" (79), drift nets/gillnets (556). There are two types of artisanal vessel: a V-bottom boat, ranging in size from 7.63 - 9.15 m (25 - 30 ft) and with no cabin but with an icebox and powered by an outboard engine; and a larger V-bottom vessel size 12.2 - 15.25 m (40 – 50 ft), with an inboard engine and cabin is used for larger gillnet and handline operations.

There are about 4,500 artisanal fishermen and of these about 1,000 are boat owners. Sixty to seventy percent of the boat owners are members of Fishermen's Cooperatives. There are approximately 500 industrial fishermen.

5 major processing plants, 9 small processing plants, and numerous wharves and dry docking facilities

2.2.2 Data collection issues

The data collection programme for the artisanal sector is a random stratified sample. Stratification is done by vessel / gear type.

A log book programme targets all trawlers that capture shrimp and finfish. The logsheets are intended to capture fishing activity at sea especially discards. Log sheets are supposed to be returned at the end of every month when in fact some vessels wait until they are ready to re licence their vessels before submitting the log sheets. The logbook data capture fishing area, depth, day or night fishing, weight for each catch (finfish and shrimp separately). Unsuccessful attempts have been made to extend log book recording to artisanal vessels.

2.2.3 Suitability for economic data collection

It s not known whether price information is readily available or utilized in the data base systems. It is assumed that this data will be incorporated.

It is presumed that an economic survey will seek to examine the performance of the shrimp and seabob fisheries, together with the principal artisanal fisheries – Chinese seine, drift / gill nets, long lines and pin seines. The artisanal vessel group may have to be divided into two segments, vessels with cabins and those without.

2.2.4 Problems

Under reporting of landings/catch by some captains.

- Insufficient data to cover all regions where fishing activity is taken place.
- Under/over sampling of some gear types.

2.3 Grenada

2.3.1 Sector observations

There are 660 fishing vessels, most of which can be described as artisanal. Principal fishing methods include 620 vessels using hand line, trolling, traps, long lining and scuba gear, either separately or in combination. All vessels over 30 ft are specifically dedicated to long lining.

The fishery resources can be divided into the coastal pelagic – Big eye scads, Round Scads etc; Offshore pelagic – Yellow fin tuna, Wah Species; conch, lobster, Dolphin fish, Bill fishes; Deep slope and Shallow reef demersal - Snapper, Grouper, Red hind, Coney, Parrot Fish etc; Lobster, Conch and Sea urchin and Sea moss.

2.3.2 Data collection issues

All fish passing through the markets, invariably the bulk of finfish, is recorded. A large proportion of the catch sold outside the markets, largely conch and lobster goes unrecorded. Catches for such species are increased by a factor of 1.75.

2.3.3 Suitability for economic data collection

It is presumed that the focus for economic analysis of this sector will be on long liners. It may also be possible to construct a survey for other fisheries based on a fairly rudimentary activity questionnaire.

It would appear that the activities of long liners could be covered by economic analysis provided that price data is incorporated. This is presumed to be accessible given that all exchanges take place on a market.

2.3.4 Problems

Economic analysis of the mixed / artisanal sector would appear problematic without the existence of a frame survey.

2.4 St Vincent & the Grenadines

2.4.1 Sector observations

There are 1,000 vessels of which only 558 are registered powered by outboard engines. The main fisheries are offshore pelagics, inshore pelagics, demersal, shell-fish, sharks, turtles and whales. There are 2,500 fishermen of which about 1,550 are registered. Fish handlers, traders, gutters and handlers make up an additional 500 persons.

2.4.2 Data collection issues

Data collection covers 21 landing sites in St. Vincent, 12 in the Grenadines and 13 trading vessels. In 1992, CFRAMP implemented a revised data collection system, based on stratified cluster zone sampling. The plan was designed to cover all missing categories of data. The landing sites are clustered into zones (7 zones) and stratified according to categories (36 landing sites).

Suitability for economic data collection

It is presumed that the data is primarily focused on collection of tonnages and effort as opposed to including price data.

No mention is made of the specific fishing methods adopted or the size of the vessels used. It is presumed that these are predominantly pirogues and that trolling, hand lining, trap fishing and scuba are used.

2.4.3 Problems

It is perceived that price data will have to be collected in conjunction with data on landings.

