

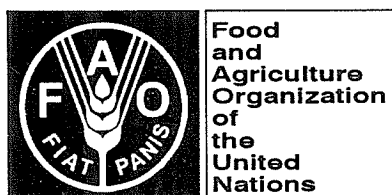
**WESTERN CENTRAL ATLANTIC FISHERY COMMISSION**

**Report of the Fourth Meeting of the**

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**WECAFC AD HOC SHRIMP AND GROUND FISH WORKING  
GROUP OF THE GUIANAS-BRAZIL CONTINENTAL SHELF AND  
CFRAMP SHRIMP AND GROUND FISH SUBPROJECT  
SPECIFICATION WORKSHOP**

**Port of Spain, Trinidad and Tobago, 8-12 January 1996**





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## PREPARATION OF THIS DOCUMENT

This document was prepared by the Food and Agriculture Organization of the United Nations (FAO), which organised the "Fourth Meeting of the Ad Hoc Shrimp and Groundfish Working Group of the Guianas-Brazil Continental Shelf" in collaboration with the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP) which organised the "CFRAMP Shrimp and Groundfish Subproject Specification Workshop." It includes summaries of the national reports and technical papers presented at the Meeting.

The work was accomplished under the guidance and supervision of FAO/WECAFC.

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#### ABSTRACT

This report provides a summary of the proceedings of the Fourth Meeting of the WECAFC Ad Hoc Shrimp and Groundfish Working Group on the Guianas-Brazil Continental Shelf and CFRAMP Shrimp and Groundfish Subproject Specification Workshop. It contains summaries of the national reports and technical papers presented during the meeting. A Supplement to this report will reproduce the papers presented at the Meeting.

The major topics discussed included priority areas for a co-operative investigation programme and proposals for CFRAMP sponsored stock assessment and data collection activities. The main recommendations and priority areas for collaboration approved by the Meeting are included in the report.

The Workshop agreed that enough data and information exist to do a preliminary stock assessment of the shrimp resources of the region and recommended that the next meeting of the Working Group should attempt this task. Bio-economic analysis of the available fisheries data in the countries was considered priority, through which optimal data requirements for the countries could be identified and alternative management strategies evaluated.

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## INTRODUCTION

1. This Workshop was the fourth on the subject to be held since the Fourth Session of WECAFC (Colombia, 1984) recommended the organisation of regular workshops to discuss biological and economic issues of the shrimp fishery in the Guianas-Brazil region. It was a joint meeting of the WECAFC Ad Hoc Shrimp and Groundfish Working Group of the Guianas-Brazil Continental Shelf and the CFRAMP Shrimp and Groundfish Subproject Specification Workshop. The first WECAFC Working Meeting was held in Miami, USA in 1986, the second in Cayenne, French Guiana in 1988 and the third in Paramaribo, Suriname in 1992. The scope of the fourth Workshop was expanded to include groundfish.

2. The Workshop was organised jointly by the FAO and CFRAMP (CARICOM Fisheries Resource Assessment and Management Program). FAO's support was provided through its regular programme, while CFRAMP's support was provided through the Canadian and CARICOM governments. The Workshop was held at the Hotel Normandie, Port of Spain, Trinidad and Tobago, from 8 to 12 January 1996, at the kind invitation of the Government of Trinidad and Tobago.

3. The objectives of the Workshop were to:

- expand the scope of the *ad hoc* Working Group to include groundfish;
- review shrimp and groundfish assessment and management activities during the intersessional period and identify approaches to be pursued;
- update fisheries officials on selected methods currently used in the assessment and management of shrimp and groundfish fisheries;
- develop co-operative investigative activities;
- review proposals for activities in countries participating in CFRAMP (Belize, Guyana, Jamaica and Trinidad and Tobago);
- identify proposals for follow-up action during the inter-sessional period.

## OPENING SESSION

4. The Chairman of the Session, Mr. Mervyn La Croix, Director of Fisheries, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago, in welcoming the invited guests and participants to the Workshop, expressed his appreciation for the work of the *ad hoc* Working Group and wished the participants a happy stay in Trinidad and Tobago.

5. The FAO Representative *ad interim* to Trinidad and Tobago, Mr. Bisessar Chakalall, in addressing the session, welcomed the participants on behalf of the Director-General of FAO. He thanked the Government of Trinidad and Tobago for hosting the Workshop. The presence of the participants was an affirmation of the importance attributed by their governments to the work of

FAO in the management and development of fisheries in the Western Central Atlantic Region (WECAFC).

6. Mr. Chakalall noted that world fisheries were passing through a period of important changes which should lead to sustainable, responsible fisheries that will continue to provide a vital source of food, employment, recreation, trade and economic well-being for present and future generations. He made mention of a number of significant milestones that were reached by the world community in 1995 and highlighted the adoption by the FAO Conference in November 1995 of the Code of Conduct for Responsible Fisheries.

7. He noted that awareness and consciousness that humans must consider themselves caretakers of nature were increasing and prevailing. In fact, evidence was mounting that humans, although adhering to different religions and philosophies, have come to believe in corporate stewardship. The regular meetings of the WECAFC Ad Hoc Shrimp and Groundfish Working Group on the Guianas-Brazil Continental Shelf since 1984 were good examples of such awareness. This group of countries recognised the need for a collaborative approach to the assessment and management of the fisheries resources of this sub-region.

8. Mr. Milton Haughton, Program Director of CFRAMP, described the difficult economic situation facing the countries of the Caribbean. He stated that one of the major challenges facing these states was the development and management of the indigenous living marine resources in a responsible and sustainable manner for the benefit of the people and the social and economic advancement of the countries. The living marine resources in the region contribute significantly to the goals of the countries for food security, economic independence, and prosperity.

9. Mr. Haughton explained that in order to realise the full potential of the fisheries resources, the countries needed to promote and adopt the concepts of responsible fishing and sustainable fisheries management. He explained that CFRAMP was working with the countries to: provide training opportunities in areas related to research and resource management; improve the systems for data collection and analysis; enhance the involvement of fishers and fishing communities in fisheries management; improve understanding of the biology and ecology of the major fish stocks; and improve institutional capability at the national and regional levels for planning and decision making.

10. Finally, he noted that as a result of several bold initiatives during the past five years, the countries now have at their disposal the necessary framework to conduct responsible fisheries and achieve sustainable management of the resources. Among these initiatives were the Declaration of Cancún, Agenda 21 of UNCED 1992, the Convention on Biological Diversity, the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, and the adoption by the FAO Conference in November 1995 of the Code of Conduct for Responsible Fisheries.

11. The meeting was officially opened by the Honourable Minister of Agriculture, Land and Marine Resources, Dr. Reeza Mohammed, who welcomed the participants to Trinidad and Tobago. Dr. Mohammed stressed the importance that Trinidad and Tobago and countries of the sub-region gave to multilateral co-operation in relation to fisheries management and conservation, and the

fact that the participation of the countries was a clear signal of their governments' intention to manage prudently and conserve their fisheries.

12. The Minister highlighted the achievements of a few recent projects, such as the UNDP/FAO project on the Establishment of Data Collection Systems and Assessment of the Marine Resources, preparation of draft fisheries management plans, and the revision of fisheries policy and legislation, with the support of FAO. Mention was made of a project proposal on "The Integrated Management and Protection of Resources in the Gulf of Paria", which was submitted to the United Nations Development Programme (UNDP) under the Global Environmental Facility (GEF) as an indication of his Government's efforts towards managing and conserving the living marine resources of the Gulf of Paria.

13. The Minister gave a brief overview of the fishery of Trinidad and Tobago, noting that emphasis was being placed on the reduction of fishing effort, and that since 1988 a maximum of 25 trawler vessels were allowed to operate in the waters of Trinidad and Tobago. He highlighted the impact of the use of Turtle Excluder Devices (TEDs) on the industrial shrimp trawlers in the Western Central Atlantic Region. He noted that Trinidad and Tobago had its share of problems related to the non-compliance of the use of TEDs by the trawlers. The Minister noted that looming on the horizon was the use of Fish Excluder Devices (FEDs) with the objective of reducing by-catch. He requested the meeting to discuss the issue.

