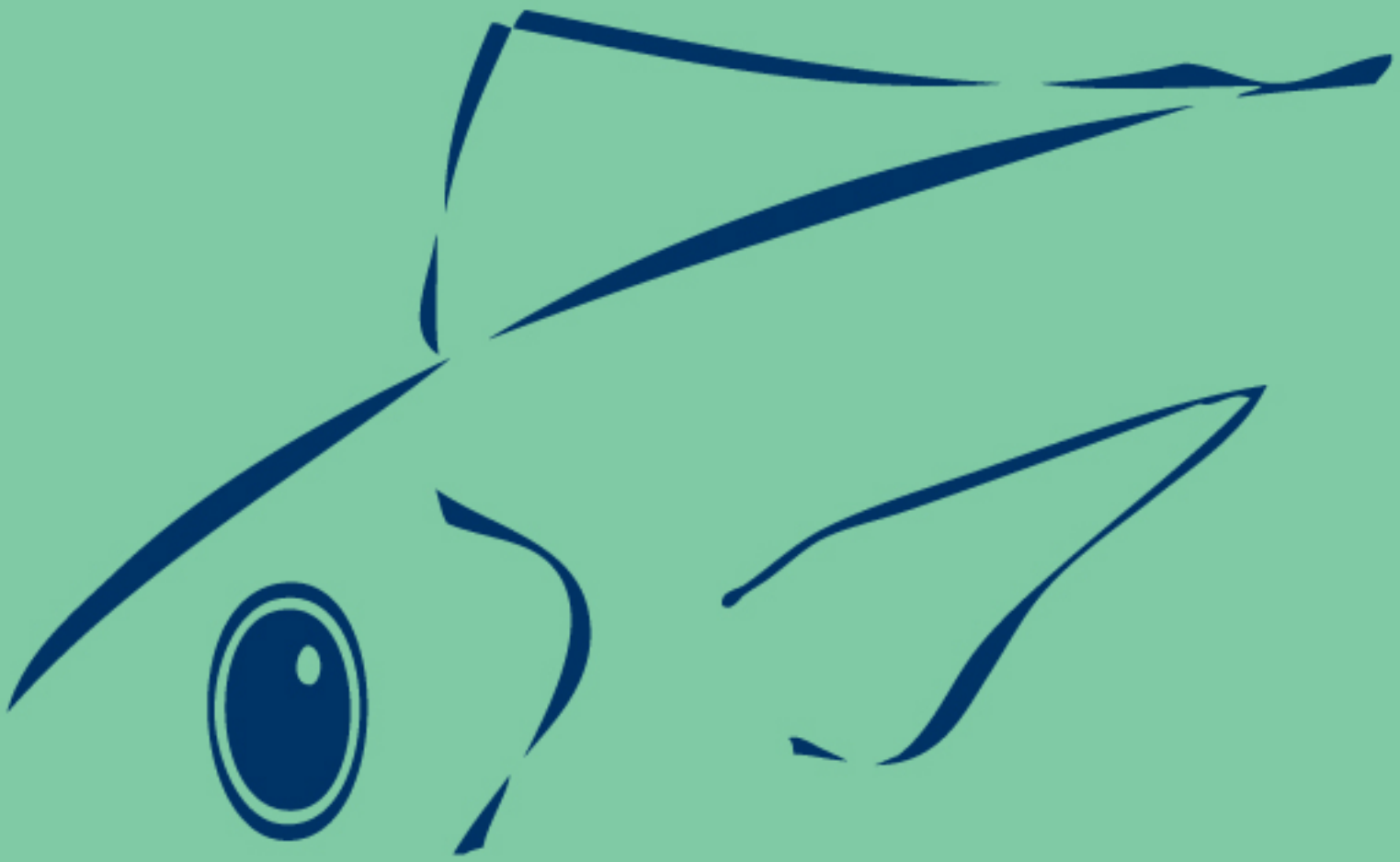
Caribbean Regional Fisheries Mechanism

ISSN:1995-4859

CRFM RESEARCH PAPER COLLECTION

Volume 5



CRFM Secretariat
Belize
2008

CRFM Research Paper Collection
Volume 5

CRFM Secretariat
Belize
2009

CRFM RESEARCH PAPER COLLECTION. Volume 5

Published by the Caribbean Regional Fisheries Mechanism Secretariat,
Belize

ISSN # 1995-4859
ISBN # 978-976-8165-30-5

CONTENTS

TRIALS TO STUDY THE GROWTH AND MOVEMENT PATTERNS OF FOUR COMMERCIALLY IMPORTANT LARGE PELAGIC FISH SPECIES USING A CONVENTIONAL TAGGING METHOD

S. Singh- Renton[1*] and J. Renton[2]
[1] *Programme Manager, CRFM Secretariat, Kingstown, St. Vincent and the Grenadines*
Email: ssinghrenton@vincysurf.com,
[2] *Head, Science Department, Girls' High School, Kingstown, St. Vincent and the Grenadines*

Abstract

During the implementation of the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP), a regional initiative involving 12 countries from the English speaking Caribbean, a large pelagic fish tagging programme was established to determine the distribution and movement patterns of four large pelagic fish species of regional commercial importance: *Thunnus atlanticus* (blackfin tuna), *Acanthocybium solandri* (wahoo), *Coryphaena hippurus* (dolphinfish), and *Scomberomorus cavalla* (king mackerel). Fish tagging activities took place at selected locations within the Eastern Caribbean during the period April 1996 to December 1999. CFRAMP's Large Pelagic Fish Tagging Programme explored several means to facilitate fish tag and release activities: (i) collaborative partnerships with national fisheries administrations; (ii) sport fishing tournaments; (iii) collaborative partnerships with individual commercial fishers; and (iv) a recreational fisher volunteer programme. Options (iii) and (iv) were the most cost-effective, as well as most productive in terms of results.

During the Programme, a total of 1,143 fish were tagged and released: 787 blackfin tuna; 250 wahoo; 89 dolphinfish; and 17 king mackerel. The majority of the fish tag releases occurred in the coastal waters of St. Vincent and the Grenadines, but some releases also took place in the coastal waters of the islands of Antigua and Barbuda, Dominica, St. Lucia, Grenada, and Trinidad and Tobago, all located within the Eastern Caribbean. To date, 13 recaptures have been reported. Eleven blackfin tuna, released off the coasts of St. Vincent and the Grenadines were recaptured close to, or at their points of release after times at liberty ranging from 5 days to 1,230 days. Similarly, 2 king mackerel fish, released off the west coast of Trinidad, were recaptured close to their points of release after 74 and 129 days at liberty. The limited number of recaptures precludes quantitative analyses of the growth and movement patterns of these fish species based on the data gathered in the present study.

KEYWORDS: pelagic fish, tagging, blackfin tuna, king mackerel

INTRODUCTION

Of the large pelagic species found in Caribbean waters, several are believed to be distributed throughout wide areas of the Atlantic Ocean (ICCAT, 2000; Graves and McDowell, 2000; NMFS, 1994; Bard *et al*., 1993). These are the large tunas and billfishes, and their assessment and management require international cooperation. This is currently the responsibility of the International Commission for the Conservation of Atlantic Tunas (ICCAT). At present, most of the large tuna and billfish stock assessments and biological research, including migration and movement studies, are conducted through an internationally co-ordinated effort by scientists of ICCAT member countries. On the other hand, the small tunas and tuna-like species such as blackfin tuna, wahoo, and king mackerel are less wide-ranging and are believed to have more coastal distributions (Collette and Nauen, 1983; Miyake 1990). In view of this, ICCAT has noted that the majority of these stocks can be managed at the regional or sub-regional level (ICCAT, 2005).

Within the Caribbean, various studies have considered the issue of stock identification and distribution of small tuna-like species (e.g. Schaefer and Fable Jr., 1994; Johnson *et al*., 1994; Fable, 1990; Fable *et al*., 1987; Mahon and Mahon, 1987; Oxenford and Hunte, 1986a, 1986b; Neilson *et al*., 1996; Constantine, 2002). In the Eastern Caribbean, there is good evidence indicating that stocks of small tuna-like species and other large pelagic species such as dolphinfish are shared: synchrony in annual abundance trends has been observed (Hunte, 1987), as well as similarity of fishing seasons among islands that are in close proximity to each other (Hunte, 1987; Mahon *et al*., 1990); also, analyses of size frequency data suggest that the fisheries in this area harvest only a section of the overall fish stocks concerned (George *et al*., 2001; Parker *et al*., 2001; CRFM, 2005). However, the extent of resource sharing has not been quantified. Improved understanding of the distributions of these stocks, their patterns of movement and the extent of sharing among fisheries within the region, are essential steps towards achieving successful and coordinated management at the appropriate sub-regional/ regional levels.

Fish movement patterns are usually investigated through tagging experiments (e.g. Oxenford, 1992; Hampton, 1991; Bayley and Prince, 1992; Ortiz, 2001). Other population parameters such as growth, fishing and natural mortality, and population size, can also be derived from tagging data (e.g. Parrack and Phares, 1979; Farber, 1988; Porch, 1999, and: reviews by Hilborn *et al*., 1990 and Ortiz *et al*., 2003). CFRAMP's[1] Large Pelagic Fish Tagging Programme was established to obtain information on the movement patterns and distributions of the stocks of four large pelagic fish species of commercial importance to CFRAMP participating countries: *Thunnus atlanticus* (blackfin tuna), *Acanthocybium solandri* (wahoo), *Coryphaena hippurus* (dolphinfish), and *Scomberomorus cavalla* (king mackerel). Data on fish size at release and at recapture were also collected to provide information on fish growth rates.

METHODS

Tags used

A single-barb, yellow dart tag was the type of tag used (see yellow tag in Plate 1). This tag was chosen for the following reasons: its fairly simple method of application compared to the internal anchor tag made it easier to use in the small open boats typically used in commercial operations in the Eastern Caribbean; the more prominent position of its placement was considered important to facilitate easier detection by fishers and market vendors; it has been used to tag similar pelagic fish species (Fable, 1990), and; its streamline shape was thought to minimize its influence on the normal swimming movements of the fish. A stainless steel applicator, with a hollow center for holding the body of the tag and a sharp point at one end for piercing the flesh of the fish (tag applicator also shown in Plate 1), was used to apply the tag

[1] CFRAMP was a co-operative programme of the following countries: Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago.

to the upper anterior dorsal section of the fish, just below and between the 2nd and 3rd, or the 3rd and 4th fin rays. A special instruction sheet outlining the steps for inserting tags into fish was prepared and issued to all taggers (see Plate 2).

Tagging procedure

Fish were caught either using rod and reel gear or with trolling gear. For tagging purposes, each fish was usually brought into the boat. Each fish was then placed on its side on a wet mat or sponge. When necessary, the head of the fish was covered with a damp cloth, which helped to keep the fish calm. Any fish that was badly hooked or damaged during the catching process was not used for tagging purposes. The straight fork length of the fish was measured as accurately as possible (usually to the nearest 0.1 cm) using a commercial tape measure. In the first few trials, attempts were made to measure the weight of individual fish by placing them on a scale. However, it was more difficult to keep fish calm during the weighing procedure, and after the first few trials, we decided instead to estimate the weights of individual tagged fish.

To insert the tag, the tag applicator point was used to remove a scale just below the base of a dorsal spine, usually the second to fourth spine of the first dorsal fin. The needle point of the applicator was held with exposed tag barb in line with the fish and on the side nearest the fish, and pointing towards the head of the fish. The needle point was then inserted at a shallow angle under the scales until the skin was pierced. At this point, the applicator was raised to an angle of about 45^0, to allow for easier entry of the barb. Once the barb was under the skin, the applicator was then held again at a shallow angle and inserted until the barb was just beyond the fin spine. This action locked the barb into place around the base of the fin spine. The applicator was then withdrawn, and the fish quickly returned to the water. Following its release, the tagged fish was observed to ensure that it swam away normally. If fish showed any signs of stress, if it swam away slowly or if it did not recover from the tagging process, this was recorded.

Data on fishing trips, fish tag releases and recaptures

Special data cards were prepared to record information about the fishing trip, tag releases and recaptures. The data collected on fishing trips were analyzed separately, and hence are not discussed further in this report. The tag release data card is shown in Plate 3. The tag recapture card was prepared and printed in four languages (English, Spanish, French, and Portuguese), to facilitate reporting by both English and major non-English speaking countries in and adjacent to the Caribbean region (Plate 4a, b, c, and d). Additionally, a special instruction sheet with guidelines for handling fish tag recaptures was prepared, mainly for use by staff of national fisheries divisions and departments in CFRAMP participating countries and CFRAMP offices (see Plate 5).

During fish tag releases, the following data were usually recorded: fish tag number; date of tag release; tagger's name; location of tag release; species released; fish size; sex of fish in the case of dolphinfish; the condition of the fish; fish activity on release; gear and bait used; depth of fishing; association of fish with a school, birds, FAD, etc.; fish school type; any regurgitated food (see Plate 3). Fish recapture data usually included: tag number; species recaptured; date of fish tag recapture; location of tag recapture; size of fish; sex of fish, if known; fishing gear; contact details of fisher who recaptured the fish; data recorder's name (see Plate 4). Given the lack of GPS equipment on most of the boats used during the Programme, location data provided the names of landmarks normally used by local fishers and/or details on distance and direction relative to these landmarks.

Field trips

Fish tagging trips were conducted in the coastal waters of several islands in the Eastern Caribbean. Most of the fish tagging trips were conducted in St. Vincent and the Grenadines. Some fish tagging activities also took place in the coastal waters of Antigua and Barbuda, Dominica, St. Lucia, Grenada, and Trinidad and Tobago. The Programme explored several arrangements to facilitate fish tag and release activities: (i) collaborative partnerships with national fisheries administrations; (ii) sport fishing

tournaments; (iii) collaborative partnerships with individual commercial fishers; and (iv) a recreational fisher volunteer programme.

Collaborative partnerships with staff of national fisheries administrations

Initially, attempts were made to implement the programme in three CARICOM countries: Dominica, St. Vincent and the Grenadines, and Grenada. These countries were selected because of their well-established large pelagic fisheries, and also because of their central location within the overall area in which these species are usually caught within the Eastern Caribbean region. Selected fisheries officers in the three countries, as well as fishers, participated in a training workshop and trial field trip to develop their skills in the proposed fish tagging procedure. Within each of the three countries mentioned above, the fisheries officers responsible for fish tagging activities made arrangements with local commercial fishing boat owners and captains to participate in fish tagging trips.

Sport fishing tournaments

The First St. Lucia International Full Tag & Release Tournament – 10 May 1997

CFRAMP, in collaboration with the Department of Fisheries in St. Lucia and the St. Lucia Game Fishing Association (SLGFA), held the First St. Lucia International Full Tag & Release Tournament on 10 May 1997. Seven boats participated in this 1-day tournament; these boats departed from Rodney Bay Marina in the northwest of the island, and conducted fish tag release activities off the north coast. In preparation for the tournament, a practice tagging session was conducted for staff and fishers who volunteered to be responsible for tagging fish during the tournament. A tagger was assigned to each boat participating in the tournament.

The Bequia Fishing Competition (1996 & 1997)

During 1996 and 1997, CFRAMP staff worked with Fisheries Division staff in St. Vincent and the Grenadines and the Rotary Club of Bequia to hold 1-day recreational fishing tournaments that included fish tagging components. As in the St. Lucia tournament, a trained tagger was assigned to each boat participating in the tagging competition. During the 1996 tournament, 3 boats participated in the tagging component of the competition; on 13 July 1996, these boats departed from Portsmouth Harbour and conducted fish tagging activities in the Bequia Channel, and in the waters around Baliceaux and Mustique Islands. During the 1997 tournament, 7 boats participated in the tagging component of the competition; on 12 July 1997, these boats departed from Portsmouth Harbour and conducted fish tagging activities off the west coast of Bequia Island, and off the northeast coast of Baliceaux Island.