2.5 St Kitts and Nevis

2.5.1 Sector observations

There are about 225 persons involved in the fishing industry of which 187 are registered fishers. There are 96 registered fishing boats operating from 7 landing sites. Most of the vessels are artisanal open dories and pirogue types, ranging in length from 12 - 14 ft, mainly powered by 14 - 225 hp. Main fisheries exploited are reef, slope, ocean, coastal, lobster conch and turtle.

Fishing activities are categorised by gear type, (i) Trap (lobster and finfish) (ii) Scuba (queen conch and lobster) (iii) Seine to a lesser extent, hand line, trolling and skin diving The latter three are used to a lesser extent because they are either seasonal (trolling) or occasional as in hand lining and skin diving.

2.5.2 Data collection issues

The data collection system appears to be in its infancy

2.5.3 Suitability for economic data collection

If there is a desire to collect economic information, any data collection system must be able to isolate specific fishing methods and must record fish price data.

2.5.4 Problems

It is perceived that price data will have to be collected in conjunction with data on landings.

2.6 St Lucia

2.6.1 Sector observations

The fishery in St. Lucia is artisanal in nature. There are 2,016 fishermen and 974 registered open vessels ranging in length from 3 - 20 m powered by engine ranging from 15 - 150 hp. One third of these vessels is under 20 ft, and the remainder largely between 20 and 30'.

The main types of fishing gear used are handlines, fish traps, trolling gear, gillnets, seine nets and vertical longlines.

The major fisheries resources of St. Lucia comprise demersal, coastal pelagic and offshore pelagic fisheries. Although there is some year-to-year variability in focus among these resources in terms of time,

the fishing year of Saint Lucia can be divided into two main seasons: a "high' season which extends from December to May when significant landings of offshore migratory pelagics occur and a "low" season which extends from June to November when large quantities of demersal fishes are landed. However the main "pot-fishing" season extends from June to February. The offshore pelagic fisheries contribute over 73% of the annual landings by weight (Department of Fisheries, 1999b), which is made up of a number of migratory species including dolphinfish, mackerel; Wahoo; blackfin tuna; yellowfin tuna; Skipjack tuna; sharks; billfishes and flying fish.

In the coastal pelagic fishery, an array of species is targeted including: ballyhoo; barracudas; creole wrasse; herrings; jacks; mackerels; needlefishes. Whilst the demersal fishery lands the most highly priced and valuable species for the local, tourism and export sectors including: snappers; groupers; Caribbean spiny lobster; Caribbean queen conch.

2.6.2 Data collection issues

Initially, catch and effort data were gathered from 13 sites, but in 1984 the data management system was revised to include collection of biological data (length, weight and sex on selected species) and as a result the number of sites at which data were collected was reduced to nine.

The system is based on a stratified random sampling system of three major spatial strata: primary, secondary and tertiary landing sites based on the number of vessel operating, the fishery types and the volume of fish landed. Of the 23 landing sites from which the fisheries operate, catch and effort data are collected from nine sites but four of these sites data are collected on a rotational basis every five years. Biological data have been collected on several occasions for various species but the collection of such data has not been sustained after the termination of externally funded projects.

2.6.3 Suitability for economic data collection

It is assumed that the stratified sample is based on fishing method. There is no reference in data collection to price. Access to price information will form an important component of the economic assessment.

2.6.4 Problems

It is perceived that price data will have to be collected in conjunction with data on landings, if in fact it is not already being collected.

2.7 Dominica

2.7.1 Sector observations

There are an estimated 2,725 fishers in Dominica, of which 60% are part-time and 1,023 vessels. They spend about 1/3 of their time fishing and the other 2/3 engaged in agriculture, construction or some other activity.

The main types of fishing gear used are handlines, trolling, gillnets, seine nets and vertical longlines.

The major fisheries resources of Dominica comprise coastal pelagic and offshore pelagic fisheries. Demersal species, queen conch and lobster are rarely targeted.

2.7.2 Data collection issues

Data is presently collected from eleven (11) fish landing sites.

2.7.3 Suitability for economic data collection

It is assumed that the stratified sample is based on fishing method. There is no reference in data collection to price. Access to price information will form an important component of the economic assessment.

2.7.4 Problems

It is perceived that price data will have to be collected in conjunction with data on landings, if in fact it is not already being collected.