#### ADOPTION OF THE AGENDA

14. Mr. Mervyn La Croix, Director of Fisheries, Trinidad and Tobago, was elected as Chairman of the meeting and Mr. Reuben Charles, Director of Fisheries, Guyana, as Vice-Chairman.

15. The Meeting adopted the Agenda, which is given as Annex I.

16. Participants volunteered to serve as rapporteurs for different Agenda items.

#### PARTICIPANTS

17. Twenty-four participants from Belize, Cuba, French Guiana (France), Guyana, Jamaica, Suriname, Trinidad and Tobago, Venezuela, FAO and CFRAMP, attended the Meeting. Two observers from the Institute of Marine Affairs (IMA) and the University of the West Indies (St. Augustine Campus) also attended. The list of participants is given in Annex II.

18. The meeting was informed that the participants from Brazil were unable to attend due to difficulties they experienced in securing their prepaid air tickets from the airline. They sent their apologies.

## NATIONAL REPORTS

19. Recent developments in the shrimp and groundfish fisheries of the region were presented in national reports, the full texts of which will be published separately as a Supplement to this Report. The national reports were prepared in accordance with the guidelines provided to the participants. The technical papers presented at the meeting will also be included in the Supplement. Summaries of the national reports are given below.

### Belize

20. The Belize shrimp fishery comprised an industrial trawl fishery having approximately six trawlers (Gulf of Mexico type), and a coastal artisanal fishery. The main management measures were: the seasonal closure of the shrimp fishery (15 April to 15 August); specific agreements formulated between the fisheries department and the processing plants in collaboration with trawler owners; and the use of specific net sizes and by-catch devices, specifically turtle excluder devices (TEDs).

21. The major area of concern for the Government of Belize was finding a balance between sustainable exploitation of the resources and the continual maintenance of the fragile marine ecosystem involved. The aim was to manage the resource on a sustainable basis and strategies would be implemented to attain this goal. Research and data gathering were identified as priority activities as these would provide the necessary information on which to base future management options.

### French Guiana

22. The entire French Guiana shelf was exploited by shrimp trawlers using various strategies. The seasonality of these activities seemed to follow a rhythm but no exact pattern was described. The more exploited area was between the 20 m and 90 m isobaths although a regulation forbidding trawling shorewards of the 30 m isobath existed. The main shrimp species exploited on the continental shelf was *Penaeus subtilis*, its landings representing nearly 95 percent of the total shrimp landed. The second species landed, *Penaeus brasiliensis*, was now considered by-catch. There was no sorting of *P. brasiliensis* which usually constituted the largest individuals among the catch.

23. This fishery was controlled by a total allowable catch (TAC) system implemented by the European Union (EU) since 1985. From 1992, an annual TAC of 4,108 tonnes of *P. subtilis* (4,000 for France and 108 for ACP countries) was set for five years. This had been complemented by a local licensing system exclusive to French boats. The maximum numbers of trawlers allowed to exploit the stock was 72 in 1992, 70 in 1993 and 1994 and 68 in 1995.

24. There was no special fishery for sea-bob (*Xiphopenaeus kroyeri*) although the resource seemed to be very important. A fishery for deep-water shrimps also existed on the slope of the shelf for *Solenocera acuminata* (200m depth) and for *Parapenaeus edwardsianus* (700m depth).

25. No data were available on the by-catch caught with the shrimps. Even if part of the by-catch had been frozen on board, the landed quantities were not known because they were not registered. The by-catch landed was supplied directly to the local market.

26. There were three main species of snappers: lane snapper (*Lutjanus synagris*), vermilion snapper (*Rhomboplites aurorubens*) and red snapper (*Lutjanus purpureus*). Only the latter was of real commercial interest. It was targeted by Venezuelan hand-liners. There had been a licensing system since 1985 for 41 Venezuelan boats and a reserve of five for ACP countries. They had an obligation to land 75 percent of their catches in French Guiana. These licences were granted only if a contract between the ship owner and a local processor existed.

27. The fishing effort on the snapper fishery, which was reduced in 1991, seemed to have stabilized from 1991 to 1994, at close to 35,000 hours per year. The landings, which also seemed to have fallen in 1991 and 1992, were reported to be increasing slowly. Moreover, an analysis of the yields by stratum of depth showed that the fleet was optimizing its strategy and was fishing in the eastern part of the fishery and in a deeper area (90 m - 120 m). The fleet and its strategy seemed to be well adapted to the fishery and, despite a slight decrease in effort, the production and the CPUE had increased in 1993 and 1994.

28. The artisanal fishery consisted of 120 boats and was similar to that of neighbouring countries. It was heterogenous, complex and adapted to the variability of the environment. The diversity of the species and variations in their seasonal abundance, access to the resources, costs of production and adaptability to the market demands were the main factors affecting the activities of the fleets. A fleet analysis was in progress and indicated how to define homogeneous groups of boats to undertake realistic sampling of the species caught.

29. The artisanal boats were fishing inside the bathymetric zone of 10 m, but interactions with the industrial shrimpers in coastal areas were likely. In the coastal zones, activities were seasonal and involved exclusive targeting of fish with gill-nets. A local licensing system had been in use from January 1996. This fleet operated within areas of relatively low salinity and in the estuaries. It was likely that the production was not representative of the real potential of the area since, in most cases, fishing was for subsistence.

#### Guyana

30. The marine fishery of Guyana consisted of a large-scale "closed entry" industrial fishery consisting of 117 trawlers, of which 67 were licensed to catch penaeid shrimp and 28 of the remaining 50 were currently licensed to catch seabob/finfish. The other 22 vessels were currently unlicensed and inoperative. The artisanal fishery consisted of approximately 1,240 vessels, of which approximately 60 percent used gillnets, 27 percent used chinese seines, eight percent used caddells, and five percent used pin seines.

31. In 1994 shrimp production of 1,890 mt (tail weight) of shrimp and 4,190 mt (whole weight) of seabob by the industrial fishery was processed primarily at the four main processing plants, while a contribution of 2,547 mt (whole weight) of seabob and whitebelly shrimp from the

used to complement each other. The first used catch and effort and ancillary data to derive an optimal fishing effort by fitting analytical models to the data, while the second approach focused on sampling and experiments designed to relate secondary production to environmental factors.

68. He noted that a great deal of information existed in the region, but that there had been few attempts to analyse the data on a regional basis. Most of the data on catch and effort related to the industrial fishery. He suggested that the artisanal fishery, whether for shrimp or groundfish, had received very little attention, with the possible exception of Trinidad and Tobago. The types of information available included total landings, results from research surveys, and remote sensing data.

69. Dr. Talbot emphasized that the fishing effort required to approach the maximum sustainable yield for shrimp is substantially higher than the maximum effort the associated groundfishes could sustain.

70. This presentation was followed by a general discussion of the goals and objectives for the fishery. Several participants considered the principal goals to be the long-term conservation of the resources and the economic "optimization" of the fishery.

71. He reported that the management measures that were considered a priority by the "Third Workshop on the Biological and Economic Modelling of the Shrimp Resources of the Guyana-Brazil Shelf in Paramaribo" (FAO, 1992) included the protection of nurseries, the establishment of closed areas/seasons and regulation of effort.

72. There was considerable discussion on the research priorities presented by Dr Talbot in his example Figure 2. However, it was agreed that the example of prioritisation of goals, and the research required to achieve these goals, was a valuable exercise in decision-making.

#### FISHERIES RESOURCE MAP OF THE MAJOR COMMERCIAL SPECIES OF SHRIMP AND GROUND FISH OF THE GUIANAS-BRAZIL CONTINENTAL SHELF

73. A demonstration of different types of thematic maps and their usefulness was presented by Dr. Talbot. He used the example of the thematic map of the lobster fishery in Nova Scotia and the thematic, distribution and habitat maps currently available for the Guianas-Brazil continental shelf, demonstrating the value of spatially related information for planning and management tasks.

74. The maps shown in this example were non-quantitative maps demonstrating the distribution of the lobster fishery and areas closed to fishing, and a series of quantitative maps showing various quantities distributed at a series of sites. He emphasized the differences between a non-quantitative map and its quantitative equivalent.