Collaborative partnerships with individual commercial fishers

The Tagging Programme employed a field assistant and this person was trained in the tagging procedure. Tagging Programme staff contacted the owners and captains of two commercial fishing boats in St. Vincent and the Grenadines, and made arrangements for the field assistant to participate in 1-day commercial fishing trips on a regular basis during which fish of the 4 species would be tagged and released. In return, the owners and captain received payment for every fish tagged and released based on the estimated weight. This arrangement facilitated tagging trips during the period March 1997 to June 1999.

A recreational fisher volunteer programme

In an effort to obtain support for volunteer activities, CFRAMP staff arranged and participated in consultations with members of sportfishing associations in Antigua and Barbuda, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago. During these meetings, CFRAMP staff explained the purpose of the Tagging Programme, demonstrated the fish tagging procedure, and highlighted the potential contribution of the recreational tagging volunteer programme. A recreational tagging volunteer kit was usually prepared for each recreational volunteer, comprising a set of fish tags, tag applicators, trip and tag release cards, and the instruction sheet for tagging fish. Following this effort, over twenty

recreational/sport fishers in St. Vincent and the Grenadines, Antigua and Barbuda, St. Lucia and Trinidad and Tobago, contributed to the Tagging Programme through voluntary tag and release activities.

Two recreational fishers conducted fish tag releases regularly during their routine recreational and sport fishing trips. These two volunteers participated in the Tagging Programme throughout the period of its duration: one volunteer conducted fish tag and release activities from April 1996 to February 1999, and the other volunteer participated in the programme from September 1997 until December 1999.

Advertisement of the Tagging Programme and tag recapture rewards

The Tagging Programme was advertised using posters, brochures, T-shirts, and the newspaper and television media. Like the tag recapture cards, the posters were prepared in four languages, so as to reach both English and major non-English-speaking fishers operating within the wider Caribbean region (see Plate 6a, b, c, d). The posters were also used to announce the cash rewards issued for tag returns. A cash reward of US$50 was offered to fishers who returned recaptured fish with their tags still attached. If only the tag was returned, together with provision of the tag recapture information, then a cash reward of US$20 was given.

A general information brochure was produced only in English, but was also widely circulated (Plate 7). A second brochure was also designed, printed, and circulated to advertise the full tag and release tournament that was held in St. Lucia on 10 May 1997 (see Plate 7). The CFRAMP tagging T-shirt, the design of which is shown in Plate 8, was distributed to all persons who helped with fish tagging activities both on commercial and recreational fishing trips, and also to those who reported fish tag recaptures.

Letters requesting support for the Tagging Programme were prepared and dispatched to national fisheries administrations in all major countries within the region, which were also likely to be sharing fisheries for the four selected fish species. Each letter specifically requested the identification of a person to serve as a CFRAMP tagging correspondent, who would be responsible for corresponding with us about the progress of the Tagging Programme, informing their local fishers about the tagging programme and advising us of any reported recaptures. Each tagging correspondent received a set of advertisement materials, such as posters and brochures.

Newspaper articles were prepared: to advertise the tagging trials conducted during the Bequia Fishing Competitions held in St. Vincent and the Grenadines; to advertise fish tag recaptures and payment of cash rewards, and; to advertise the 1-day recreational volunteer tagging effort conducted in Trinidad and Tobago. A television documentary was produced and broadcast regionally in CFRAMP participating countries to educate the public about the aims of the Tagging Programme and to advertise the tagging efforts by commercial fishers in St. Vincent and the Grenadines and by the recreational fishers in Trinidad and Tobago. A shorter television information programme was also produced to educate the local public in St. Vincent and the Grenadines, and to remind fishers and the public to look out for fish with tags.

RESULTS

Tags and the tagging method

The single-barb dart tags were easy and quick to apply, and tags were observed to be securely fixed in the few recaptures taken. Fish recaptures were reported for fish tagged by only 3 of 21 taggers. Although many of the taggers were temporary volunteers for short periods only, there was some evidence of variation in tagger ability even among the three taggers who each tagged more than 80 fish (see table 2). Although some tag shedding was expected and probably occurred, the extent of this during the programme was not estimated. Similarly, no experiment was conducted to evaluate errors in tag reporting rates during the Programme.

Collaborative arrangements for achieving fish tag releases

The three national fisheries administrations involved in the Programme completed altogether 9 one-day field trips, during which a total of 35 fish were tagged and released. CFRAMP tagging activities

were successfully conducted during three fishing tournaments, including one held in St. Lucia in 1997 that was devoted solely to CFRAMP fish tag and release activities. Seven boats participated in the St. Lucia tournament, and tagged and released a total of 10 fish. Similarly, only a few recreational fishers and boats participated in the tagging component of each of the two 1-day fishing tournaments held in July 1996 and July 1997 (3 boats in 1996 and 7 boats in 1997) in St. Vincent and the Grenadines, resulting in 25 fish being tagged and released.

In contrast, the collaborative partnership arrangements established with individual commercial fishers in St. Vincent and the Grenadines allowed CFRAMP staff to participate in 256 commercial one-day fishing trips during which a total of 779 fish were tagged and released.

In respect of the recreational fisher volunteer programme, the sport fisher captain volunteer from Antigua and Barbuda did not submit data on the number of fishing trips conducted, but reported 86 fish tag releases. In St. Vincent and the Grenadines and Trinidad and Tobago, two individual recreational fisher volunteers conducted 208 fish tag releases during the course of 134 recreational one-day fishing trips.

Fish tag releases

Table 1 shows the number of each species tagged and released in each of the Eastern Caribbean Island States, which participated in the Tagging Programme; and figure 1 shows the actual locations where fish tagging activities were conducted within these States. The majority of the fish tag releases occurred in the coastal waters of St. Vincent and the Grenadines, but some releases also took place in the coastal waters of the islands of Antigua and Barbuda, Dominica, St. Lucia, Grenada, and Trinidad and Tobago, all located within the Eastern Caribbean (see figure 2). A total of 1,143 fish were tagged and released by the Programme: 787 blackfin tuna; 250 wahoo; 89 dolphinfish; and 17 king mackerel.

Fish tag releases were conducted during single-day commercial, as well as recreational, fishing trips. For these fishing trips, rod and reel and trolling gear, using artificial bait, were the most common methods used to catch fish (figures 3 & 4). Additionally, in more than 97% of the 1,110 releases for which fishing depth was recorded, the fish released had been caught at depths less than 50m. As intended, fish were usually brought aboard the fishing vessels for application of tags and to take size measurements; tagging records showed that only 10 fish were tagged while still in the water. Among the fish caught and released, more than 98% were reported to have been in good condition; on release, most fish actively swam away, with less than 0.5% observed to show poor fishing activity upon release.

Except for king mackerel, tag releases of the other three species occurred throughout the year (fig. 5). However, the more productive collaborative arrangement with individual commercial fishers resulted in slightly more fish tag releases occurring during the main commercial offshore pelagic fishing season that usually extends from November of one year to June of the following year (figure 5).

The size ranges of each species caught are given in figure 6. In the case of blackfin tuna releases in St. Vincent and the Grenadines, slight differences were observed in the sizes of fish commonly caught by the main recreational fisher volunteer operating in inshore waters and the main commercial offshore fisher (figure 7). The recreational fisher tended to catch very small and medium-sized fish (modes observed at 27-28 cm Fork length (FL) and 51-52 cm FL). The size distribution for the commercial fisher showed a mode at 39-40 cm FL, and the presence of large fish greater than 68 cm FL.

Fish tag recaptures

Of the total number of fish tag recaptures reported, 11 were blackfin tuna and 2 were king mackerel. All 11 blackfin tuna were released in the coastal waters of St. Vincent and the Grenadines, and were recaptured close to or at their points of release after times at liberty ranging from 5 to 1,230 days (figure 8). Similarly, the 2 king mackerel recaptures occurred close to their points of release off the west coasts of Trinidad after 74 and 129 days at liberty (figure 9).

Fish growth

Fish were usually tagged on board the fishing vessel, and hence taggers were able to obtain an accurate measure of the fork length of the fish. However, the weight of the fish was not often directly measured, and hence these data were considered to be less reliable for assessing fish growth.

The few blackfin tuna recaptures recorded covered a range of lengths, and the observed growth of these fish during their various periods of liberty are given in table 3 and illustrated in figure 10. In figure 10a, the observed changes in fish length after varying periods at liberty are shown in order of fish size. These observed average growth rates decreased with size of fish, as shown in figure 10b. The recapture length of one blackfin tuna was 1cm less than its recorded length at release; in this case, the fish was recaptured only 12 days after its release, and hence the difference in the release and recapture measurements was most likely due to an error in the measurement of the release length. Given the very few data points, no attempt was made to apply these data to any growth model.

DISCUSSION

Fishing methods

The methods, gears and bait used to catch fish for tag and release activities were those commonly used also in commercial, small-scale large pelagic fishing operations in the islands. Most fish were therefore caught by line gear, trolling or rod and reel gear, baited with artificial lure, and deployed in surface waters. Fish were also tagged and released in areas frequented by commercial fishers. Considering this, the release rate could be directly compared with the recapture rate, given that the Programme was dependent on commercial fishing activities for recapture observations.

Suitability of tags and tag release methods

Given that most of the fish tagging activities were conducted using the typical small, open, commercial fishing boats, it was important to use a fish tagging procedure that was relatively simple and quick. The selected tagging procedure employing single-barb dart tags allowed fish to be tagged, measured and released again in 30 seconds or less, and required minimal effort and space. The relative ease of application also made the procedure appropriate for engaging the voluntary efforts of individual recreational fishers who were willing to participate in the Programme. The procedure did not appear to be intolerably stressful to fish, as the majority of tag releases noted that fish showed good activity upon release, and fish usually swam away quickly. Although other studies have reported tag shedding for the single-barb dart tag (see review of king mackerel tagging studies by Fable, 1990), and some shedding was expected during the tagging activities conducted under the Programme, trials were not designed to estimate tag shedding rate, and hence this remains an unknown factor for interpretation of the present results. Likewise, the possible error in the tag reporting rate was also not determined, partly due to the variable and often complex structure and layout of fish harvest and post harvest operations in the islands that would probably give rise to variable tag reporting rates. The Programme focused much time and effort to identify the best approach for facilitating the maximum number of fish tag releases. Further studies will therefore need to estimate the effects of both tag shedding and tag reporting on the recorded number of recaptures.

As noted, the number of tag releases varied considerably for the selected target species of the Programme. In the case of the commercial fishers in St. Vincent and the Grenadines who were responsible for a large portion of the tag releases, these fishers were not very keen to allow tagging of wahoo and dolphinfish. This was largely due to the fact that these fish were usually bigger and heavier than the blackfin tuna, and fetched more attractive sale bargains with market vendors with whom the local commercial fishers usually had established arrangements for fulfilling a minimum supply of fish. So, despite the fact that the Tagging Programme paid for every fish tagged and released, the operational framework of the market in St. Vincent and the Grenadines dominated the attitude of the commercial fishers who always wanted to satisfy their market supply demand first before giving up fish for tagging

purposes. In addition, the commercial fishers also argued that dolphinfish were often found in schools, and that if the first few dolphinfish were tagged and released, then the rest of the school would disperse, and no additional dolphinfish would be caught from that school at that time. Hence, the taggers had to wait until the fishers had caught most of the dolphinfish in the school, before they were allowed to tag this species. The comparatively lower number of tag releases of king mackerel was due primarily to the fact that this species naturally comprised a much smaller portion of the catches normally taken by fishers north of Trinidad and Tobago. In the case of the recreational fishers, these fishers often noted their preference to tag and release billfishes and tuna species, and to retain species such as wahoo, dolphinfish, and king mackerel for eating purposes. Hence, more blackfin tuna releases were also recorded by the recreational fishers.

Tag Recapture Rates

Given that more blackfin tuna were tagged and released, it was not surprising that the majority of tag returns were also for this species. However, the rate of tag returns was not in exact proportion to the number of releases for each species. It is possible that the variation was due to variations in tag shedding rates by the different species, but it is also possible that wahoo and dolphinfish, which were mostly tagged by commercial fishers operating in offshore areas, moved greater distances that took them beyond the range of local fishers. Additionally, wahoo and dolphinfish are highly valued eating fish within the region, and so it is probable also that fishers and/or vendors were less likely to make the effort to report the tag return for a wahoo or dolphinfish, especially if they did not pay close attention to the information on the tag and were unaware of the cash reward offer for tag returns. In contrast, the return rate was highest for the king mackerel. Since most of the tag releases and the two recaptures took place off the west coast of Trinidad, the high returns reflect the localized nature of the resource at least in this area, and possibly also comparatively high exploitation pressure.

Another factor that seemed to have influenced recapture rates was the ability of the tagger to place the tag correctly. The apparent differences in the three main 'regular' taggers in table 1, may also have been due, at least in part, to differences in areas of operation. For example, the tagger 'JR' conducted most fish tag releases within a few kilometers of the shoreline, while the other two taggers 'EG' and 'DB' operated slightly further offshore. Additionally, given that tagger 'JR' was a recreational fisher volunteer who tagged and released fish regularly along the west coast of St. Vincent, local commercial and subsistence fishers operating in the same relatively small area were constantly reminded of the Tagging Programme, as well as the monetary reward given for a recapture. Hence this may have increased the chances of fishers from this area reporting their recaptures. Although the reported size composition of tagged blackfin tuna also varied slightly with each regular tagger, this was not considered to be a full and true representation of the actual size compositions of blackfin tuna the areas of tagging operations, as the selection of fish for tagging was subjective and driven by factors such as market demands in the case of the commercial fishers. It is therefore not possible to ascertain from the present data whether size played a role in fish remaining close to their points of release, and hence the apparent disproportionate number of recaptures from releases undertaken by tagger 'JR' along the west coast of St. Vincent.

Collaborative arrangements for achieving fish tag releases

Primarily due to difficulties experienced with administrative regulation and disbursement of project funds that included delays in payments to fishers, and also problems with transportation of equipment and crew to landing sites, efforts to establish collaborative partnership arrangements with national fisheries administrations were unsuccessful in the long-term. Similarly, fishing tournaments proved too costly. Local corporate sponsorship contributions, needed to boost the funds available to the Programme, were comparatively little. This, coupled with very limited participation by local recreational fishers on the day of the tournaments, made the cost of tagging a single fish prohibitively high. On the other hand, a few individual recreational fishers volunteered to tag and release fish on a regular basis. This voluntary effort facilitated a notable number of fish tag releases at little extra cost to the programme.

The most productive arrangement for conducting a reasonable number of fish tag releases at regular time intervals proved to be that which used local commercial fishing boat captains who agreed to allow a tagger to participate in their daily commercial fishing trips. This arrangement would probably have been even more successful, but fishers were reluctant to tag fish early in the fishing trip, because of commitments to supply market vendors with certain minimum amounts of fish. It is likely that this arrangement was also the most successful in this case, because it involved the active participation of CFRAMP technical staff, and fisher payments did not suffer the delays experienced when working through national fisheries administrations.

Fish movement

Recaptures were reported for only blackfin tuna and king mackerel. In the case of blackfin tuna, those fish that were tagged very close to the shoreline along the west coast of St. Vincent and within the Grenadines were also recaptured close to or at their points of release. Several of these recaptures occurred following short periods at liberty, but three recaptured fish were taken at comparatively short distances from their points of release, after being at liberty for over one year. On the other hand, the two blackfin tuna recaptures involving fish tagged and released off the eastern side of St. Vincent and the Grenadines, showed comparatively greater movement following periods of liberty ranging from 110 days to 1230 days.