2.8 Dominican Republic

2.8.1 Sector observations

The main fishery resources in Dominican Republic are demersal and pelagic finfishes, spiny lobster, queen conch and a small shrimp fishery located in Samaná Bay. There are 160 landing sites

The Principal gears for exploiting demersal resources are traps, hook-and-line, hookah and free diving. Most of the vessels are under 8.5 metres. These comprise *yola*, *palangre*, and *bote*. There are a further 62 ships between 9 and 24 m fishing the offshore banks, and 19 marginally larger *yolas*, the main distinction between the yolas being that the front of the vessel is covered and the boats carry ice boxes in the inshore fisheries.

These landing sites were grouped in five (5) fishing zones: 1) North: Monte Cristi, Puerto Plata and Espaillat 2) Northeast: María Trinidad Sánchez and Samaná 3) East: Hato Mayor, El Seibo, La Altagracia, La Romana and San Pedro de Macorís 4) South: Santo Domingo, San Cristobal and Baní 5) Southwest: Azua, Barahona and Pedernales.

Table 5. Number of boats, fishers and landing sites by zone in Dominica Republic.

Zone	North	Northeast	East	South	Southwest	Total
# of boats	615	1,252	964	320	601	3,752
# of fishermen	1,878	2,947	1,737	760	1,318	8,640
# of landing sites	27	50	35	16	32	160

2.8.2 Data collection issues

Data collection is the responsibility of both the General Fisheries Resources Department, Ministry of Agriculture for the 20 landing sites covering most coastal regions in the south (about 70-80 percent of the fishing in the Dominican Republic takes place on the south coast); and the Fisheries Department which collects catch and effort data in the north and east coasts of the country.

Data is collected for stock assessment and fisheries management. Currently, data is collected from each fishing unit at the landing site. A fishing unit is defined as the boat, crew and type of fishing gear. At

present data elements being collected are: the number of fishermen, number of boats, boat size capacity, number and type of gear, gender of the fish and length frequency. However, most of these elements are not collected on a consistent or regular basis. In particular, very little or no data on economic or biological aspects of the fisheries are being collected. The system, at this time does not generate data required to conduct stock assessment or economic assessment of any species using the standard models of tropical fish stock assessment or bio-economic assessment (CFU, 2000).

2.8.3 Suitability for economic data collection

The data collection process for the southern landing stations appears to be particularly comprehensive. The departments do not appear to be collecting fish price data.

It should be noted that socio economic data has been collected in the past. This relates to age, size of fisher family, education and fishery dependency.

2.8.4 Problems

It is perceived that price data will have to be collected in conjunction with data on landings, if in fact it is not already being collected. It is also likely that the data collection system in the east might require strengthening.

Appendix 3. Identified fisheries in the CARICOM countries

Identified trap fisheries in CARICOM countries

	Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica	Dominican Republic	Grenada	Guyana	Haiti	Jamaica	Montserrat	St Kitts and Nevis	St Lucia	St Vincent and the Grenadines	Suriname	Trinidad and Tobago
Trap fisheries < 12' (mech)	*	*	*	*		*	*		*	*	*	*	*	*		*
Trap fisheries < 12' (unmech	*	*	*	*		*	*		*	*	*	*	*	*		*
Trap fisheries 12-30' (mech)	*	*		*		*	*		*	*	*	*	*	*		*
Trap fisheries 12-30' (unmech	*	*		*		*	*		*	*	*	*	*	*		*
Trap fisheries > 30'		*				*			*	*						

Identified scuba fisheries in CARICOM countries

	Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica	Dominican Republic	Grenada	Guyana	Haiti	Jamaica	Montserrat	St Kitts and Nevis	St Lucia	St Vincent and the Grenadines	Suriname	Trinidad and Tobago
Scuba, and free diving vessels (conch) < 30 ' (9 m)	*			*		*	*			*	*	*		*		
Scuba, and free diving vessels (conch) > 30 ' (9 m)		*		*		*				*						
Scuba, hooker and free diving vessels (lobster) < 30 ' (9 m)			*			*	*		*	*				*		
Scuba, hooker and free diving vessels (lobster) > 30 ' (9 m)		*	*			*				*						