75. Using maps of the Guianas-Brazil continental shelf, he showed the distribution of *Penaeus subtilis* and *P. brasiliensis*, the main concentrations of small sized shrimps offshore, the nurseries, adult migration and surface currents/larval drift. He also showed the distribution of the commercial species of sciaenids and maps of the bottom conditions and trawl data from the R/V

Fridtjof Nansen surveys. The usefulness of these maps was discussed, demonstrating the level of information presently available in the region, the inadequacies of the existing information, and the potential uses of resource maps in stock assessment.

#### DATA COLLECTION SYSTEM FOR THE ARTISANAL FISHERY OF SURINAME

76. Ms. Yolanda Babb-Echteld explained that the Fishery Information Service (FIS) was the result of an FAO/UNDP project, which started in October 1990 and was completed in 1992. The aim was to provide information needed for management purposes. For each fishing unit, monthly estimates of effort, landings and CPUE were produced. Approximately 50 landing sites were sampled. A total of 57 species was included by the System.

77. FIS was reported to be reliable but could still be improved. The main problem was still the coverage, in that a significant part of the landings was missed. It was necessary to periodically revise and update the System, particularly the list of landing places and the methodology applied to each of them. Current problems included the landing by vessels at unrecorded landing places and the lack of qualified manpower to operate the System properly.

78. She concluded that:

- FIS was an essential tool for the development and management of fisheries in Suriname and was one of the principal ongoing activities;
- the shortcomings of the System should be corrected as soon as possible and it was very important to keep the FIS flexible so that it could be quickly adapted to changing situations in the fisheries; and
- the System was very dependent on the performance and availability of a few key staff.

79. In response to a question, Ms. Babb-Echteld indicated that the greatest problem encountered in the collection of data was a lack of properly trained personnel. She cited the example of the loss of a single key technician which had effectively stalled the process.

#### THE SHRIMP FISHERY OF THE CUBAN SHELF

80. An integrated analysis of the Cuban shrimp fisheries, including biological, ecological and economical aspects was presented by Dr. Paez. There had been a reduction in the catches of the Cuban shrimp fishery thought to be mainly due to changes in environmental conditions and also to periods of over-exploitation. Years of drought and damming of rivers had affected the coastal lagoons and probably the seagrass beds (*Halodule wrightii*), which were thought to influence the post larval and juvenile phases of *Penaeus notialis*.

81. Two approaches had been tried to assist in alleviating the decline in catches in Cuba. One of them was improved management, including effort regulation, closed season, protection of nursery grounds, and closed microareas where a great percentage of small shrimp occur. The second approach was to attempt to compensate for the results of negative environmental phenomena. This involved shrimp releases and the planting of artificial sea grass beds. However, despite the number of fry released, no increase had been observed in the commercial biomass. Some evidence of the presence of these released shrimp in the adult population from both the chronological data analysis and protein electrophoretic experiments, was confirmed.

82. An overview of the application of BEAM-4 was presented. BEAM-4 was found to have been a useful tool in the analysis of both economic and biological aspects of the shrimp fisheries of Cuba. Different output scenarios were presented for the Manzanillo Fishing Company. Dr. Paez suggested that a reduction of effort in this area could be the best way to increase profit.

83. The main conclusion of this report was that there was a need for an integrated analysis (biological, ecological, social and economic aspects) of the fishery by a multidisciplinary team, and to continue to improve knowledge of the resource.

84. There was some discussion about the accuracy of the value of natural mortality,  $M$ , used in the analyses, which was considered to be high. Dr. Paez explained that this high rate was estimated from a direct method using CPUE data of monthly exploratory cruises during the closure of the fishery for 12 months. The ecological function of sea grass habitats in increasing shrimp abundance was discussed. He stated that his hypothesis was that they increased availability of organic matter, increasing production, rather than simply acting as an aggregating device. However, he stated that there was no proof of this as yet.

#### **OBSERVER PROGRAMME - VENEZUELAN EXPERIENCE**

85. In his presentation, Mr. Marcano stated that trawl fisheries in Venezuela began in the early 1950s. Since then, several attempts had been made to set up a reliable, official system for monitoring the fisheries and recording fishery statistics, but none had succeeded. In 1969, an FAO/UNDP project set up a programme for the collection of fishery statistics on board fishing vessels and in the processing plants. In spite of the good results obtained, the programme was not continued when the FAO project ended its work in Venezuela.

86. In 1981, a new programme was established by the Government, based on maintenance of fishing logbooks by the industrial sector. The programme failed to provide reliable information. Prompted by the lack of proper information on trawl fisheries, the FONAIAP (Fondo Nacional de Investigaciones Agropecuarias) researchers re-implemented the 1969 FAO programme. The major goals were to determine the distribution in space and time of catches and of fishing effort, as well as variation in abundance of the major exploited species of shrimp and by-catch. The observers were the key factor in the programme. They were fishing technicians, with a high-school equivalent diploma. They were trained in species recognition, proper completion of forms, biological data gathering and recording, and estimation of non-commercial by-catch. Four percent of the trips made by the fleet were covered by observers, amounting to 70 trips per year on the



eastern side of the country. Sampling also took place in the harbours and processing plants. Some of the logbooks provided by the industry were still being used for the compilation of fisheries statistics.

87. In response to a question, Mr. Marcano stated that the observer programme cost about US\$ 17,000 per year. The programme was able to keep trained staff by paying competitive salaries.

#### CANADIAN INTERNATIONAL OBSERVER PROGRAM

88. The Interim Canadian Program Director of CFRAMP, Mr. Hurley, described the Canadian International Observer Program, setting out its mandate and approach, organization, legal status, target coverage levels, and synopses of the various Program activities including shrimp sampling and attributes and problems. He discussed the applicability of such a program or a modified version of it to the CARICOM region (especially Guyana, Trinidad and Tobago and possibly Belize). Suggestions and recommendations focused on the data collection aspects with the aim of developing a sampling strategy that would reduce biases both in terms of vessel selection and the ability of the observer to report factual information.

89. In response to a question, Mr. Hurley stated that the Program costs were about US\$ 2 million per year for the Atlantic region. It had been in operation since 1977.

#### JOINT FRENCH GUIANA-SURINAME PROJECT ON SHRIMP RECRUITMENT

90. According to Mr. Charuau of IFREMER (Institut Français de Recherche pour l'Exploitation de la Mer) the general mechanism for recruitment of juveniles to the fishery was known but had proven almost always impossible to quantify. Recent observations confirmed the migration of the juveniles from the coast to the open sea up to 40 meters depth. The gradation in distribution of recruits appeared more obvious during the wet season than during the dry season. These recent observations also confirmed very strong concentrations in front of the main rivers (Oyapock, Maroni, and Sinnamary). No seasonal or cyclic mechanisms had been confirmed. When the results of various cruises were compared, events were found to occur during different periods each year. An important correlation between the level of recruitment and the production of the stock was considered likely. Although no major variations of the landings were observed in recent years, there was no evidence that catches were correlated with recruitment during this period.

91. It was obvious that the CPUE of the smallest categories was also related to the dynamics of the fleet. If the strategy of the shrimp-trawlers was oriented towards small categories, in the shallow waters, the recruitment indices were found to go up.

92. As an illustration of these problems, a regression between the indices of abundance of the stock against the recruitment indices over the 35-year period showed that variations in the two series do not correlate. It seemed difficult, at the time of reporting, to use these indices directly without a correction for the dynamics of the fleet and/or for the catchability of the various age-groups of the stock.

93. Mr. Charuau stated that the shrimp recruitment indices shown in his report were calculated only from catches within the 30m depth contour.

#### SYNTHESIS OF LITERATURE REVIEWS ON ENVIRONMENT/HABITAT/RECRUITMENT

94. Dr. Talbot made a presentation on Habitat Requirements and Environmental Factors Controlling Shrimp Production in the Guianas-Brazil Continental Shelf Area. The hydrography of the area is strongly influenced by freshwater run-off from major river systems extending from the Amazon on the northeast coast of Brazil to the Orinoco in Venezuela. Sediment, carbon and organic loads in freshwater discharge have a profound influence on the bathymetry and productivity of shelf habitats.