Large pelagic fish are believed to engage in specific long distance migrations in search of good supplies of food and good spawning conditions (e.g. Bard *et al*., 1993; Sturm, 1978; Sturm *et al*., 1984). There is some evidence that large pelagic fishes may utilize currents to help them move from one location to another (Nakamura, 1969; Anon., 1988). Large pelagic fish, especially tunas, also aggregate in areas of upwelling (Ramos and Sangra, 1992) and ocean fronts that provide favorable feeding conditions (Fiedler and Bernard, 1987). It may be argued, therefore, that large pelagic fish would take advantage of high prey densities occurring on a local scale, and local occurrence of schools of prey species may attract these migratory fish to stay longer than expected in small sea areas.

The comparatively shorter distances travelled by the fish tagged along the west coast of St. Vincent and within the Grenadines may be linked to the fact that these areas lie very close to the shoreline, where the tidal currents interact with a narrow shelf edge and submerged banks to create a local upwelling action that tends to concentrate and attract schools of small fish on a regular basis. In contrast, the longer distances observed for the two fish tagged off the eastern coasts of St. Vincent and the Grenadines occurred in offshore areas with more oceanic conditions, and where prey might be expected to be more patchily distributed and also more mobile.

In the case of king mackerel, the two fish recaptured off the west coast of Trinidad also did not show long distances of movement, although one fish was at liberty for 129 days. Like blackfin tuna, these fish were tagged in an area where the tidal currents interact with the shoreline features to produce local areas of comparatively high productivity. While it is possible that food supply and currents may be influencing the rate of movement for the king mackerel in this area, other factors such as water salinity are thought to affect the movement of king mackerel around the island (Sturm and Salter, Sturm *et al*., 1984). Further studies are needed to confirm the proposed patterns and their causes.

Fish growth

The small sample of recaptures produced too few points to facilitate quantitative analyses of growth. The recapture length of one blackfin tuna was less than its length at release, and this was most likely due to an error in the measurement of the release length. As expected, there was some apparent observed variation in average growth rate shown by individual fish of similar size, and observed average daily growth rates appeared to decrease non-linearly with increasing size of fish. The variation in growth rate among individual fish of the same size can be an important consideration for modelling fish growth (Hampton, 1991), and so future tagging studies should aim to address this. Additionally, data from the present study showed that measurable growth in blackfin tuna sometimes occurred during short periods of time.

REFERENCES

Anonymous. 1988. Fishery management plan, final environmental impact statement, regulatory impact review, and initial regulatory flexibility analysis for the Atlantic billfishes. NMFS and NOAA Source Document. 137 pp.

Bayley, R.E., & E.D. Prince. 1992. A review of tag release and recapture files for *Istiophoridae* from the Southeast Fisheries Center's Cooperative Game Fish Tagging Program, 1954 to present. *ICCAT Collective Volume of Scientific Papers*, **XLI**, 527- 548.

Collette, B.B. & C.E. Nauen. 1983. FAO Species Catalogue. Vol. 2 Scombrids of the World. An annotated and illustrated catalogue of tunas, mackerels, bonitos, and related species known to date. *FAO Fisheries Synopsis*, No. 125, Vol. 2, 137 pp.

Constantine, S.L. 2002. RAPD analysis of genetic variation in wahoo, *Acanthocybium solandri*, in the western central Atlantic. M.Sc. Research paper. UWI: Barbados. 97 pp.

CRFM. 2005. Report of the First Annual CRFM Scientific Meeting. *CRFM Fishery Report* No. 11, 318 pp.

Fable, W.A. Jr. 1990. Summary of king mackerel tagging in the southeastern USA: mark-recapture techniques and factors influencing tag returns. *American Fisheries Society Symposium*, 7, 161-167.

Fable, W.A. Jr., L. Trent, G.W. Bane & S.W. Ellsworth. 1987. Movements of king mackerel, *Scomberomorus cavalla*, tagged in southeast Louisiana, 1983-85. *Marine Fisheries Review*, **49** (2), p 98-102.

Farber, M.I. 1988. An overview of available information pertinent to interpreting possible stock structure of swordfish in the Atlantic Ocean. *ICCAT Collective Volume of Scientific Papers*, **XXVVII**, 240-254.

Fiedler, P.C. and H.J. Bernard. 1987. Tuna aggregation and feeding near fronts observed in satellite imagery. *Continental Shelf Research* **7,** 871-881.

George, S., S. Singh-Renton & F.B. Lauckner. 2001. Assessment of wahoo (*Acanthocybium solandri*) fishery using Eastern Caribbean data. Working Document: CFRAMP_PRFA/2000-04, 25-40. In *Report of the 2000 Caribbean Pelagic and Reef Fisheries Assessment and Management Workshop*. (S. Singh-Renton, ed.). CARICOM Fishery Report, No. 9. 139 pp.

Graves, J.E. & J.R. McDowell. 2000. A genetic perspective on the stock structures of blue marlin and white marlin in the Atlantic Ocean. *ICCAT Collective Volume of Scientific Papers*, **53**, 180-187.

Hampton, J. 1991. Estimation of southern bluefin tuna, *Thunnus maccoyii*, natural mortality and movement rates from tagging experiments. *Fishery Bulletin*, 89, 591-610.

Hilborn, R., C. J. Walters, & D.B. Jester Jr., 1990. Value of fish marking in fisheries management. *American Fisheries Symposium*, 7, 5-7.

Hunte, W. 1987. Summary of the available data base on oceanic pelagic fisheries in the Lesser Antilles. In R. Mahon ed. Report and Proceedings of the Expert Consultation on Shared Fishery Resources of the Lesser Antilles Region. *FAO Fisheries Report*, No. 383, 125-176.

ICCAT, 2000. Report of the Fourth ICCAT Billfish Workshop. *ICCAT Collective Volume of Scientific Papers*, **53**, 1-130.

ICCAT, 2005. *Report for the biennial period, 2004-05, Part I (2004)* – Vol. 2. 219 pp.

Johnson, A.G., W.A. Fable Jr., C. Grimes, L. Trent, & J Vasconcelos Perez. 1994. Evidence for distinct stocks of king mackerel, *Scomberomorus cavalla*, in the Gulf of Mexico. *Fishery Bulletin*, **92**, 91-101.

Mahon, R. & S. Mahon. 1987. Seasonality and migration of pelagic fishes in the Eastern Caribbean. *FAO Fisheries Report*, No. 383, 192-273.

Mahon, R. F. Murphy, P. Murray, J. Rennie, & S. Willoughby. 1990. Temporal variability of catch and effort in pelagic fisheries in Barbados, Grenada, St. Lucia and St. Vincent: with particular reference to the problem of low catches in 1989. *FAO FI: TCP/RLA/8963.* Field Document 2. 74 pp.

Miyake, P. 1990. History of the ICCAT tagging program, 1971-1986. *American Fisheries Society Symposium*, 7, 746-764.

Nakamura, H. 1969. *Tuna. Distribution and Migration*. London: Fishing News (Books) Ltd. 76 pp.
National Marine Fisheries Service (NMFS). 1994. Cooperative Game Fish Tagging Program Annual Newsletter: 1992. NOAA Technical Memorandum NMFS-SEFSC-346, 23 p.
Neilson, J.D., P.A. Murray, J.A. Finlay & J. Rennie. 1996. Wahoo landings in the Lesser Antilles: "biased" samples cause problems for stock assessment. *Proceedings of the Gulf and Caribbean Fisheries Institute*, **46**, 346-359.
Ortiz, M. 2001. Review of tag releases and recaptures for yellowfin tuna from the U.S. CTC program. *ICCAT Collective Volume of Scientific Papers*, **52**, 215-221.
Ortiz, M., E.D. Prince, J.E. Serafy, D.B. Holts, K.B. Davy, J.G.Pepperell, M.B. Lowry & J.C. Holdsworth. 2003. Global overview of the major constituent-based billfish tagging programs and their results since 1954. *Marine and Freshwater Research*, **54**, 489-507.
Oxenford, H. 1992. Preliminary tagging results on the four-wing flyingfish *Hirundichthys affinis* in the Eastern Caribbean. *Proceedings of the Gulf and Caribbean Fisheries Institute*, **41**, 51-66.
Oxenford, H. & W. Hunte. 1986a. A preliminary investigation of the stock structure of the dolphin, *Coryphaena hippurus*, in the Western Central Atlantic. *Fishery Bulletin*, **84**(2), 451-460.
Oxenford, H. & W. Hunte. 1986b. Migration of the dolphin (*Coryphaena hippurus*) and its implications for fisheries management in the Western Central Atlantic. *Proceedings of the Gulf and Caribbean Fisheries Institute*, **37**, 95-111.
Parker, C., S. Singh-Renton A. Hackett & F. B. Lauckner. 2001. Assessment of dolphinfish (*Coryphaena hippurus*) fishery using Eastern Caribbean data. Working Document: CFRAMP_PRFA/2000-05, p 41-53. In Report of the 2000 Caribbean Pelagic and Reef Fisheries Assessment and Management Workshop. (Ed. S. Singh-Renton). *CARICOM Fishery Report* No. 9. 139 pp.
Parrack, M.L. & P.L. Phares. 1979. Aspects of the growth of Atlantic bluefin tuna determined from mark-recapture data. *ICCAT Collective Volume of Scientific Papers*, **8**(2), 391-420.
Porch, C.E. 1999. Estimating Atlantic bluefin tuna mortality from the release and recapture dates of recovered tags. *ICCAT Collective Volume of Scientific Papers*, **49**, 327-333.
Ramos A.G. and P. Sangra. 1992. Características oceanográficas en al Area de Canarias: Relación con la Pesquería de Listado (*Katsuwonus pelamis*). *ICCAT Collective Volume of Scientific Papers*. **39**, 289-296.
Schaefer C. & W.A. Fable Jr. 1994. King mackerel, *Scomberomorus cavalla*, mark-recapture studies off Florida's east coast. *Marine Fisheries Review*, 56,3, 13-23.
Sturm, M.G. 1978. Aspects of the biology of *Scomberomorus maculatus* (Mitchell) in Trinidad. *Journal of Fish Biology*, **13**, 155-172.
Sturm, M.G., M. Julien & P. Salter. 1984. Exploitation and biology of the mackerel fishery in Trinidad. *Proceedings of the Gulf and Caribbean Fisheries Institute*, **36**, 142-151.

Table 1. The number of each fish species tagged and released in the waters of the 6 Island States, which participated in the tagging programme.

Island State	Blackfin tuna	Wahoo	Dolphinfish	King mackerel	Grand Total
Antigua and Barbuda	82	2	2		86
Dominica	15		3		18
Grenada	6	6	3		15
St. Lucia	6	1	4	2	13
St. Vincent and the Grenadines	678	241	77	1	997
Trinidad and Tobago				14	14
Grand Total	787	250	89	17	1143

Table 2. No. fish tag releases, recaptures and the recapture rate for each tagger. The row data for the three regular taggers ('DB', 'EG' & 'JR') are emboldened and shaded in light grey. The row data for the tagger, 'DV', with the apparent highest rate of return are emboldened and shaded in dark grey.

Tagger	No. tag releases	No. tag recaptures	Recapture rate per tagger
BJ	3	0	0.00
CI	12	0	0.00
DB	**86**	**0**	**0.00**
DM	1	0	0.00
DRJ	2	0	0.00
DV	**9**	**2**	**22.22**
EB	7	0	0.00
EG	**786**	**2**	**0.25**
EJB	1	0	0.00
GA	6	0	0.00
JR	**189**	**9**	**4.76**
JRD	18	0	0.00
LAR	3	0	0.00
LM	1	0	0.00
MRG	1	0	0.00
NAR	2	0	0.00
PP	5	0	0.00
RM	1	0	0.00
RR	3	0	0.00
SC	4	0	0.00
SSR	5	0	0.00
Grand Total	1143	13	

Table 3. Observed average growth rates (cm FL per day) of recaptured blackfin tuna and king mackerel.

SPECIES	Date of Release	Date of recapture	Fork length (cm) at release	Fork length (cm) at recapture	Days at liberty	Total growth during period at liberty (cm)	Average daily growth rates (cm/day)
Blackfin tuna							
	17-Aug-98	2-Sep-98	27	29	16	2	1.25E-01
	9-Aug-98	7-Sep-98	28	31	29	3	1.03E-01
	15-Apr-98	3-Aug-98	38	45	110	7	6.36E-02
	6-Aug-97	9-Oct-97	48	49	63	1	1.59E-02
	17-Jan-98	31-Jul-98	48	52	195	4	2.05E-02
	28-Jun-97	5-Sep-98	49	57	434	8	1.84E-02
	19-Apr-97	13-Jun-98	54	56	420	2	4.76E-03
	8-Jul-97	13-Jul-97	55	55	5	0	0.00E+00
	13-Jul-96	24-Sep-97	59	67	438	8	1.83E-02
	3-Apr-98	15-Aug-01	59	65	1230	6	4.88E-03
	13-Jul-96	25-Jul-96	66	65	12	-1	-8.33E-02
King mackerel	7-Jun-98	20-Aug-98	73	76	74	3	4.05E-02
	7-Jun-98	14-Oct-98	82	83	129	1	7.75E-03