Identified line and gill net fisheries in CARICOM countries

	Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica	Dominican Republic	Grenada	Guyana	Haiti	Jamaica	Montserrat	St Kitts and Nevis	St Lucia	St Vincent and the Grenadines	Suriname	Trinidad and Tobago
Handline / trolling < 20'	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
Handline / trolling < 20-30'	(*)		*		*	*		*	*				*		*	*
Handline / trolling > 30'			*		*	*		*	*				*		*	*
Long line fisheries < 25'	*		*		*	*	*	*	*	*			*	*	*	
Long line fisheries 25-35'			*		*	*			*				*			
Long line fisheries > 35'			*		*	*			*							
Gill net < 25'	(*)		*			?		*					*		*	*
Gill net > 25'				*		?		*							*	
Cast net				*			*									
Drift net < 10 m								*							*	
Drift net > 10m								*							*	

Identified seine and trawl fisheries in CARICOM countries

	Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica	Dominican Republic	Grenada	Guyana	Haiti	Jamaica	Montserrat	St Kitts and Nevis	St Lucia	St Vincent and the Grenadines	Suriname	Trinidad and Tobago
Chinese seine < 10 m								*							*	
Chinese seine > 10 m								*							*	
Seine net < 10 m					*				*			(*)			*	*
Seine net > 10 m		*							*							
Shrimp trawl < 10 m						*				*						*
Shrimp trawl fisheries 10-12																*
Shrimp trawl (twin rig)				*				*							*	*
Seabob fisheries								*							*	
Finfish trawl															*	

Identified other fisheries in CARICOM countries

	Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica	Dominican Republic	Grenada	Guyana	Haiti	Jamaica	Montserrat	St Kitts and Nevis	St Lucia	St Vincent and the Grenadines	Suriname	Trinidad and Tobago
Beach seine fishers	(*)														*	
Bank net															*	
Sea urchin fisheries							*							*		
Polyvalent vessels < 25'		*	*													
Polyvalent > 25'			*													

Summary of different fisheries identified in each CARICOM country

	Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica	Dominican Republic	Grenada	Guyana	Haiti	Jamaica	Montserrat	St Kitts and Nevis	St Lucia	St Vincent and the Grenadines	Suriname	Trinidad and Tobago
Main fisheries	7	9	13	8	7	16	11	12	13	14	4	4	10	10	16	12
Marginal fisheries	3															
Total man days	28	36	52	32	28	64	44	52	52	56	16	16	40	40	60	48

Appendix 4. Costs and Earnings Questionnaire

The data requested are being collected by the *National Fishery Department* as a means to estimate the value of the fishery. The data collected will be used to assist the management of the fisheries and to illustrate the importance of the fishery sector within the country's economy. The data are collected in a manner that the information cannot identify specifically with a single vessel. All information will however be treated as confidential and the only information available will relate to average data for each fishing group or segment.

1. Data collector:

2. Port market / landing beach:

3. Date:

4. Vessel segment (suggest an assigned number for each national or CARICOM segment):

5. Number of fishers on the vessel:

6. Average number of days per trip:

7. Species caught

Species	Average weight (Optional)	Average price ($) / (kg or lb)

9. Fuel (diesel / petrol) in litres per trip

10. Cost per litre ($)

11. Lub oil cost per trip ($)

12. Ice (kg / trip)

13. Cost / kg ($)

14. What percentage of sales are the landing costs: %

15. What are the landing costs if other: $

16. What are the transport costs incurred: $ / kg OR $ / trip

17. Bait (kg / trip)

18. Cost / kg

19. Specify type of bait being used

20. Food cost / trip: $

21. What share system is used to allocate wages from each trip?:

    (a) How many shares are there on the vessel (Crew plus boat share)
    (b) How many shares are allocated to the crew after deduction of operating costs:
    (c) How many shares are allocated to the skipper after deduction of operating costs:
    (d) If none of the above, what is the fixed salary paid per:
        (i) Crew man: $ / trip:
        (ii) Skipper: $ / trip:
        (iii) Engineer: $ / trip:
        (iv) Cook: $ / trip:
    (e) If none of the above, what is the total crew share as a percentage of sales: %

22. How many non-nationals are there on board the vessel?

23. How many are:
    Crew
    Skipper
    Other

24. What percentage of their wages are paid into a foreign account or sent overseas:

25. Summarize below your estimated costs per trip:

Costs	**$ / trip**
Gear cleaning	
Replacing weights	
Replacing lines	
Replacing hooks	
Replacing anchors	
Replacing dhans & flags	
Replacing rope	
Replacing warps & wires	
Engine parts	
Vessel running repairs	
Replacing other	
Specify other	