95. Four species of penaeid shrimp dominated commercial landings along the Guianas-Brazil continental shelf. Their recruitment into the commercial fishery appeared to be influenced by coastal habitat type, environmental conditions (eg. precipitation, temperature), freshwater runoff from river systems and biotic factors. Shrimp display considerable variation in seasonal and annual abundance. Dr. Talbot suggested that much of this variability was due to mortality during the planktonic larval and subsequent demersal estuarine juvenile stages when environmental factors could be expected to determine cohort strength. These fluctuations, and the ability to predict them, could be of interest to commercial and small scale fishermen and resource managers. Dr. Talbot also stated that traditional methods of stock assessment had often proven inadequate, and more recent techniques that attempt to incorporate a series of environmental parameters had met with limited success. This study reviewed the major factors affecting shrimp recruitment and production, and proposed monitoring methods and ecological approaches that could result in improved understanding of the processes determining yields and the ability to predict them.

96. In response to the statement that very little was known about the ecology of the species that sustain the shrimp and groundfish fisheries, Dr. Hatcher suggested that, under such circumstances, and faced with very high species diversity, a habitat approach should be pursued through measures such as closed areas and closed seasons.

97. It was pointed out that an intensive study to predict recruitment in shrimp would be an ambitious and expensive task and that there could be no guarantee of success. Dr. Talbot responded that he envisaged the use of data generated in routine, on-going monitoring and from projects directed at other objectives. Hence, the research activities proposed in this area would use only a small proportion of personnel and financial resources.

#### FINFISH CATCH ESTIMATION

98. Dr. Ehrhardt discussed finfish catch estimation in complex, multispecies-multigear fisheries. He stated that demersal finfish resources in the Guianas-Brazil region were impacted by non-directed and directed fisheries. Among the non-directed fisheries, the shrimp trawl fishery was mentioned as the most significant. Finfish resources formed part of important shrimp by-catch volumes that are discarded at sea.

99. Shrimp by-catch estimation procedures adopted in the United States Gulf of Mexico shrimp fishery were explained in some detail. Emphasis was put on the extensive data requirements needed to estimate the by-catch. Observer programmes were also suitable for collecting these data. However, the level of investment for a continuous data gathering programme was high.

100. It was noted that finfish landings may be assessed by means of frame surveys. This would require a census, involving a complete enumeration of landing sites, fleets and boats, and surveys that use these frame data to enumerate a few of the landing sites. On the basis of the census, the data from the surveys could be used to estimate the total catch. The sites for the surveys should be statistically determined according to a stratified design. It was brought to the attention of the meeting that several frame survey designs had been undertaken in the region to estimate finfish landings. The advantage of standardizing these procedures was highlighted.

#### **TRANSBOUNDARY STOCKS/FISHERIES - GUYANA**

101. Mr. Charles examined issues relating to the management of the fisheries occurring primarily at the border between Guyana and Suriname. The EEZs of these neighbouring countries constituted a section of the natural management area that extends from the Amazon River to the Orinoco River, hence fishermen of the two countries fished the same stocks. Guyana had a large artisanal fleet in addition to an industrial trawl fleet. The industrial trawl fleet exploited prawns and finfish.

102. Both countries regulated their fisheries by issuing licences to fishing vessels, but there had been problems with unlicensed fishing. Through the intervention of Government, an arrangement was put in place where Suriname had offered the Guyanese fishermen on the Corentyne 100 licenses; 50 to fish in the Corentyne River and 50 to fish off the coast of Suriname. Problems of licensing, piracy at sea, and data submission to fishing authorities, were presented.

103. In the discussions that followed, Mr. Charles, explained that an attempt to open the Guyana-Suriname fishing grounds to fishers from both nationalities, without restrictions on movements between the countries, was probably not feasible at the moment. While the fishers may have accepted this move, the countries were probably not politically ready for it. In addition, this approach would not solve conflicts with foreign vessels. The participant from Suriname, Mr. Lieveld, added that such a move would probably lead to greater fishing concentration in Suriname where higher densities of fish occurred. This would lead to conflict.

#### **TEDs/BRDs LITERATURE REVIEW, INCLUDING WORK BEING DONE BY VENEZUELA**

104. In his presentation, Mr. Alió of Venezuela mentioned that the major goals of introducing by-catch reduction devices (BRDs) in shrimp trawl nets were to achieve a reduction in juvenile by-catch (by about 50 percent) while maintaining the loss of shrimp capture to a minimum (no more than five percent). In order for the gear modification to be accepted by the crew members of different fleets, the device needed to be made from materials that were readily available and of low cost, and which introduced the least possible modifications to the existing fishing gear.

105. The by-catch reduction devices, proposed or currently in use, could be grouped according to two approaches; "blocking" or "behavioural" devices. The "blocking" devices tended to sort the catch *in situ*, either preventing the entrance of the by-catch at the mouth of the net, or preventing its retention before it reaches the cod end (e.g., the Turtle Excluder Device). Many "blocking" devices used grids that could get clogged, resulting in loss of shrimp or commercial finfish species.

106. The "behavioural" type of devices took advantage of the different behaviour of shrimp and fish inside the nets for the sorting of the by-catch, allowing the escape of a significant proportion of the latter. They had been more effective than the "blocking" devices in reducing by-catch without inducing economic losses to the fleets. Behavioural types of devices used exits placed in different sections of the net, to allow the escape of finfish. Retention of commercially important finfish could be obtained by covering the exit with net of appropriate mesh size. However, the variation in by-catch was still large among tows made with a similar design. The reasons for the variability could be attributed to different seasons, locations, species in the catch, or even the effect of the position of the net on either side of the boat. As with the use of the TEDs, the exact sources of the variations would most probably be found when the use of BRDs became common in commercial operations.

107. The obligatory use of TEDs in the trawl nets of several shrimp fisheries had resulted in a substantial reduction in incidental capture of marine turtles and by-catch, also resulting in economic losses due to the significant escape of commercially important shrimp and fish from the nets. The use of TEDs had also disrupted the implementation of other types of by-catch reducing devices, that could be more effective in the exclusion of finfish by-catch from shrimp trawl nets.

108. In discussion, the meeting noted the importance of differences in species behaviour. It was suggested that some species swim upwards when trapped in the cod-end, while others swim downwards. Devices therefore needed to be designed for specific circumstances. It was stated that in trials with the Nordmond Grate in Canada, it had been found that nets in a trouser-ends configuration provided a better experimental comparison than separate nets. The Nordmond Grate had reduced the by-catch in shrimp trawl fisheries by over 90 percent.

109. Mr. Alió informed the meeting that Venezuela had not included other countries in their experimental programme but that the issue was going to be discussed in forthcoming meetings on the Venezuela-Trinidad and Tobago fishing agreement.

110. He also indicated that there was resistance from fishers to the introduction of TEDs, as this deprived them of important finfish catches. The only reason TEDs were supported was because of the possible ban on sale of shrimp catches to the United States. Fishers in Trinidad and Tobago were reported to have the same attitude. The difficulty for the fishers of installing both TEDs and BRDs was raised and it was considered highly unlikely that they would be able to comply with both.

111. The effects of the installation of TEDs and BRDs on the efficiency of the gear for catching shrimp was stressed. Where CPUE was being used for assessment, the introduction of devices would have to be considered and its impact included in the assessments.

**CO-OPERATIVE INVESTIGATIVE PROGRAMME - SHRIMP AND GROUND FISH. CURRENT INITIATIVES AND PRIORITY AREAS FOR COLLABORATION**

112. The participants were divided into two Working Groups for this Agenda item. The first group was requested to evaluate the project proposals submitted to CFRAMP while the second group was asked to highlight priority activities for the inter-sessional period of the WECAFC Ad Hoc Working Group. The working group were:

WORKING GROUP I

Gilbert Richards  
Reuben Charles  
Avery Galbraith  
Sita Kuruvilla  
Mario Amos  
Lara Ferreira  
Yolanda Babb-Echteld  
Bruno Bautil  
Nelson Ehrhardt  
Milton Haughton  
Terrence Phillips  
André Talbot  
Bruce Hatcher  
Garret Manwaring

WORKING GROUP II

Juan Paez Costa  
Anatole Charuau  
Dawn Shepherd  
Anne Marie Jobity  
René Lieveld  
José Alió Mungo  
Luis Marcano  
Indar Ramnarine  
Bisessar Chakalall  
Kevern Cochrane  
Geoffrey Hurley

113. As an introduction to the Working Group deliberations, the Secretariat summarised the types of stock assessment which could be undertaken within the countries and region with different types of data. A table illustrating this can be found in Annex III. It was stressed that most, if not all, of the countries had sufficient data to undertake some analyses and some had already done so with useful results. In addition to obtaining more information on the status of the stocks, such analyses also highlighted weaknesses and gaps in the data and could lead to improved data collection approaches.