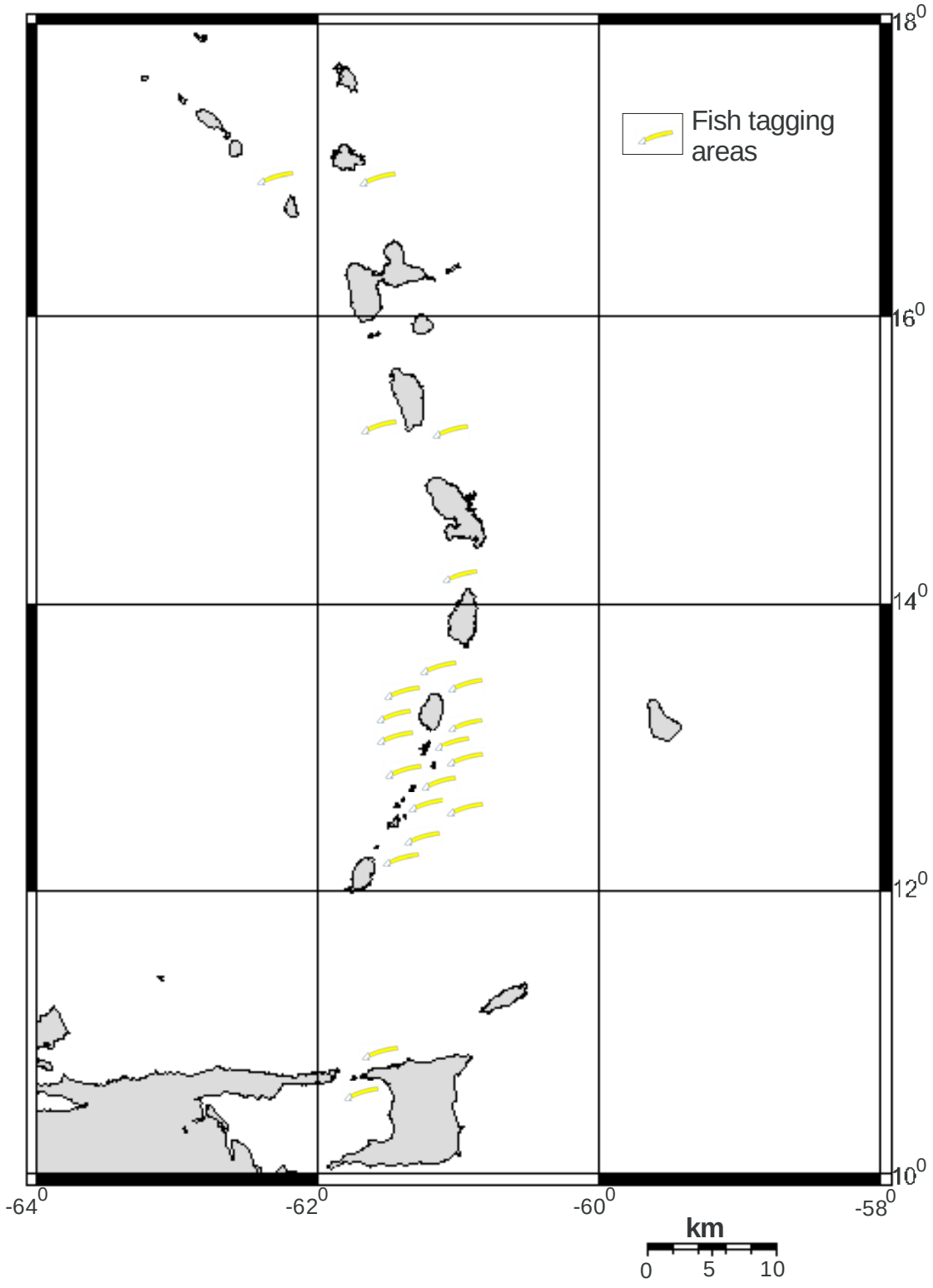
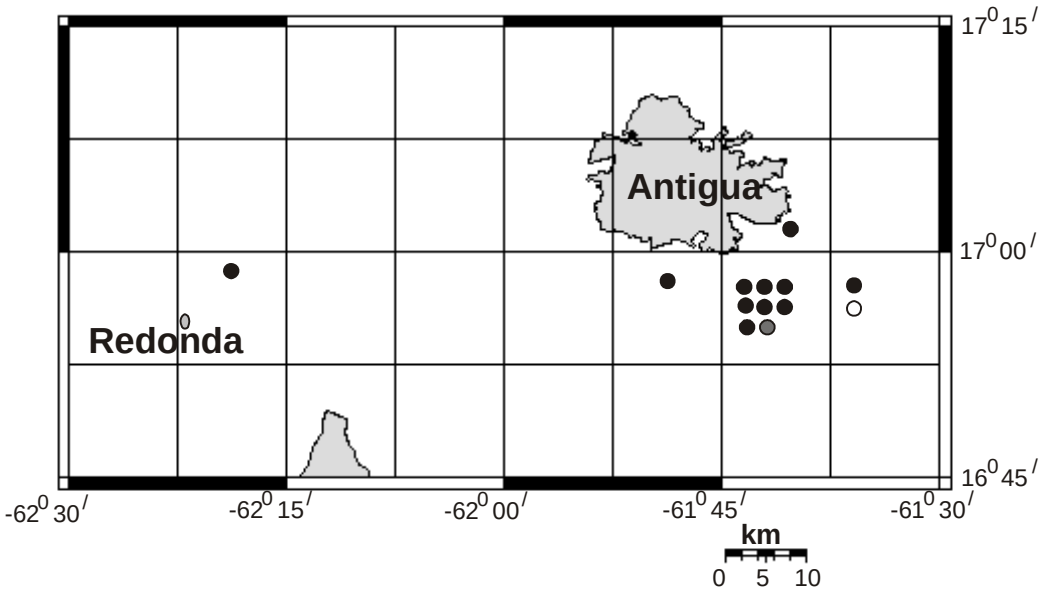
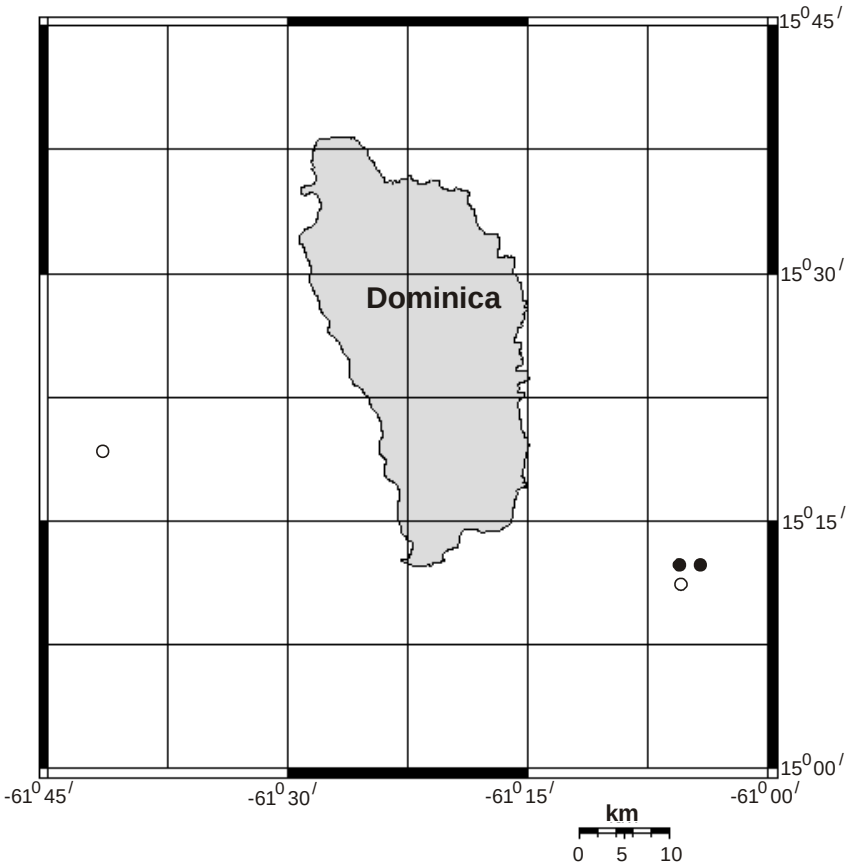


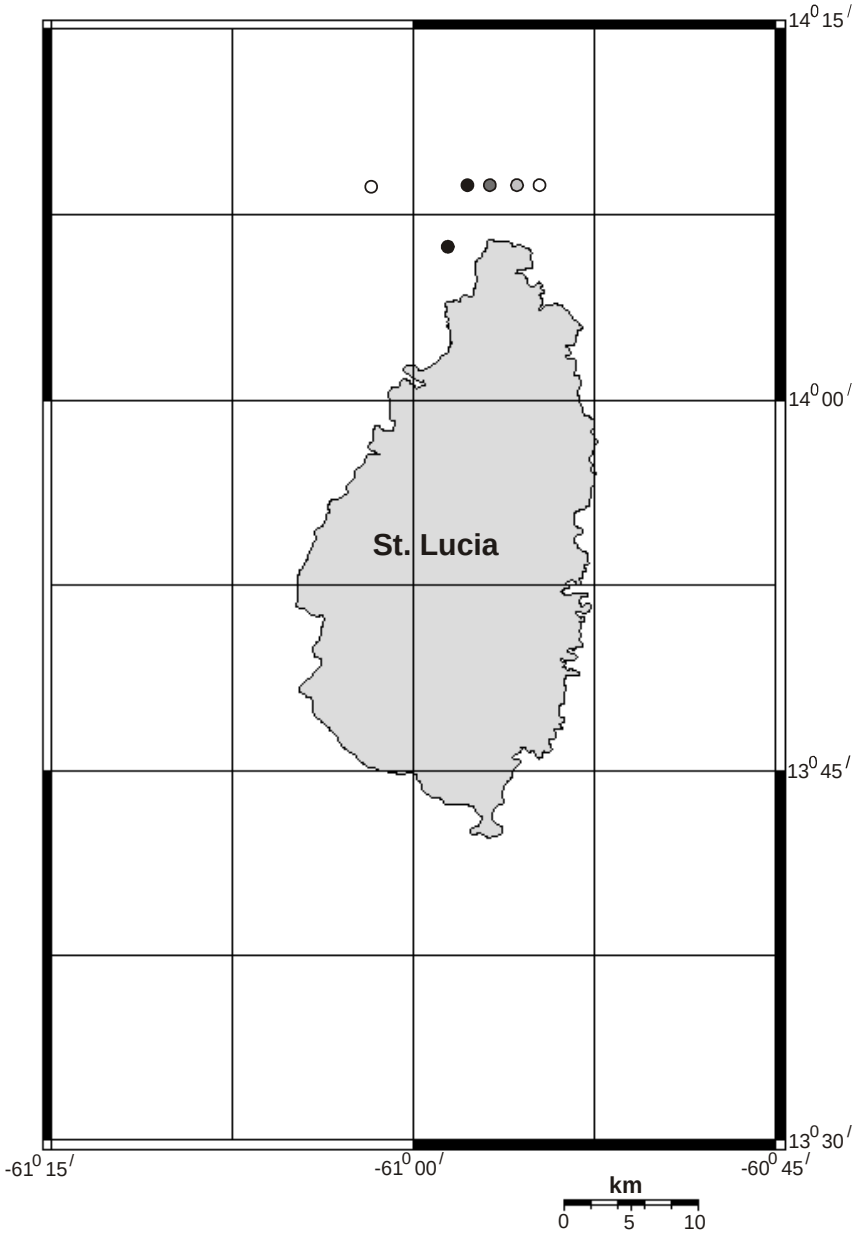
Figure 1. Chart showing areas in which fish tagging activities took place during the implementation of CFRAMP's Large Pelagic Fish Tagging Programme.


17⁰15′
17⁰00′
16⁰45′
Antigua
Redonda
-62⁰30′
-62⁰15′
-62⁰00′
-61⁰45′
-61⁰30′
km
0 5 10

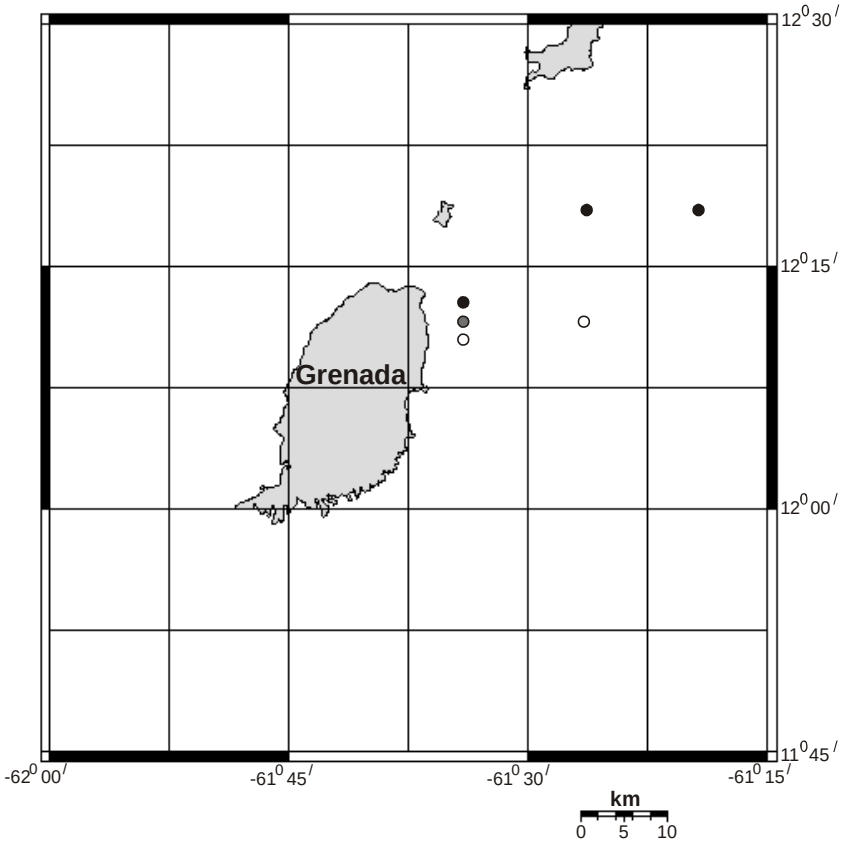
(a)


15⁰45′
15⁰30′
15⁰15′
15⁰00′
Dominica
-61⁰45′
-61⁰30′
-61⁰15′
-61⁰00′
km
0 5 10

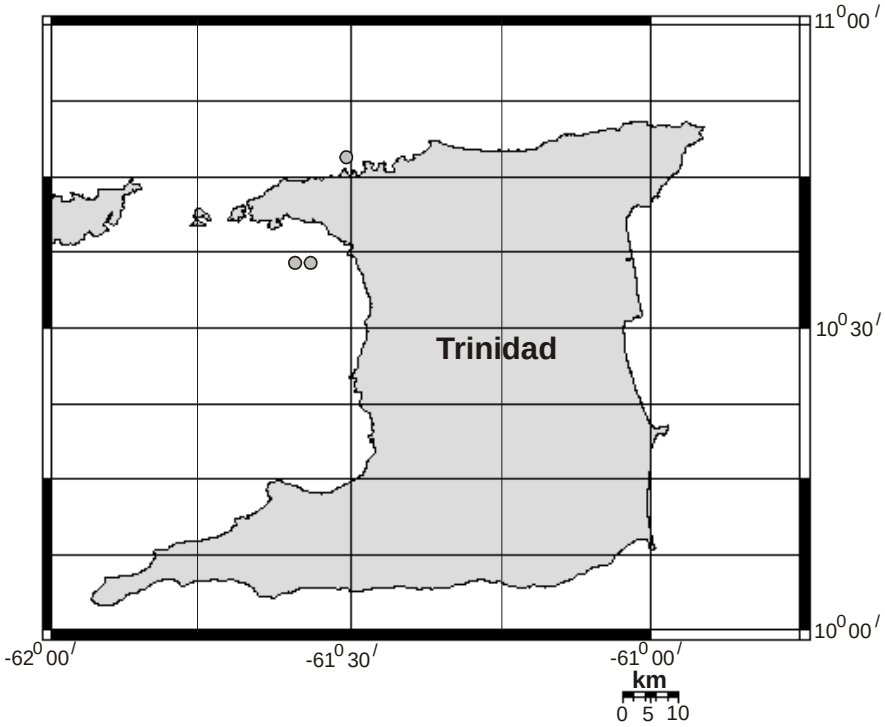
(b)



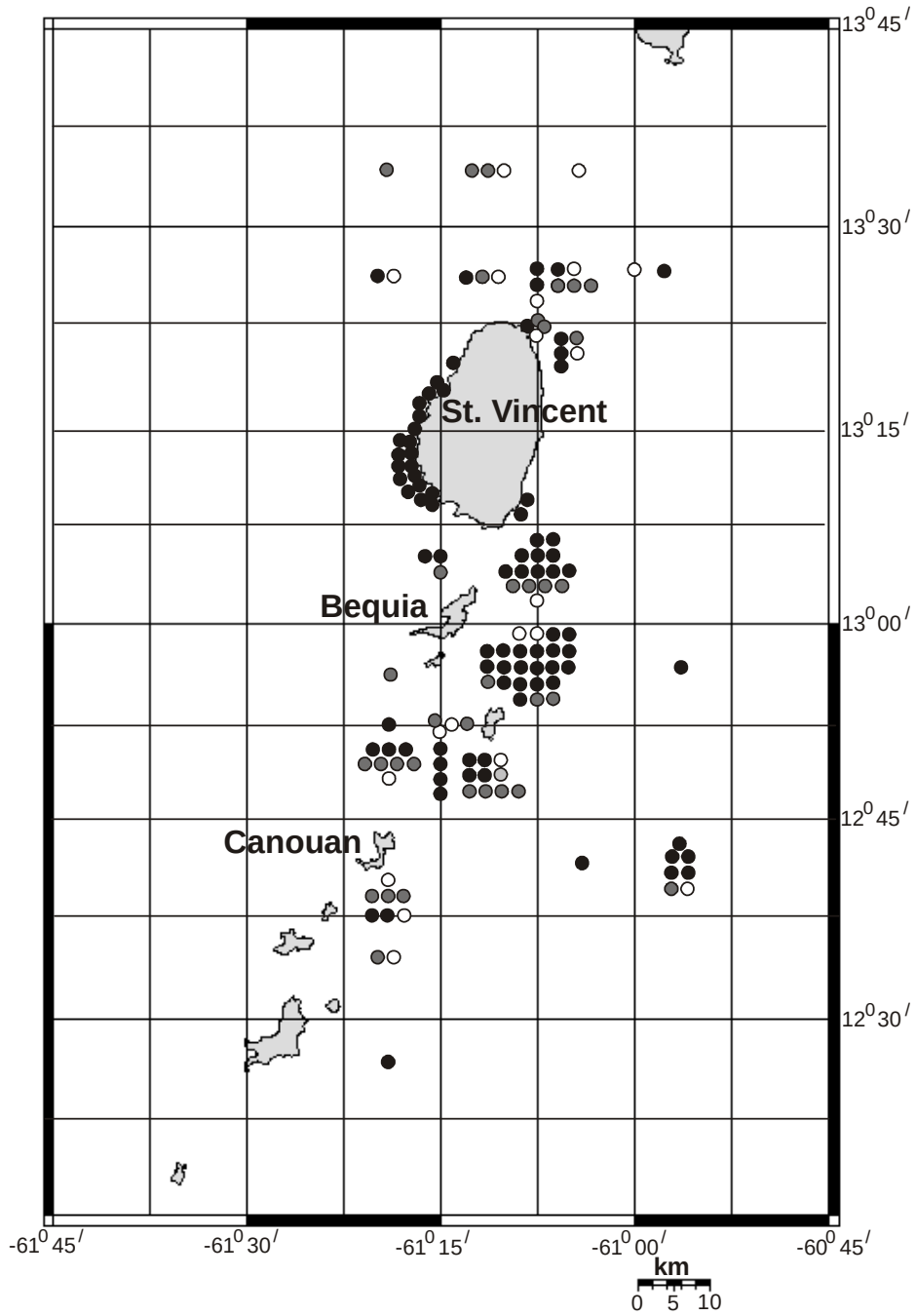
(c)