In addition to all the above costs, what other costs would you incur per trip and what would these amount to: $ / trip

26. How many trips would you expect to make in a season:

Please divide into high season low season:

High season	Low season	Total

27. What are your annual insurance costs: $

28. What are your annual loan repayments: $

29. Please complete the following:

VESSEL	Initial cost ($)	
	Life expectancy of the vessel (years)	
TRAPS / CASITAS	Number of traps	
	Cost per trap ($)	
	Life expectancy of the trap (years)	
NETS / SLEEVES / TIERS	Number of nets / tiers	
	Cost per net ($)	
	Life expectancy of the net (years)	
WARPS / WIRES / DOORS	Number of warps / wires / doors / hoppers / TED	
	Cost per warp / wire / net / hopper / TED ($)	
	Life expectancy of the net (Years)	
LINES / TROLLS	Number	
	Cost ($)	
	Life expectancy (years)	
DIVING EQUIPMENT	Number	
	Cost ($)	
	Life expectancy (years)	
TRUCK	Cost ($)	
	Life expectancy (years)	

Thank you for your co-operation. As and when we prepare a summary of the information gathered, would you like to receive a copy?

Yes / No

Address kept separate to the form

Appendix 5. Socio-Economic Questionnaire

1. How many people (including yourself) are there in your household, and what age, gender and nationality are they? – table to be filled in, e.g.

Household members	Age	Gender	Citizenship
Person 1	40	M	Local
Person 2	38	F	Not-local
Person 3	2	M	Local

2. What are their occupations (including yourself)? – key categories to be defined, and to include differentiation of roles in fisheries e.g. full owner, co-owner, skipper, crew, marketing of catch, processing

Household members	Occupation	Work status	Number of days
Person 1	Fishing crew	Full-time	240
Person 2	Housewife Fish sales	Full-time Part-time	365 120
Person 3	Student	-	300

3. What is your total household income in an average month?

4. Could you please break this down into different sources of income.
   (a) fishing crew earnings x
   (b) sale of fish catch y
   (c) other informal sales z
   (d) etc

5. What %, if any, of your household income in an average month is repatriated to other countries?

6. What level of education/training and literacy does each member of the household have?

Household members	Education	Other Training	Difficulty with reading and writing?
Person 1	Level 7	Skippers certificate	No
Person 2	etc		
Person 3			

7. Do any members of the household belong to any fishing or non-fishing organisations e.g. co-ops, youth groups?

Household members	Fishing	Non-fishing
Person 1	Co-op	Soccer
Person 2	Fish sales group	Women's group
Person 3		

8. What are your main physical assets in terms of value, not used for income generating activities? E.g. house, car, TV

Item	Value
House	X
Car	Y

9. What are the main economic assets which you use to earn income, and what would be their value if you if you had to replace them with something of a similar age and quality?

Fishing Item	Value	Non-fishing item	Value
Boat	$X		
Fishing gear	etc		

10. What is your household expenditure on the following items in a normal month?

(a) food
(b) health
(c) education
(d) social
(e) business expenses
(f) any other

11. As a household, how much and how many times each week on average do you eat:

		Times / week	kg / week
(a)	Fish	3	1
(b)	other forms of protein	1	0.1

12. How many loans do you have, and what is their total value?

13. Where are the loans obtained from: e.g. commercial bank, development bank, processor, co-operative, fishermen's association, money lender, family, friends?

14. What is the interest rate charged?

15. What is the period of the loan(s)?

16. What is used as security for the loan?

17. In relation to the sale of fish catch, what % is sold to the following different market sales outlets: e.g. % to processor / co-op, % sold on beach market, % consumed in household, % sold privately (hotel and other own distribution network)?

18. What do you consider to be the key threats to maintaining the level of your household income?

19. As a household, in what ways do you try to prevent your livelihoods/income from becoming worse, before something bad happens (e.g. saving – in what, investing in what, education for children)?

20. In the event of some unforeseen factor impacting on your livelihoods, what are the usual methods of re-building your livelihoods (e.g. credit from co-op for new gear following hurricane, using savings etc)?