114. It was agreed that a primary task of fisheries assessments was to provide decision makers with advice on how best to manage the living marine resources. The Secretariat suggested that such advice could best be presented in the form of a decision-table which showed the estimated biological, economic and social consequences of given management actions. Hence, for example, advice could be given in the form of the probable consequences in both the shrimp and groundfish fisheries, of maintaining effort at its current level, and the consequences of reducing or increasing effort, for example by 20 percent. The preparation of such decision-tables could be

seen as a short-term goal for the region, and research priorities and needs could be determined on the basis of achieving this goal.

115. Generally, in setting research priorities, the Secretariat suggested that the following needed to be considered:

- research must be driven by objectives;
- the objectives must be realistically attainable;
- more emphasis must be placed on objectives which will provide meaningful answers in the short to medium term;
- focus must be placed on objectives which address the major problems facing the countries and region; and
- considerable effort needs to be put into analysing the available data, using them in assessments and evaluating the validity of the results.

#### **Report of Working Group I**

116. The purpose of this Group was to review the CFRAMP proposals for the Shrimp and Groundfish Subproject. These proposals, if approved, would be supported technically and financially by CFRAMP over the next three years. The Shrimp and Groundfish Resource Assessment Unit (RAU) would be responsible for co-ordinating these activities in the countries. A list of the proposals presented and discussed in the Working Group is attached as Annex IV.

117. The chairman of Group I reminded the group that the goal of CFRAMP was to promote the management and conservation of fisheries resources of CARICOM countries on a sustainable basis and to provide these countries with the basic information and institutional capacity necessary to manage and develop their fishery resources.

118. The Working Group agreed that the following points were to be considered in the evaluation of proposals:

- strengthening the capability of fisheries departments to accomplish their goals by providing training as well as technical assistance;
- supporting activities and personnel in a sustainable fashion, such that programmes continue after the CFRAMP ends;
- having clearly defined objectives, based on specified management goals which must be manageable and achievable given available departmental and CFRAMP resources;

- employing standardized approaches which harmonize with other nations' programmes, and integrate data on a regional basis (including a uniform observer programme);
- including mechanisms for quality control in data collection programmes, and quality assurance of fisheries data;
- providing clear prioritization of discrete activities within projects, and species to be studied (if applicable);
- making use of historical data existing in many countries;
- avoiding duplication of effort and making optimal use of limited financial and human resources; and
- focussing on data gathering, data analyses and the generation of useful products.

119. The priority areas identified were data collection, habitat/thematic mapping, stock assessment, community participation/social studies, and training.

120. The Working Group agreed that, given the regional nature of the shrimp and groundfish stocks, consideration be given to common issues in proposals, and attempts be made to standardize approaches to facilitate data comparison. The following were recommended:

- approaches to design and implementation of frame surveys be standardized, in the light of resource availability;
- harmonize approaches in data collection, bearing in mind the shared nature of the resources and the need for regional approaches to stock assessment and management;
- common procedures be developed for the observer programmes in the region; and,
- need to identify and rank priority species for stock assessment.

121. After discussions of the country proposals for Belize and Jamaica on data acquisition and monitoring systems for their respective shrimp fishery, the Group concluded that both proposals should be implemented in a phased approach, as this would enable both countries to develop a better understanding of their respective fisheries. It was noted that application of surplus production models would not be possible within the life of CFRAMP, but the data collection system would have to be carried beyond the Program if an adequate time series of data is envisioned to assess the fisheries.

122. After discussing the Guyana proposal, the Group recognised the need to relate more clearly management objectives to activities to be undertaken in the proposal. It was also suggested that

the approaches to data collection need to be examined in relation to the level of investment and the benefits.

123. The Group accepted the Guyana proposal, noting that the budget needed revision. The Group agreed that:

- the data requirements for the utilisation of the shrimp assessment algorithm proposed by Dr. Ehrhardt would be incorporated into the proposal;
- an observer programme was necessary but needed to be revised and refined within the constraints of the available human and financial resources;
- the thematic mapping components were acceptable, but needed to be examined in terms of the national and regional approaches;
- the item listed for hosting the next CFRAMP Shrimp and Groundfish workshop would be re-allocated to the Trinidad and Tobago RAU budget.

124. After discussing the Trinidad and Tobago proposal, the meeting agreed that it was a good proposal which touched on past activities and projected into the future. However, it was decided that the proposal was complex and would require extra management efforts for its successful implementation.

125. The Group further requested that Trinidad and Tobago revise its proposal identifying priority areas in view of the financial constraints of the RAU. Training funds will be maintained in the Trinidad and Tobago RAU budget.

126. After discussing the Data Bank proposal the Working Group supported the intent of this proposal to establish a centralized database of environmental and fisheries data for use by the countries. It was agreed that the funds should be used to strengthen the FISMIS database in Trinidad and Tobago. The Group further suggested that this activity should be co-ordinated with existing CFRAMP activities aimed at strengthening the FISMIS database and that acquisition of data would focus on collecting neutral data since the countries may not be willing to contribute their management oriented data. The scope of the project would be defined by a budget of US\$25,000.

127. After discussion of the acoustic equipment proposal, the Group agreed not to support this proposal. It was suggested that a revised proposal could be presented at the Coastal Pelagics Subproject Specifications Workshop. The Group proposed that a request for the use of the R/V Dr. Fridjof Nansen or a more suitable vessel be discussed in the plenary session.

128. After discussing the thematic/habitat mapping proposal the Group agreed that thematic/habitat mapping was an important activity and should be supported. The current proposal would be revised and integrated with the country proposals for thematic maps. The budget would be substantially reduced and the scope of work narrowed to focus on priority areas of the shelf in Trinidad and Tobago and Guyana. The RAU would be responsible for coordinating these activities.



129. After discussing the recruitment proposal the Group agreed that these activities were important to understand better fishery resource dynamics and should be incorporated into Guyana's overall data collection program.

130. The Group recommended that the Shrimp and Groundfish RAU should host a stock assessment workshop within a year to analyse historical data to obtain information for their management plans and identify data gaps.

### **Report of Working Group II**

The Group considered the major fishery problems facing the countries of the Guianas-Brazil region, identified the following issues, and proposed actions. The actions were divided into five broad categories; these are not listed in order of priority.

#### **A. Human and Financial Resources**

##### *Issues*

- Lack/deficiency of technical expertise to undertake effective stock assessment activities, even where data were available.
- Inadequate political commitment to fisheries management and research, which has resulted in insufficient financial resources for these activities.

##### *Actions*

- Provide technical assistance in stock assessment, data collection, and analysis.
- Inform politicians of the importance of fishery resource assessment in support of fishery management.
- Conduct "hands on" stock assessment workshops.
- Promote formal training (university level) in stock assessment and related activities.

#### **B. Policy/Legal/Enforcement**

##### *Issues*

- Management goals and objectives were not clearly defined.
- Differing national objectives within fisheries sectors.
- Outdated or non-existent legislation and absence of regulations.

- Problems with enforcement of regulations.
- “Open access” policy in artisanal fishery.
- Little input to fisheries management by fishers.

*Actions*

- Formulate and disseminate draft national management plans with involvement of all resource users/interest groups.
- Management plans should also be used to assist in increasing awareness of regional collaboration and co-operation.
- Enact appropriate supporting legislation for fisheries management.
- Consider introducing limited access to artisanal fisheries.
- Promote bilateral/regional co-operation in enforcement.

C. Data and Information and Fisheries Stock Assessment

*Issues*

- Uncertainty about optimal data requirements for fishery stock assessments.
- Unreliability of data and no data verification.
- Inadequate biological knowledge of exploited species.
- Complexity of the fisheries (multispecies, multisector).
- Absence of data analyses on a regional basis.
- Lack of uniformity in approaches to data collection and analysis.
- Low selectivity of shrimp fishing gear (by-catch).