12⁰30′
12⁰15′
12⁰00′
11⁰45′
Grenada
-62⁰00′
-61⁰45′
-61⁰30′
-61⁰15′
km
0 5 10

(d)


11⁰00′
10⁰30′
10⁰00′
Trinidad
-62⁰00′
-61⁰30′
-61⁰00′
km
0 5 10

(e)



(f)

Figure 2. Charts showing the frequency of fish tag releases in: (a) Antigua and Barbuda, (b) Dominica, (c) St. Lucia, (d) Grenada, (e) Trinidad and Tobago, and (f) St. Vincent and the Grenadines. The black, dark grey, light grey and unshaded circles indicate releases of blackfin tuna, wahoo, king mackerel, and dolphinfish respectively. Each circle represents 1-10 fish.

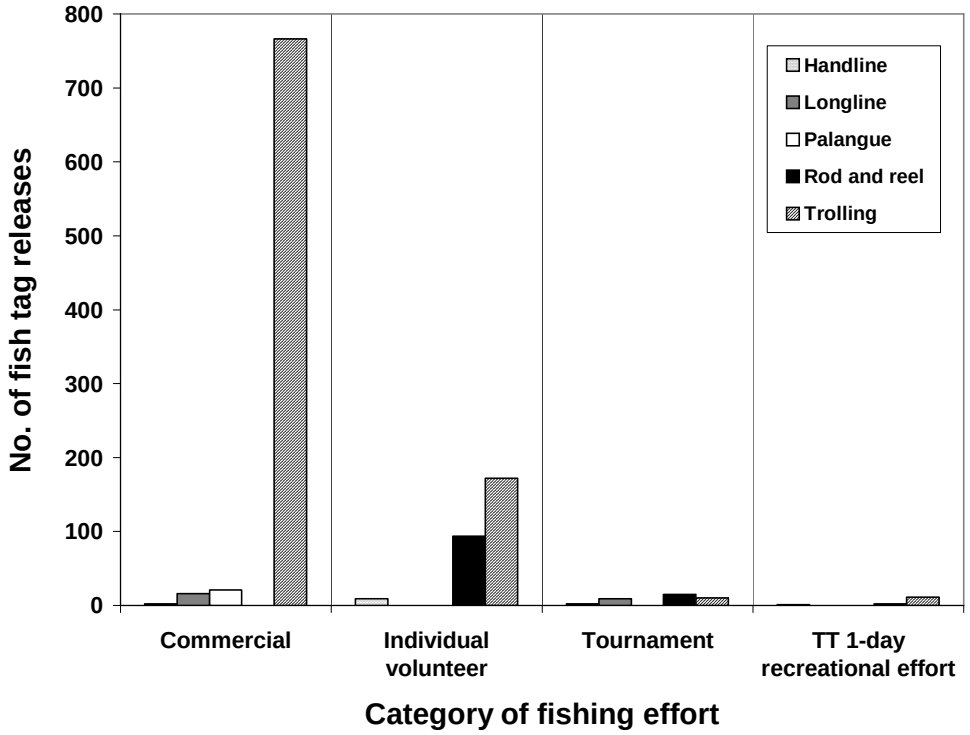


Figure 3. Number of fish tag releases made by various categories of fishing effort using different types of gear.

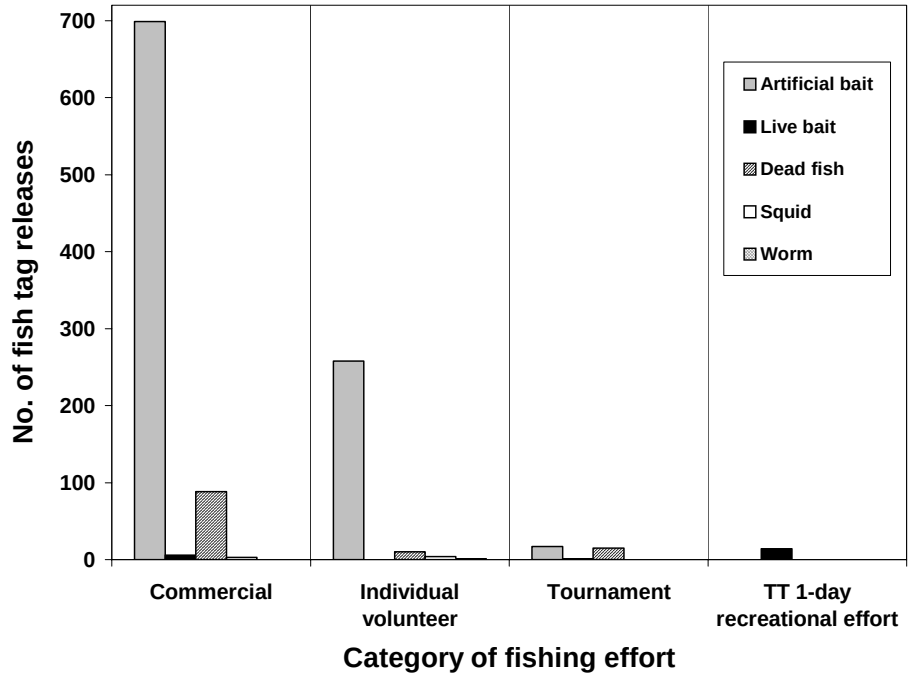


Figure 4. Number of fish tag releases made by various categories of fishing effort using different types of bait.

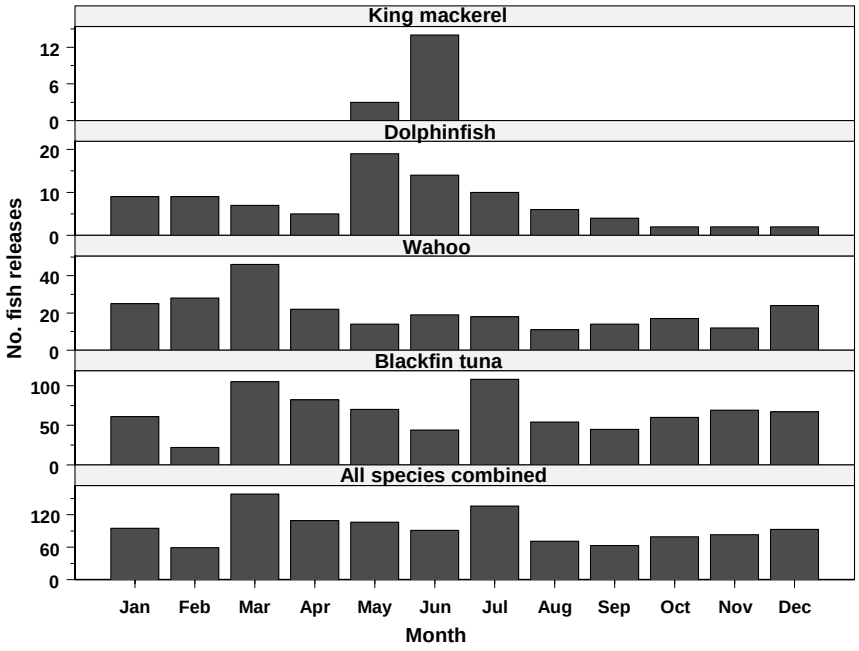


Figure 5. Total number of fish tag releases made in each month, summed across the period 1996-1999.

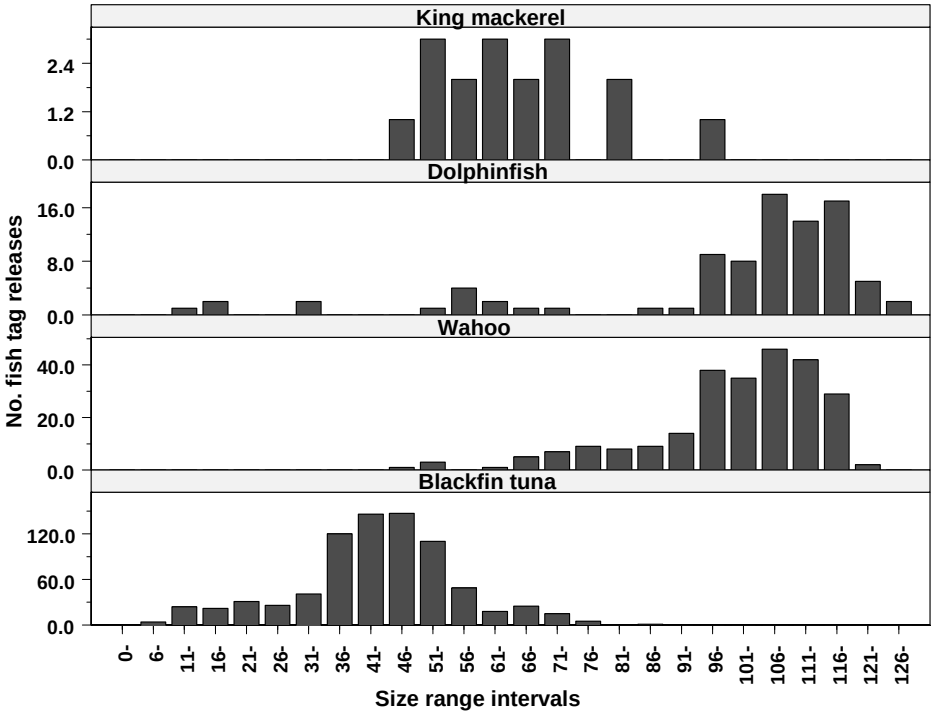


Figure 6. Size ranges of each species caught and released during the tagging programme.

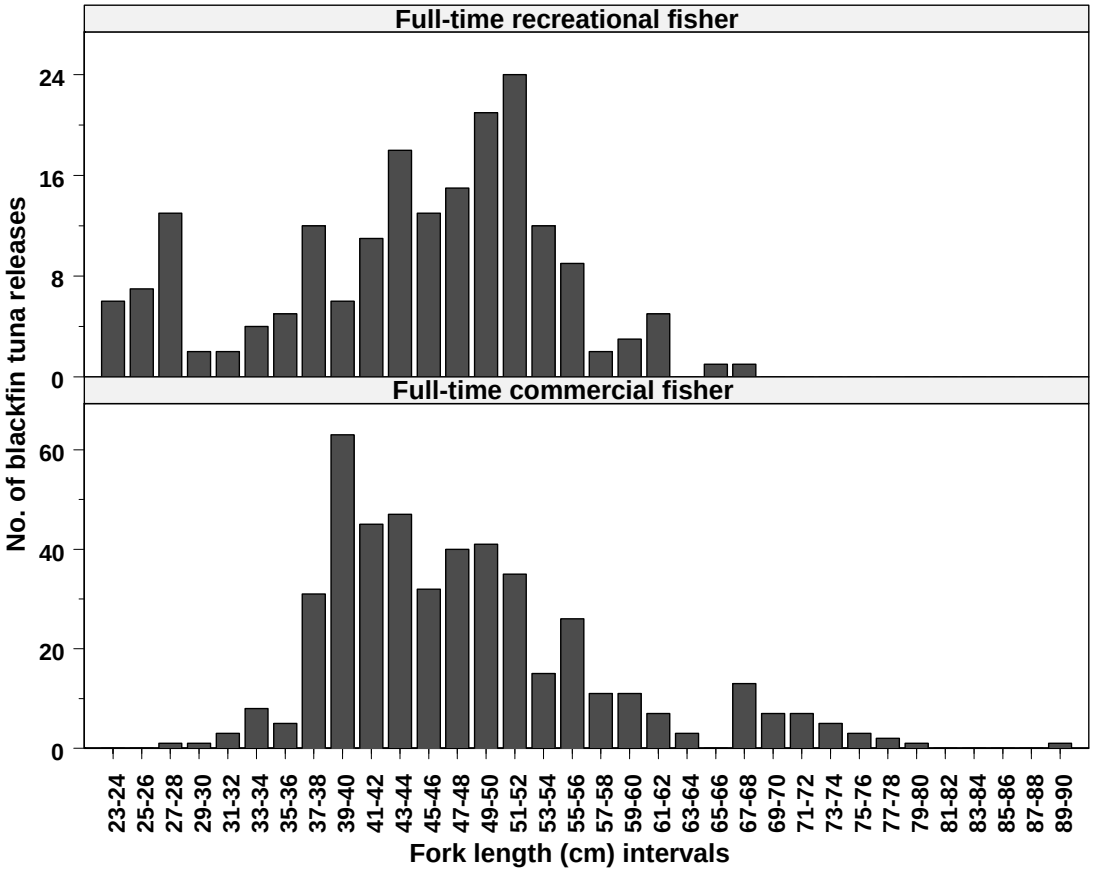


Figure 7. Size ranges of blackfin tuna caught by the two principal recreational and commercial taggers.

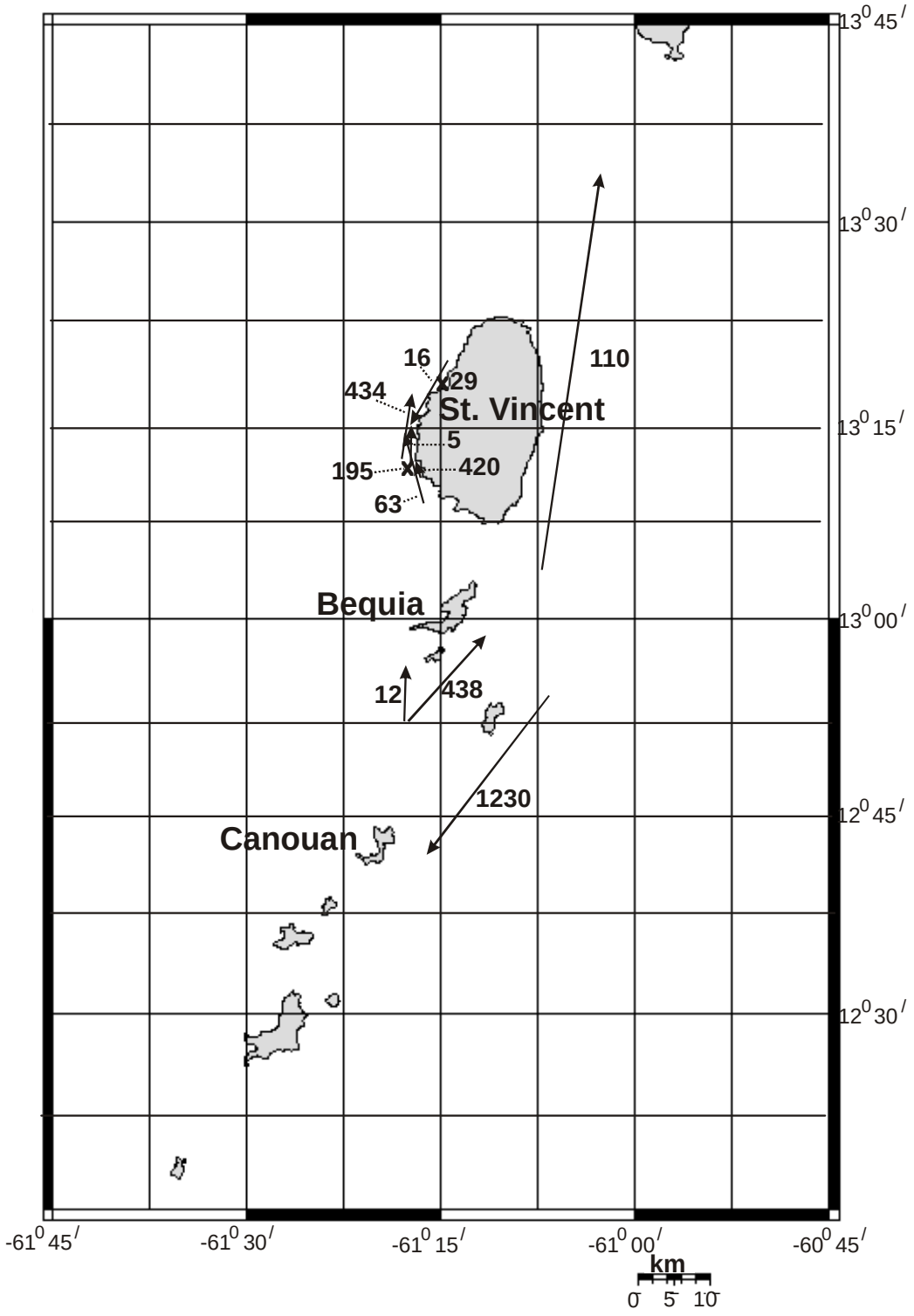


Figure 8. Chart showing the release and recapture positions of the 11 blackfin tuna returned. The arrow shows the direction of movement, and the number adjacent to each line gives the total number of days at liberty.

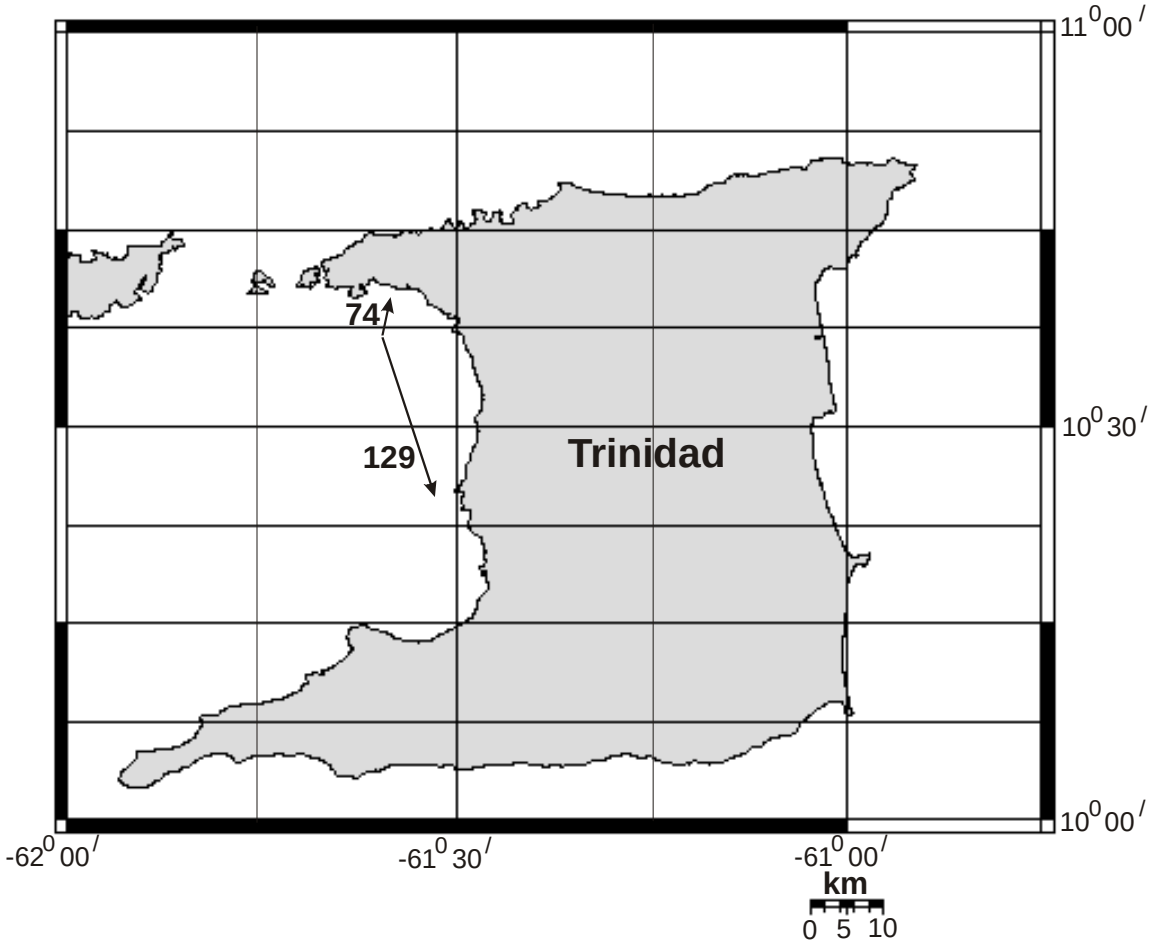
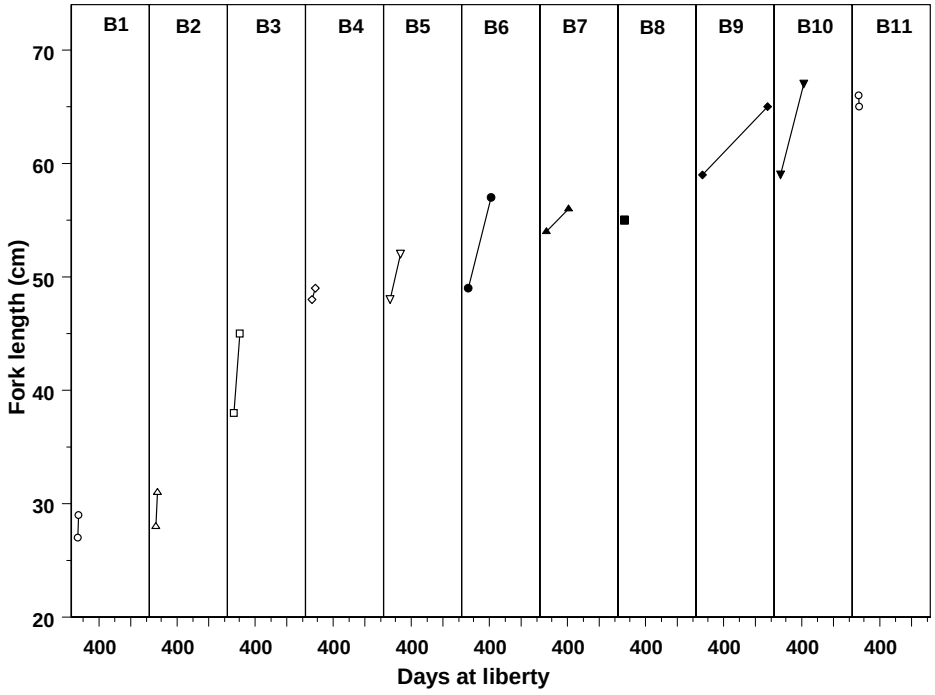
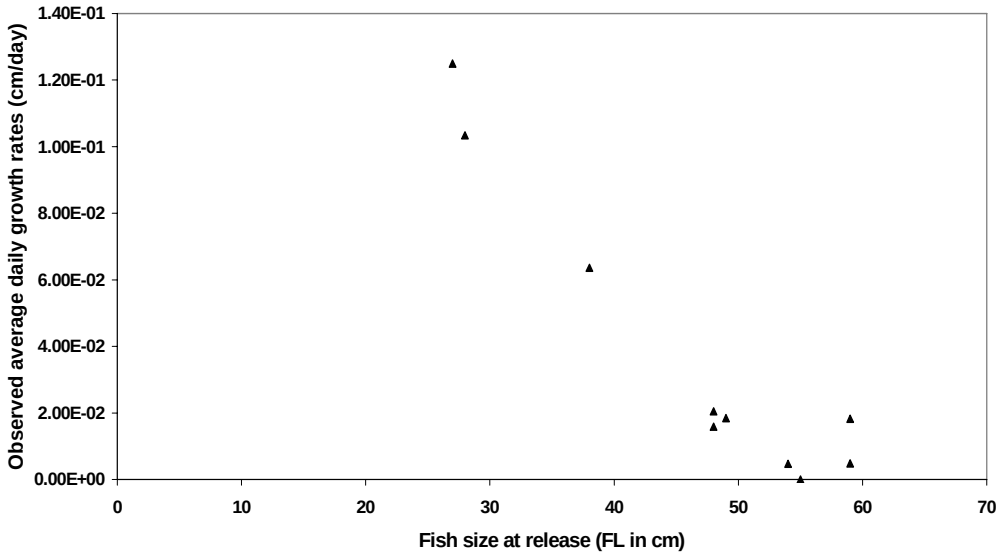


Figure 9. Chart showing the release and recapture locations of the two king mackerel returned. The arrow shows the direction of movement, and the number adjacent to each line gives the total number of days at liberty.



(a)



(b)

Figure 10. Observed average growth rates (cm FL per day) of individual recaptured blackfin tuna, with (a) showing the average increase in size of fish with time (growth slopes), and with (b) showing a decrease in the average growth rate with size of fish.

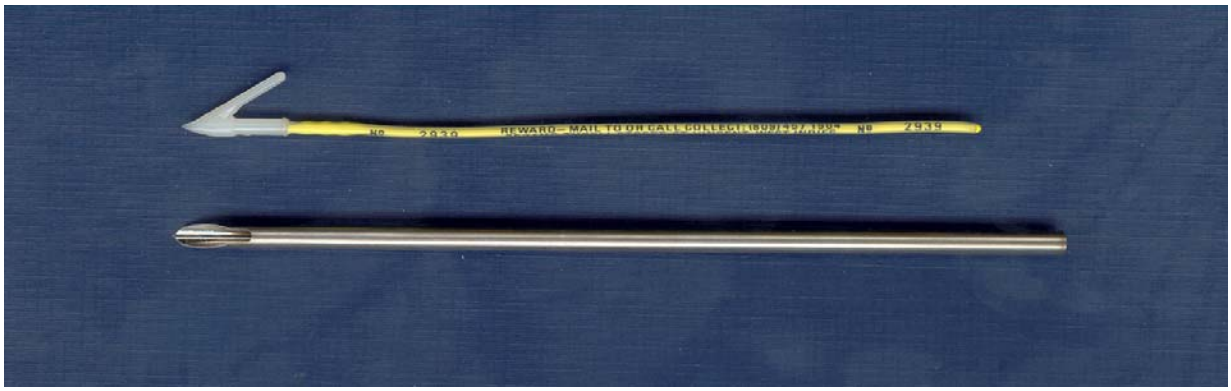
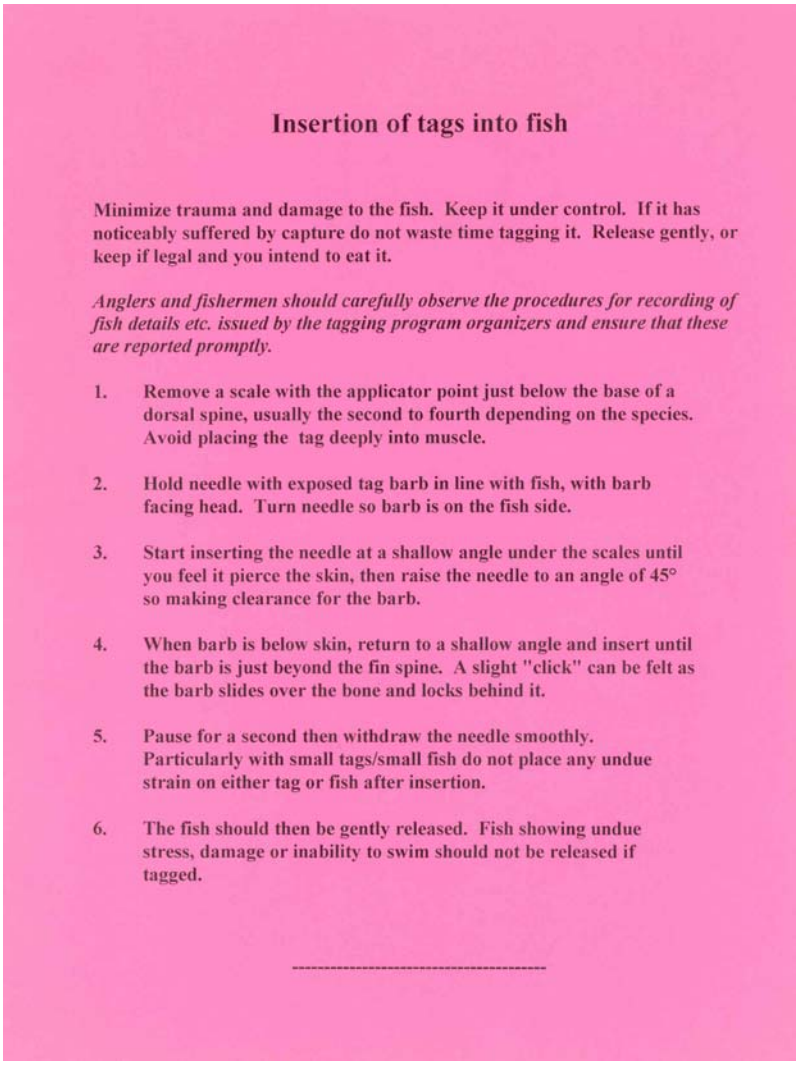


Plate 1. Photo of yellow single barb dart tag (item in upper position) and stainless steel tag applicator (item in lower position) used in CFRAMP's Large Pelagic Fish Tagging Programme.



Insertion of tags into fish

Minimize trauma and damage to the fish. Keep it under control. If it has noticeably suffered by capture do not waste time tagging it. Release gently, or keep if legal and you intend to eat it.

Anglers and fishermen should carefully observe the procedures for recording of fish details etc. issued by the tagging program organizers and ensure that these are reported promptly.

1. Remove a scale with the applicator point just below the base of a dorsal spine, usually the second to fourth depending on the species. Avoid placing the tag deeply into muscle.

2. Hold needle with exposed tag barb in line with fish, with barb facing head. Turn needle so barb is on the fish side.

3. Start inserting the needle at a shallow angle under the scales until you feel it pierce the skin, then raise the needle to an angle of 45° so making clearance for the barb.

4. When barb is below skin, return to a shallow angle and insert until the barb is just beyond the fin spine. A slight "click" can be felt as the barb slides over the bone and locks behind it.

5. Pause for a second then withdraw the needle smoothly. Particularly with small tags/small fish do not place any undue strain on either tag or fish after insertion.

6. The fish should then be gently released. Fish showing undue stress, damage or inability to swim should not be released if tagged.

Plate 2. Tag insertion instruction sheet prepared for training purposes, and for inclusion in field tagging kits.