*Actions*

- Undertake analyses with available data to highlight strengths and weaknesses.
- Identify data requirements for planned stock assessments.
- Refine data collection activities and expand as necessary.

- Harmonise approaches to data collection and analysis within the region..
- Carry out gear selectivity research studies to reduce undesirable by-catch.

D. Environmental

*Issues*

- Degradation of the coastal environment.
- Lack of understanding of environmental influences on fishery resources.

*Actions*

- Enforce existing legislation and improve as necessary.
- Educate public and decision makers on importance of environmental conservation and management.
- Study impacts of pollution of the coastal environment on fisheries resources.
- Undertake studies on environmental variability and its effects on fish productivity.

E. Socio-economic

*Issues*

- Imposition of gear regulations under threats of trade sanctions (e.g. enforcing installation of TEDs).
- High prices arising from market forces and concomitant over-capitalization in shrimp fishery, leading to inefficient fishing effort levels.
- Poor awareness amongst fishers of principles of resource utilisation and conservation.

*Actions*

- Comply with FAO Code of Conduct for Responsible Fisheries and publicize successes.
- Conduct bioeconomic modelling to investigate the optimal use of diverse fisheries resources.
- Foster a sense of resource ownership among fishers, including co-management.

- Identify attractive alternative opportunities to fishing.
- Reduce fishing capacity through mechanisms such as licence restrictions and a buy-back policy.

131. Overall, the Group made the following recommendations:

- that specialised universities in the region should be approached and requested to explore avenues to provide training in quantitative resource assessment and data analysis, to facilitate the longer-term development of local expertise in these disciplines;
- in most countries in the region, the impact of pollution and degradation of the coastal environment on the shrimp and groundfish resources was cause for concern. It was therefore agreed that the fisheries departments in those countries should approach other departments with related responsibilities, to identify the concerns and develop collaborative research and management action to investigate and address these issues. Further, it was recommended that fishery departments should be represented in those fora where planning and management decisions are made which could, through coastal processes, have an impact on fish stocks.

132. The following actions were considered by the Working Groups to have highest priority and developed into more detailed sketches which are found at Annex V:

- i) Bio-economic analyses of the available fisheries data in the countries and region to assess the status of the shrimp and groundfish stocks and the fisheries dependent on them;
  - through these analyses, to identify the optimal data requirements for the countries of the region; and
  - using the results, to develop national and regional management scenarios to inform decision makers as to the options available to them and the importance of rigorous resource management.
- ii) Training personnel from the region, in the field, in data collection and analysis;
- iii) Greater co-operation between countries of the region in the experimental development, design and testing of shrimp fishing gear to minimise undesirable by-catch.

## PLENARY DISCUSSIONS ON WORKING GROUPS REPORTS

133. The Working Groups presented their reports to the plenary. Working Group I referred to the proposal to request the use of the R/V Dr. Fridjof Nansen or a more suitable vessel for a new survey of fish resources in the region. It was agreed that the objectives of this proposed survey needed to be clarified before such an approach was made. It was pointed out that the vessel was unable to undertake surveys in shallow water, thought to be less than 20m, and was therefore unable to survey some habitats critical to the fisheries in the region. Nevertheless, it was agreed that the vessel had much to offer resource assessment in the region and that an approach should be made to NORAD and FAO.

134. The Secretariat pointed out that an approach to NORAD should be made by the countries and copied to FAO. Participants were therefore advised to identify the objectives and requirements for assistance, and then to submit a co-ordinated request directly to NORAD with a copy to FAO.

135. There was also discussion concerning the proposal for the expansion of the regional database situated in Trinidad and Tobago, to include available fisheries and environmental data, in addition to the existing bibliographic information. It was stated that the database would include all relevant data which were not considered sensitive by the member countries. It was recognised that there was a reluctance by countries to release raw data. The meeting agreed that the funds proposed for this activity should be diverted to the proposed stock assessment activities of CFRAMP Shrimp and Groundfish RAU.

136. Following these discussions, the plenary accepted the reports of the two Groups.

## ANY OTHER MATTERS

137. The Secretariat brought to the attention of participants a UNEP/FAO proposal to GEF Project Development Facility for a Block B Grant to assess the impact of tropical shrimp trawling on living aquatic resources. This proposal would have to be driven by the countries involved, and the Secretariat requested the names of contact persons in each country for this purpose. Further information could be obtained from Mr. Jan de Boer at FAO, Rome.

## TIME AND PLACE FOR THE NEXT MEETING

138. Guyana proposed to host the next meeting in January 1998 subject to the approval of the Government of Guyana.

Figure 1: Generalised Shrimp Stock Assessment Algorithm.

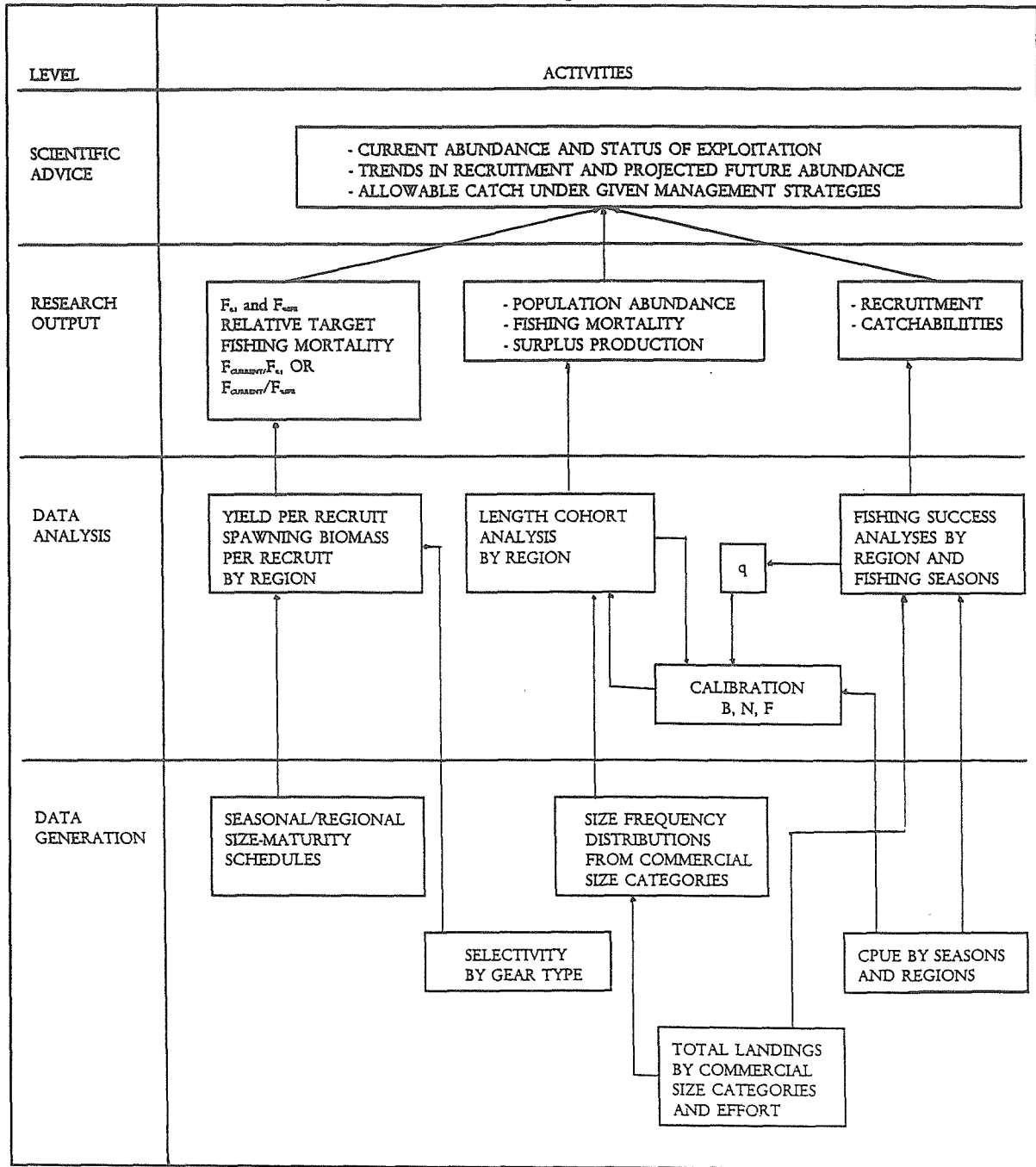


Figure 2: A hypothetical example of a decision analysis of research priorities. The example management objective scores were taken from the USA fishery and the score of knowledge rank was estimated from the Background Review and Subproject Initiation Mission Report for Shrimp and Groundfish Assessments (WBS - 420).