CFRAMP TAG RELEASE CARD

CFRAMP is a co-operative program of the following countries: Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St.Kitts and Nevis, St.Lucia, St.Vincent and the Grenadines, Trinidad and Tobago.

TAG NUMBER: 0012		
Date:	**Trip number:**	**Time:**
Tagger's name:		**Country:**
Location of capture:		
Species: (tick one)	□ *Blackfin tuna (Thunnus atlanticus);* □ *Wahoo (Acanthocybium solandri)* □ Dolphin fish (*Coryphaena hippurus);* □ King mackerel (*Scomberomorus cavalla)*	
Fork length (cm) :	**Weight (kg) :**	**Dolphin fish:** male / female
Fish condition:		**Fish tagged:** in the water / on board
Activity of fish on release: poor / fair / good (actively swimming)		
Gear used:		**Bait used:**
Depth of bait: 0-50 m / 50-100 m / >100 m		
Fish associated with: birds / floating object / floating weed / whales / F.A.D		
School type: single fish / surface feeding / moving / loose group		
Note any regurgitated food by species:		

Plate 3. The CFRAMP Tag Release Card showing data collected each time a fish was tagged and released.

CFRAMP TAG RECAPTURE CARD

CFRAMP IS A CO-OPERATIVE PROGRAM OF THE FOLLOWING COUNTRIES: ANTIGUA AND BARBUDA, BARBADOS, BELIZE, DOMINICA, GRENADA, GUYANA, JAMAICA, MONTSERRAT, ST. KITTS AND NEVIS, ST. LUCIA, ST. VINCENT AND THE GRENADINES, TRINIDAD AND TOBAGO.

REWARD IS US$ 50 FOR TAG AND FISH, OR US$ 20 FOR TAG ONLY.
FISH IS RETURNED TO FISHER AFTER RECORDING THE FOLLOWING INFORMATION:

SPECIES: _____ TAG NUMBER: _____ DATE OF CAPTURE (dd/mm/yy): _____

LOCATION OF CAPTURE: _____

FISH LENGTH (FORK LENGTH): _____cm / ins (circle units)

FISH WEIGHT (WHOLE): _____ kgs / lbs (circle units)

SEX OF FISH, IF KNOWN: Male / Female (circle appropriate one)

FISHING GEAR USED: _____ NAME OF BOAT: _____

NAME OF FISHER: _____

TELEPHONE NUMBER OR ADDRESS OF FISHER: _____

NAME OF PERSON WHO COMPLETED THIS CARD: _____

OTHER NOTES: _____

The CFRAMP Tagging Program covers the four species: Blackfin Tuna (*Thunnus atlanticus*), Dolphinfish (*Coryphaena hippurus*), Wahoo (*Acanthocybium solandri*) and King Mackerel (*Scomberomorus cavalla*). Please identify the species by either scientific name or standard common name.

For "location of recapture", please give most precise information possible, i.e. latitude and longitude co-ordinates, or direction and number of miles off specified coast, town, or country.

(a) i - Front view of tag recapture card, English version

MAIL TAG AND THIS CARD TO:

PLACE POSTAGE STAMP HERE

LARGE PELAGIC TAGGING PROGRAM,
CARICOM FISHERIES RESOURCE ASSESSMENT AND MANAGEMENT PROGRAM (CFRAMP),
TYRELL STREET,
ST. VINCENT AND THE GRENADINES,
WEST INDIES

If you have any questions regarding completion of this card or the reward offered, call CFRAMP (St. Vincent) collect at (809) 457 1904, or CFRAMP (Trinidad) at (809) 634 4528/4530, or contact your local Fisheries Office.

(a) ii – Back view of tag recapture card, English version .

CFRAMP TARJETA PARA MARCA RECAPTURADA

CFRAMP ES UN PROGRAMA DE COOPERACIÓN DE LOS SIGUIENTES PAISES: ANTIGUA Y BARBUDA, BARBADOS, BELIZE, DOMINICA, GRANADA, GUYANA, JAMAICA, MONTSERRAT, SAN KITTS Y NEVIS, SANTA LUCIA, SAN VICENTE Y LAS GRANADINES, TRINIDAD Y TOBAGO.

LA RECOMPENSA ES DE US$ 50 POR LA MARCA Y EL PEZ O US$ 20 POR LA MARCA SOLAMENTE.
EL PEZ SERÁ DEVUELTO AL PESCADOR DESPUÉS DE REGISTRAR LA SIGUIENTE INFORMACIÓN:

ESPECIE: _____ Nº MARCA: _____ FECHA DE CAPTURA (dia/mes/año):_____
LUGAR DE CAPTURA: _____
LONGITUD DEL PEZ (LONGITUD HORQUILLA): _____cm / pulgada (encierre la unidad en un círculo)
PESO DEL PEZ (ENTERO): _____ kg / libro (encierre la unidad en un círculo)

SEXO DEL PEZ, SI LO CONOCE: Macho / Hembra (rodee con un círculo)
ARTE DE PESCA USADO: _____ NOMBRE DE LA EMBARCACIÓN:_____
NOMBRE DEL PESCADOR: _____
NÚMERO DE TELÉFONO O DIRECCIÓN DEL PESCADOR: _____
NOMBRE DE LA PERSONA QUE RELLENÓ ESTA TARJETA: _____
OTROS DATOS: _____

El programa de marcaje CFRAMP cubre cuatro especies: Atún Aleta Negra (*Thunnus atlanticus*), Dorado (*Coryphaena hippurus*), Peto (*Acanthocybium solandri*) y el Carite Rey (*Scomberomorus cavalla*). Por favor, identifique las especies por nombre científico o bien por nombre común..

Para "lugar de captura", por favor facilite la información más precisa posible, es decir, coordenados latitud y longitud, o dirección y número de millas frente a la costa, cuidad o país.

(b) Front view of Spanish version of tag recapture card.

FICHE CFRAMP DE RÉCUPÉRATION DE MARQUES

LE CFRAMP EST UN PROGRAMME EN COOPÉRATION DES PAYS SUIVANTS: ANTIGUA ET BARBUDA, LES BARBADES, BÉLIZE, DOMINICA, GRENADE, LA GUYANE, LA JAMAÏQUE, MONTSERRAT, ST. KITTS ET NEVIS, STE. LUCIE, ST .VINCENT ET LES GRENADINES, TRINIDAD ET TOBAGO.

RÉCOMPENSE DE 50 US$ POUR LA MARQUE + LE POISSON, 20 US$ POUR LA MARQUE SEULE.
LE POISSON EST RENVOYÉ AU PÊCHEUR UNE FOIS QUE L'INFORMATION A ÉTÉ ENREGISTRÉE COMME CI-DESSOUS:

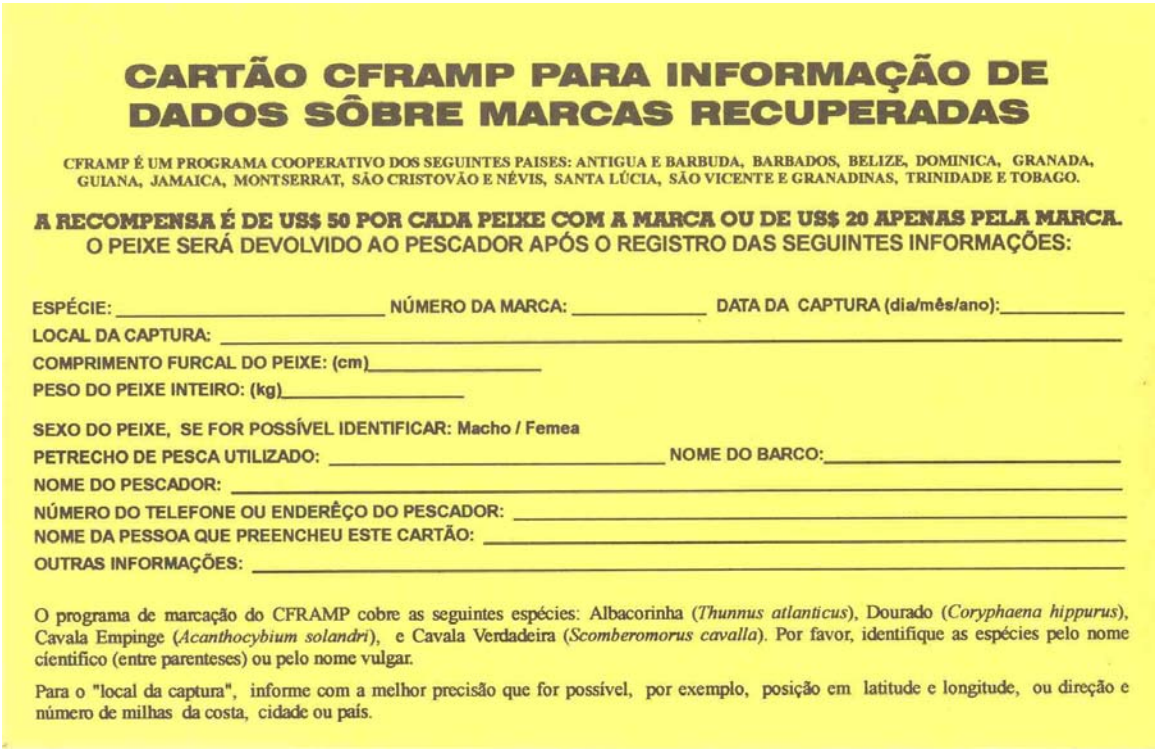
ESPÈCE: _____ NUMÉRO DE LA MARQUE: _____ DATE CAPTURE (jour / mois/ année):_____
LOCALISATION DE LA CAPTURE: _____
TAILLE POISSON (LONGUEUR FOURCHE):_____ cm
POIDS POISSON (ENTIER): _____ kg

SEXE POISSON, SI CONNU: _____ MÂLE / FEMELLE (SIGNALER LE SEXE PERTINENT)
ENGIN UTILISÉ: _____ NOM DU BATEAU: _____
NOM DU PÊCHEUR: _____
NUMÉRO TÉLÉPHONE ET ADRESSE DU PÊCHEUR:
_____
NOM DE LA PERSONNE QUI A REMPLI LA FICHE: _____
AUTRES REMARQUES: _____

Le Programme de Marquage du CFRAMP porte sur quatre espèces: Thon noir (*Thunnus atlanticus*), Coryphène (*Coryphaena hippurus*), Thazard bâtard (*Acanthocybium solandri*) et Thazard barré (*Scomberomorous cavalla*). Veuillez identifier les espèces selon leur nom scientifique ou leur nom vernaculaire.

Fournir l'information la plus précise possible sur le lieu de recapture, c'est-à-dire latitude et longitude, ou distance en milles marins d'une côte donnée, d'un port ou d'un pays.

(c) Front view of French version of tag recapture card



CARTÃO CFRAMP PARA INFORMAÇÃO DE DADOS SÔBRE MARCAS RECUPERADAS

CFRAMP É UM PROGRAMA COOPERATIVO DOS SEGUINTES PAISES: ANTIGUA E BARBUDA, BARBADOS, BELIZE, DOMINICA, GRANADA, GUIANA, JAMAICA, MONTSERRAT, SÃO CRISTOVÃO E NÉVIS, SANTA LÚCIA, SÃO VICENTE E GRANADINAS, TRINIDADE E TOBAGO.

A RECOMPENSA É DE US$ 50 POR CADA PEIXE COM A MARCA OU DE US$ 20 APENAS PELA MARCA.
O PEIXE SERÁ DEVOLVIDO AO PESCADOR APÓS O REGISTRO DAS SEGUINTES INFORMAÇÕES:

ESPÉCIE: _____ NÚMERO DA MARCA: _____ DATA DA CAPTURA (dia/mês/ano):_____
LOCAL DA CAPTURA: _____
COMPRIMENTO FURCAL DO PEIXE: (cm)_____
PESO DO PEIXE INTEIRO: (kg)_____

SEXO DO PEIXE, SE FOR POSSÍVEL IDENTIFICAR: Macho / Femea
PETRECHO DE PESCA UTILIZADO: _____ NOME DO BARCO:_____
NOME DO PESCADOR: _____
NÚMERO DO TELEFONE OU ENDERÊÇO DO PESCADOR: _____
NOME DA PESSOA QUE PREENCHEU ESTE CARTÃO: _____
OUTRAS INFORMAÇÕES: _____

O programa de marcação do CFRAMP cobre as seguintes espécies: Albacorinha (*Thunnus atlanticus*), Dourado (*Coryphaena hippurus*), Cavala Empinge (*Acanthocybium solandri*), e Cavala Verdadeira (*Scomberomorus cavalla*). Por favor, identifique as espécies pelo nome científico (entre parenteses) ou pelo nome vulgar.

Para o "local da captura", informe com a melhor precisão que for possível, por exemplo, posição em latitude e longitude, ou direção e número de milhas da costa, cidade ou país.

(d) Front view of Portuguese version of tag recapture card

Plate 4. Fish tag recapture card, produced in the four main languages spoken in the Wider Caribbean region: (a) English; (b) Spanish; (c) French; (d) Portuguese. Only back view of English version is shown.

INSTRUCTIONS FOR HANDLING LARGE PELAGIC FISH TAG RECAPTURES

STEP 1: FILL IN THE REQUIRED INFORMATION ON A YELLOW CFRAMP TAG RECAPTURE CARD (TAG NUMBER AND LOCATION OF FISH CAPTURE VERY IMPORTANT!).

STEP 2: IF YOU HAVE ACCESS TO THE RECAPTURED FISH, MEASURE AND RECORD THE FORK LENGTH (STRAIGHT MEASURE OF DISTANCE FROM TIP OF SNOUT TO INDENTATION OR FORK IN TAIL, SEE ILLUSTRATION BELOW) AND WEIGHT OF THE FISH.

STEP 3: RETURN FISH TO FISHER.

STEP 4: **US$50.00 REWARD TO BE GIVEN TO FISHER IF**
(1) YOU HAVE SEEN AND MEASURED THE RECAPTURED FISH,
(2) OBTAINED TAG AND
(3) OBTAINED THE REQUIRED INFORMATION FOR COMPLETION OF YELLOW CFRAMP TAG RECAPTURE CARD.

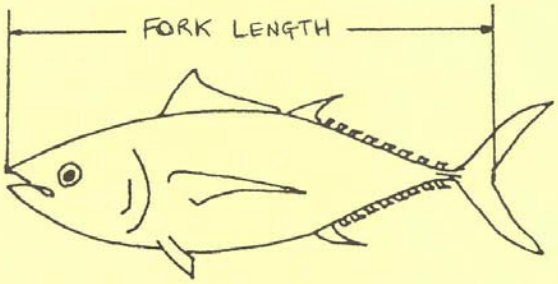
NB: US$50 reward is payable only if all 3 requirements listed above are satisfied.

US$20.00 REWARD TO BE GIVEN TO FISHER IF
(1) YOU HAVE NOT SEEN AND MEASURED THE RECAPTURED FISH, BUT HAVE OBTAINED THE TAG, AND
(2) OBTAINED THE REQUIRED INFORMATION TO COMPLETE THE YELLOW CFRAMP TAG RECAPTURE CARD.

NB: US$20 reward is payable only if the 2 requirements listed above are satisfied.

STEP 5: PREPARE AND ISSUE A RECEIPT FOR THE REWARD.

STEP 6: ASK FISHER TO RETURN WHEN SUSAN IS IN OFFICE, TO COLLECT HIS CFRAMP TAG T-SHIRT.