<i>Objectives</i>	<i>Management Objectives</i>				<i>Total Score</i>	<i>Manag. needs rank</i>	<i>State of Knowledge Rank **</i>	<i>Combined Rank</i>
	<i>Opt. size*</i>	<i>Max. Economic function*</i>	<i>Minimize biological risk*</i>	<i>Habitat Manag.*</i>				
Growth	1	3	2	3	9	6.5	M/5	7
Nat. Mort.	1	3	2	3	9	6.5	L/1.5	4
Fishing Mort.	1	1	1	2	5	1	L/3	1
S/R Fcn	2	2	1	2	7	3.5	L/1.5	2
Inter-species relationships	3	3	1	1	8	5	L/6	6
Environmental interactions	2	1	2	1	6	2	M/4	3
Harvesting economic dynamics	2	1	3	1	7	3.5	M/7	5
Processing Economic Dynamics	3	2	3	2	10	8	M/8	8
Market economic dynamics	3	2	3	3	11	9	M/9	9

* Score Description (only 3 of each per objective)	** Level of current Knowledge
1=Essential	H= High
2=Primary supporting information	M=Moderate
3= Secondary supporting Information	L=Low

Table 1a: Landings (L) in tons of tails, number of vessels (V) and landings per vessel (L/V) of the commercial fleets in the Guianas-Brazil Shelf.

YEAR	VENEZUELA			SURINAME			GUYANA			FRENCH GUIANA			BRAZIL			BELIZE		
	L	V	L/V	L	V	L/V	L	V	L/V	L	V	L/V	L	V	L/V	L	V	L/V
1960				173	40	5	1,618	60	30									
1961				203	24	20	1,788	72	32									
1962				486	25	25	2,325	89	31									
1963				629	25	31	2,740	81	39									
1964				775	25	40	3,168	96	38									
1965				1,008	25	39	3,651	105	41									
1966				1,335	34	23	4,330	113	36									
1967				1,150	50	28	4,099	134	31									
1968				1,559	55	31	4,155	142	33									
1969				1,577	55	29	4,749	162	33									
1970				1,603	45	31	5,356	160	27									
1971				1,398	55	29	4,374	175	28									
1972				1,596	63	28	4,873	200	27									
1973	2,000	136	15	1,791	63	28	5,443	202	25									
1974	701	92	8	2,022	106	19	5,086	202	25									
1975	1,398	105	13	3,167	140	23	3,899	209	19									
1976	1,473	90	16	3,782	165	23	3,082	190	16									
1977	2,075	117	17	3,965	192	21	3,518	157	22									
1978	818	58	14	2,751	165	17	3,380	165	20									
1979	940	51	18	3,228	150	19	3,570	148	24									
1980	960	58	17	3,071	133	23	3,530	119	30									
1981	919	68	14	3,847	161	24	2,650	116	23									
1982	1,180	85	14	3,428	166	20	3,080	123	25									
1983	946	70	14	3,304	161	20	2,710	153	18									
1984	646	64	10	2,758	164	13	2,150	134	16									
1985	566	66	9	2,433	134	18	1,780	131	14									6.53
1986	415	75	6	3,312	137	24	2,380	128	19									10.20
1987	836	94	9	3,489	137	25	2,404	129	19									9.73
1988	885	98	9	2,755	141	20	1,872	119	16									11.79
1989	1,087	135	8	2,174	131	17	1,810	118	15									13.21
1990	1,421	140	10	2,566	140	18	1,565	122	13									8.75
1991	1,433	136	11	2,828	140	20	1,918	115	17									8.04
1992	1,162	121	10	2,410	131	18	1,481	120	12.34									6.03
1993	1,257	141	9	2,088	120	17	1,821	114	15.97									4.06
1994	692	119	6	1,979	119	16	1,890	117	16.15									6
1995	957	122	8	1,874	119	15.75	2,473*	119	36*									8.17

\* = preliminary



Table 1b: Shrimp landings (L), number of vessels (V) and landings/vessel (L/V) and fishing effort for the artisanal, semi-industrial and industrial trawl fleets of Trinidad and Tobago.

YEAR	Shrimp Landings (whole weight in tonnes)			Number of Vessels			Landings/Vessels (tonnes)			# trips			# days at sea		
	Artisanal	Semi-industrial	Industrial	Artisanal	Semi-industrial	Industrial	Artisanal	Semi-industrial	Industrial	Artisanal	Semi-industrial	Industrial	Artisanal	Semi-industrial	Industrial
1987	920	375	n.a	179	9	23	5.14	41.67	n.a	17,581	4,598	n.a	6,449	3,257	n.a
1988	605	173	n.a	179	9	23	3.38	19.22	n.a	18,093	3,819	n.a	6,711	2,705	n.a
1989	329	109	n.a	179	9	23	1.84	12.11	n.a	12,687	3,472	n.a	4,604	2,459	n.a
1990	653	162	n.a	179	9	23	3.65	18.00	n.a	19,090	4,351	n.a	6,739	3,082	n.a
1991	618	162	1,000	179	9	23	3.45	18.00	43.48	16,226	3,911	300	5,801	2,770	3,000
1992	456	145	n.a	179	9	23	2.55	16.11	n.a	14,669	3,986	n.a	5,171	2,823	n.a
1993	553	125	n.a	179	9	23	3.09	13.89	n.a	14,850	3,619	n.a	5,349	2,563	n.a

Note: The data for Trinidad and Tobago is given separately because they have three types of vessels targetting the shrimp resources.

Table 2: Other types of units of effort registered for the vessels included in Table 1a.

YEAR	VENEZUELA		SURINAME		GUYANA		FRENCH GUIANA		BRAZIL		BELIZE	
	# trips	# days at sea	# trips	# days at sea	# trips	# days at sea	# trips	# days at sea	# trips	# days at sea	# trips	# days at sea
1970								13,720	42	987		
1971								12,530	169	3,518		
1972								13,811	88	1,896		
1973	456	8,208						13,524	182	4,550		
1974	378	4,552						12,645	221	5,967		
1975	794	7,712						10,929	153	4,394		
1976	632	7,275						9,098	248	7,018		
1977	810	6,956						12,419	330	9,133		
1978	415	4,256	894					14,821	299	8,502		
1979	531	4,879	793					20,341	468	10,976		
1980	531	5,387	724					22,905	793	23,039		
1981	579	6,670	971					26,123	739	26,027		
1982	498	6,120	1,063					27,310	712	24,170		
1983	449	5,474	954					28,407	833	26,343		
1984	n.a	3,305	958					27,185	1,272	39,239		
1985	n.a	3,223	714					22,846	1,368	48,875	n.a	n.a
1986	n.a	n.a	652			707		23,579	1,231	46,212	n.a	n.a
1987	484	6,719	669			747		20,551	1,294	45,641	n.a	n.a
1988	545	7,175	705			706		21,430	1,214	38,760	n.a	n.a
1989	675	8,710	746			643		22,378	1,241	40,449	n.a	n.a
1990	1,006	13,252	712			470		19,023	1,122	35,952	70	1,400
1991	1,026	13,011	611			614		14,524	1,090	36,376	73	1,460
1992	738	9,952						15,937	831	28,092	69	1,311
1993	842	12,762						15,694	934	32,148	41	829
1994	608	8,951						n.a	872	31,151	32	640
1995	664	9,784						n.a			31	573

ANNEX I: Agenda of The Workshop.

Monday 8 January 1996

- |               |   |
|---------------|---|
| 8:30 - 9:00   | Registration of Participants  |
| 9:00 - 9:50   | Opening of the Workshop   |
| 9:50 - 10:50  | Break   |
| 10:50 - 11:00 | Adoption of Agenda and Arrangements for the Sessions.                                   |
| 11:00 - 12:15 | National Reports - Belize, French Guiana.   |
| 12:15 - 13:15 | Lunch   |
| 13:15 - 15:20 | National Reports continued - Guyana, Jamaica, Suriname, Trinidad and Tobago, Venezuela. |
| 15:20 - 15:35 | Break   |
| 15:35 - 16:20 | Management Framework and Objectives for Shrimp and Groundfish<br>- B. Chakalall         |

Tuesday 9 January 1996

- |               |   |
|---------------|---|
| 8:30 - 9:15   | Crustacean stock assessment techniques incorporating uncertainty.<br>- Nelson M. Ehrhardt   |
| 9:15 - 10:00  | Conceptual Approach to Stock Assessment for Shrimp and Groundfish<br>in the CFRAMP Countries.<br>- Andre Talbot                               |
| 10:00 - 10:15 | Break   |
| 10:15 - 11:00 | Fisheries Resource Map of the Major Commercial Species of Shrimp and<br>Groundfish of the Guianas-Brazil Continental Shelf.<br>- Andre Talbot |
| 11:00 - 11:45 | Data Collection System for the Artisanal Fishery of Suriname.<br>- Yolanda Babb-Echteld   |
| 11:45 - 13:30 | Lunch   |

- 13:30 - 14:15 Shrimp Fishery of Cuba.  
- Juan Paez
- 14:15 - 15:00 Venezuela Observer Programme  
- Luis Marcano
- 15:00 - 15:15 Break
- 15:15 - 16:00 Canadian International Observer Program.  
- Geoffrey Hurley
- 16:00 - 16:45 Joint French Guiana-Suriname Project on Shrimp Recruitment.  
- Anatole Chuarau

Wednesday 10 January 1996

- 8:30 - 9:15 Synthesis of Literature Reviews on Environment/Habitat/Recruitment.  
- Andre Talbot
- 9:15 - 10:15 Shrimp By-catch Estimation.  
- Nelson Ehrhardt.
- 10:15 - 10:30 Break
- 10:30 - 11:45 Trans - Boundary Stocks/Fisheries.  
- Reuben Charles
- 11:45 - 12:30 TEDs/BRDs Literature Review, including work being done by Venezuela  
- José Alio
- 12:30 - 13:30 Lunch
- 13:30 - 14:15 Background/Introduction to Working Group Tasks  
- Kevern Cochrane
- 14:15 - 14:30 Break
- 14:30 - 17:00 Working Group I
- Review of Plans and Proposals for CFRAMP sponsored stock assessment  
and data collection activities.
- Working Group II
- Priority Areas for Co-operative Investigation Programme.

Thursday 11 January 1996

- |               |   |
|---------------|---|
| 8:30 - 10:30  | Working Groups (cont'd)   |
| 10:30 - 10:45 | Break   |
| 10:45 - 13:30 | Presentation of Working Groups' Reports.<br><br>Any Other Matters.<br><br>Time and Place of the next Meeting. |
| 13:30 - 14:30 | Lunch   |
| 14:30 - 17:00 | Preparation of Workshop Report.   |

Friday 12 January 1996

- |               |                         |
|---------------|-------------------------|
| 9:00 - 11:00  | Adoption of the Report. |
| 11:00 - 11:45 | Break                   |
| 11:45 - 12:00 | Closure of the Meeting. |

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ANNEX III: Table Showing Types of Stock Assessment.

DATA REQUIREMENTS FOR ASSESSMENTS	
Data	Techniques Possible
<b>1. BIOLOGICAL</b>	
<ul style="list-style-type: none"> <li>- Total Catch and CPUE</li> <li>+ Survey Estimates</li> <li>- Size information by time and area</li> <li>- Growth, mortality, maturity</li> <li>- Commercial size category landings</li> <li>+ size frequency by category</li> <li>All above</li> <li>- Habitat/environment: recruitment relationship</li> </ul>	<ul style="list-style-type: none"> <li>Surplus production</li> <li>"Tuned" surplus production</li> <li>Qualitative impacts of closed areas/seasons</li> <li>Yield-Per-Recruit; Spawner-Biomass-Per-Recruit</li> <li>Length cohort analysis</li> <li>Integrated analysis (Ehrhardt)</li> <li>Assess impacts coastal development, climate variability</li> </ul>
<b>2. ECONOMIC</b>	
<ul style="list-style-type: none"> <li>- Current Value</li> <li>- Size-based Assessment</li> <li>Fish prices</li> <li>Costs of harvesting</li> <li>Processing costs</li> <li>Foreign exchange costs</li> <li>Opportunity costs</li> <li>Taxes and subsidies</li> </ul>	<ul style="list-style-type: none"> <li>Extrapolation</li> <li>BEAM Analyses</li> </ul>
<b>3. SOCIAL / EMPLOYMENT</b>	
<ul style="list-style-type: none"> <li>- Current Employment</li> <li>- Industry Input</li> <li>Demographic Trends</li> </ul>	<ul style="list-style-type: none"> <li>Extrapolation</li> <li>Social Forecasts</li> </ul>

**ANNEX IV: CFRAMP Proposals for the Shrimp and Groundfish Subproject.**

- **Country proposals for Belize, Guyana, Jamaica and Trinidad and Tobago for establishment of data collection and monitoring systems for their shrimp and groundfish fisheries;**
- **A proposal for the development of a central data bank for shrimp and groundfish research in the Guianas-Brazil Continental Shelf Area;**
- **A proposal for marine resource mapping - geographic representation of coastal habitat, the fishing industry and associated habitat and environmental parameters controlling shrimp production in the Guianas-Brazil Continental Shelf Area;**
- **A proposal for the acquisition and use of acoustic survey gear for assessment of demersal fish and shrimp stocks within CFRAMP;**
- **A proposal for measuring recruitment of shrimp and groundfish using artisanal fixed gear in Guyana.**

ANNEX V: Working Group II Project Sketches.

- I. Title:** Provision of training in data collection through short courses.
- Objectives:**
- To train regional fisheries personnel in data collection methods.
  - To train research personnel on data analyses.
  - To conduct follow-up training on-site.
  - To harmonise methods and systems in data collection among countries.
- Approach:** The training course must involve on-site visits to key landing points in every country, to observe, advise, update and, as far as possible, standardise data collection and analysis methods. A regional training course in data collection methodology should also be implemented.
- Output:**
- Trained regional fisheries officials in data collection methods.
  - Progress towards uniformity and comparability in methods of data collection and analysis.
  - Critical information needed for formulation of a management plan.
  - Evaluation of feasibility of standardised regional data collection and analysis systems.
- II. Title:** Cooperative Regional Bio-economic Assessment of Shrimp and Groundfish Resources.
- Objective:**
- Assess status and productivity of stocks.
  - Evaluate strengths and weaknesses of available data and identify data needs and systems for region.
  - Develop national/regional management scenarios for decision-makers.
- Approach:**
- Preparation of data under technical guidance.
  - Hands-on assessment workshops.
  - Evaluation of improvements to national data collection systems and progress towards harmonization.

- Outputs:**
- National and regional biological and economic assessments.
  - Improved national capability in stock assessment and bio-economic modelling.
  - Guidance on data requirements.
  - Management scenarios for decision-makers.

**III. Title:** Improving Selectivity of Shrimp Trawl Nets.

- Objectives:**
- To develop gear to reduce undesirable by-catch in shrimp fishing operations.
  - Maintain yields of shrimp and targeted finfish.

- Approach:**
- Censuses of gear in use in the participating countries and their impact on by-catch.
  - Trials with appropriate alternatives or modifications of gear in use.

- Requirements:**
- Technical expert on fishing gear design.
  - Financial support for gear purchase, gear modification, field campaigns, and rental of fishing vessels.

- Output:**
- Adoption of modified or alternative gear by fleets.
  - Reduction of undesirable by-catch and hence enhanced fish stocks.
  - Maintenance of shrimp/groundfish yields.





**This report provides a summary of the proceedings of the Fourth Meeting of the WECAFC Ad Hoc Shrimp and Groundfish Working Group on the Guianas-Brazil Continental Shelf and CFRAMP Shrimp and Groundfish Subproject Specification Workshop. It contains summaries of the national reports and technical papers presented during the meeting. A Supplement to this report will reproduce the papers presented at the Meeting.**