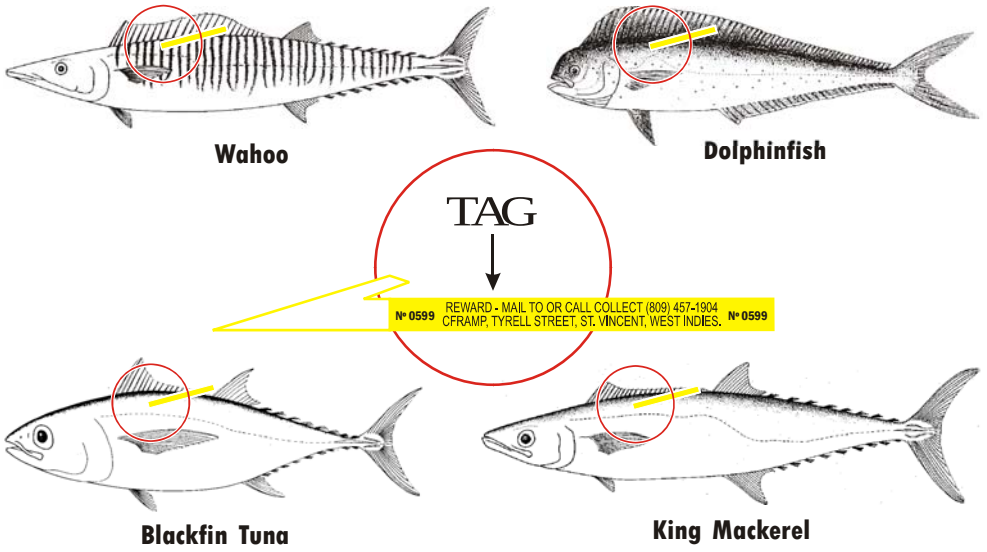


NOTE: IF IN DOUBT, MAKE SURE YOU HAVE A NAME, CONTACT NUMBER AND/OR ADDRESS FOR THE FISHER (THIS INFO SHOULD ALREADY HAVE BEEN REQUESTED FOR COMPLETING THE YELLOW CARD), OR CONTACT SUSAN.

Plate 5. Flyer, providing instructions on the handling of fish tag recaptures.

Fish Tags for CASH

US$50 FOR TAG & FISH
or
US$20 FOR TAG ONLY
plus other prizes



To find out more about the movements of wahoo, dolphinfish, blackfin tuna and king mackerel in the Caribbean region, biologists of the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP), and biologists of various national Fisheries Divisions and Departments, are tagging and releasing these fish in Caribbean waters.

CAUGHT A TAGGED FISH ?

Please note the tag number, date of the catch, the area where the fish was caught, size of fish (length and weight), and then do one of the following:

- *Contact your Fisheries Division or Department, during working hours.*
- *Call us collect at CFRAMP St. Vincent (809) 457-1904, or Trinidad (809) 634-4528 during working hours.*
- *Mail the tag (you keep the fish) and required information to:*

  LARGE PELAGIC TAGGING PROGRAM
  CARICOM Fisheries (CFRAMP),
  Tyrell Street, St. Vincent and the Grenadines, West Indies.

Cash in your tag today !!

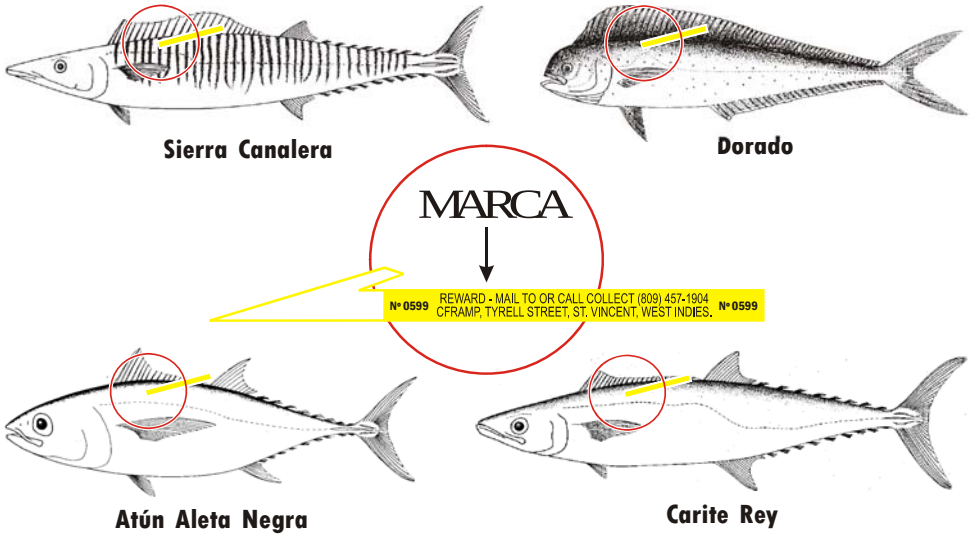
(a) English version

Peces Marcados para

50 $US POR LA MARCA Y EL PEZ
o
20 $US POR SOLO LA MARCA

PAGO

y otros premios



Para conocer más a cerca de los movimientos de la sierra canalera, el dorado, el atún aleta negra e el carite rey en la región del Caribe, biólogos del Programa Evaluación y Manejo de Recursos Pesqueros de CARICOM y biólogos de varias Divisiones y Departamentos de Pesquerías nacionales están marcando y liberando estos peces en aguas del Caribe.

¿ USTED HA CAPTURADO UN PEZ MARCADO ?

Por favor, anote el número de la marca, la fecha de captura, el área donde el pez fue capturado, el tamaño del pez (longitud y peso) y luego haga lo siguiente:

- *Contacte la División o Departamento de Pesquería durante las horas de trabajo.*
- *Llámenos para cobro a destino a CFRAMP, San Vicente (809) 4571904, o Trinidad (809) 6344528 durante las horas de trabajo.*
- *Envie la marca (guarda el pez) e información requereda a:*

  LARGE PELAGIC TAGGING PROGRAM
  CARICOM Fisheries (CFRAMP),
  Tyrell Street, San Vicente y las Granadines, Las Antillas.

¡¡ Entréguenos la marca hoy mismo !!

(b) Spanish version

Retournez des marques de poissons contre

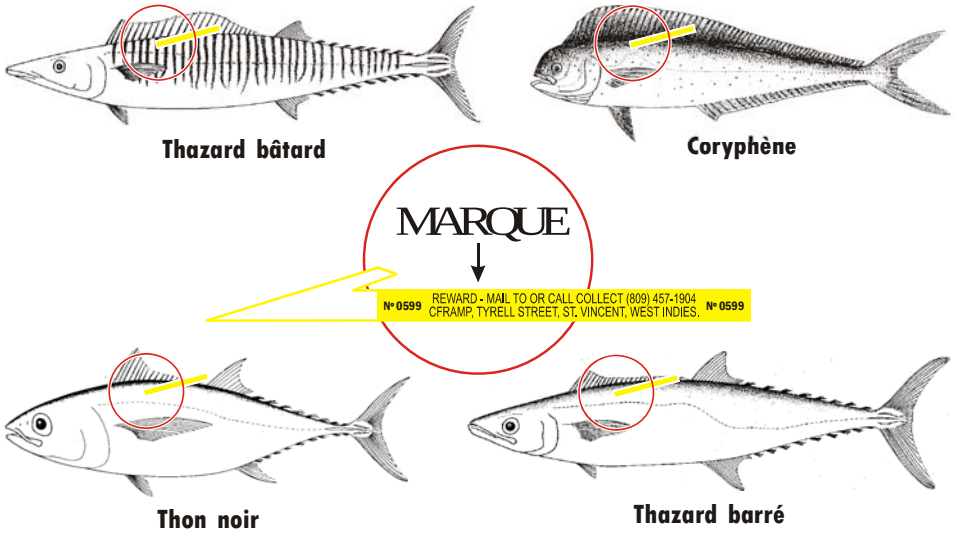
50 US$ POUR LA MARQUE ET LE POISSON

ou

20 US$ POUR LA MARQUE SEULE

RÉCOMPENSE

et autres prix



Pour en savoir plus sur les déplacement des thazards bâtards, des coryphènes, des thons noirs, et des thazards barrés dans la région des Caraïbes, des biologistes du CFRAMP de la CARICOM et de divers Centres et Instituts nationaux des Pêches, marquent et remettent à l'eau ces poissons dans les eaux des Caraïbes.

AVEZ-VOUS PRIS UN POISSON MARQUÉ ?

Veuillez noter le numéro de la marque, la date et la zone de capture, la taille du poisson (longueur et poids), puis procéder comme suit:

- *Contacter votre Administration des Pêches pendant l'horaire ouvrable.*
- *Contacter le CFRAMP à St. Vincent (809) 457.19.04, ou à Trinidad (809) 634.45.28 pendant l'horaire ouvrable.*
- *Expédier la marque (vous gardez le poisson) avec l'information à:*

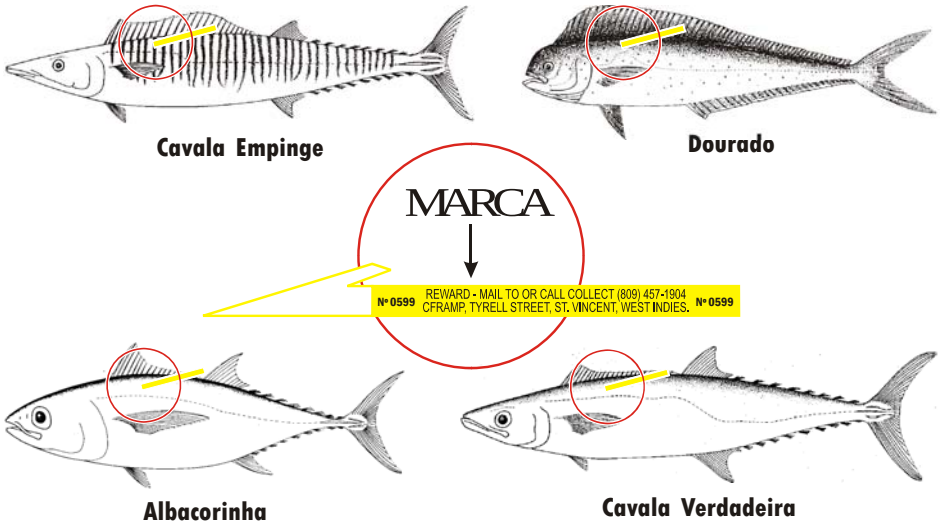
  LARGE PELAGIC TAGGING PROGRAM
  CARICOM Fisheries (CFRAMP),
  Tyrell Street, St. Vincent et les Grenadines, Indes Occidentales.

Echangez votre marque contre de l'argent liquide !!

(c) French version

Peixes Marcados valem DINHEIRO

US$50 POR CADA PEIXE COM MARCA
ou
US$20 SO PELA MARCA
além de outros prêmios



Para conhecer melhor os movimentos migratórios do cavala empinge, dourado, albacorinha e cavala verdadeira no mar do Caribe, biologistas do Programa de Avaliação e Ordenamento de Recursos Pesqueiros do CARICOM, hem como de vários Departamentos e Divisões dos Serviços nacionais de Pesca, dos paises membros do CARICOM, estão realizando a marcação e liberação de individuos destas espécies em aguas do mar do Caribe.

CAPTUROU UM PEIXE MARCADO ?

Por favor anote o número da marca, a data de captura, o local ou área aonde o peixe foi capturado e o tamanho do peixe (comprimento e peso), em seguida:

- *Procure o setor de pesca do escritório do IBAMA mais próximo, ou.*
- *Ligue a cobrar para o escritório do CFRAMP, em São Vicente (809) 4571904, ou em Trinidade (809) 6344528 no horário comercial.*
- *Envie pelo correio, para o endereço abaixo, a marca e as informações solicitades:*

  LARGE PELAGIC TAGGING PROGRAM
  CARICOM Fisheries (CFRAMP),
  Tyrell Street, São Vicente e Granadinas, Ilhas Ocidentais.

Troque sua marca por dinheiro !!

(d) Portuguese version

Plate 6. Posters produced in the four main languages to advertise the Tagging Programme: (a) English; (b) Spanish; (c) French; (d) Portuguese.

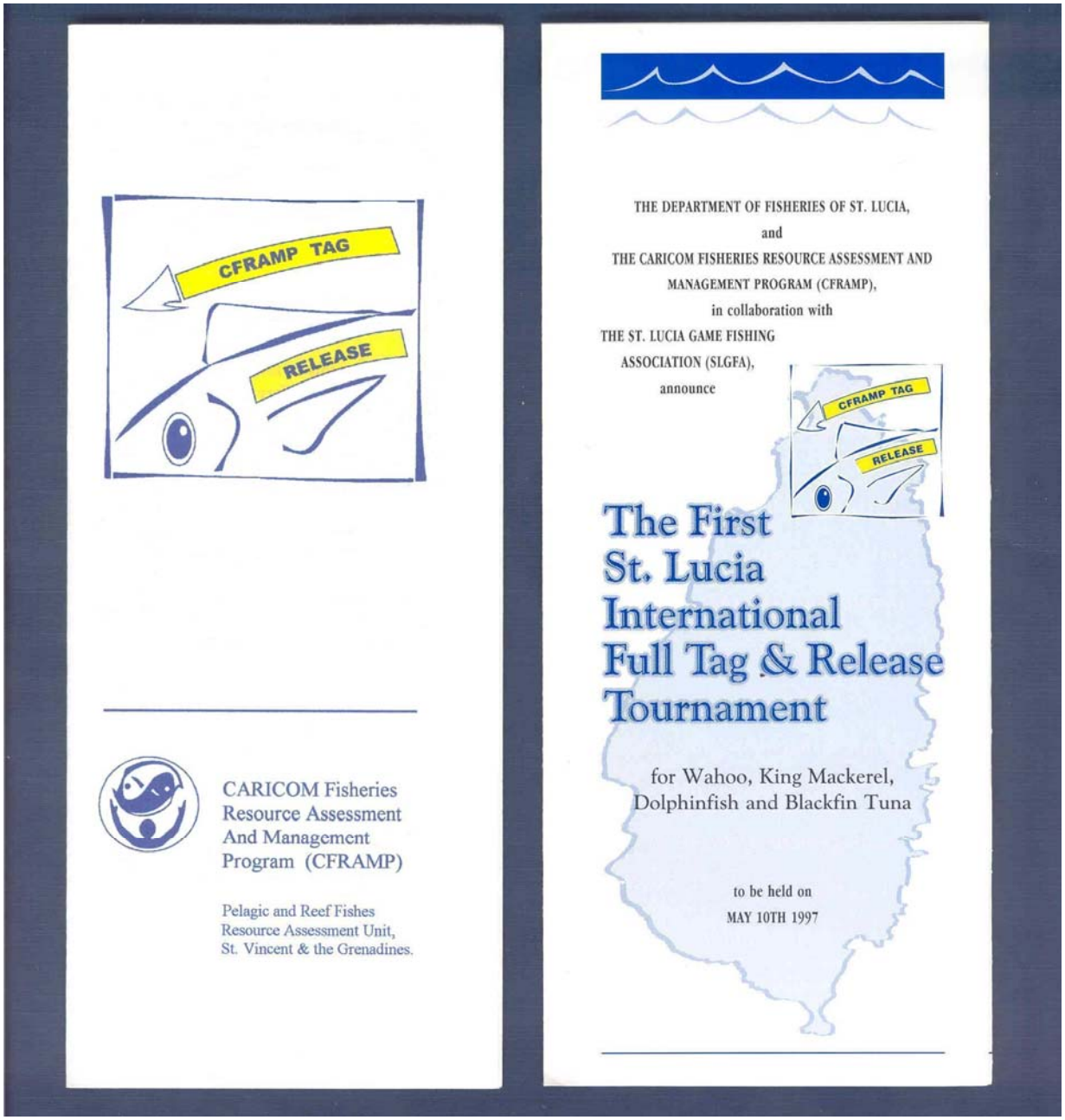


Plate 7. Front pages of the brochures providing (i) general information about the Tagging Programme (cover page shown on left), and (ii) information about the full tag and release fishing tournament held in St. Lucia on 10 May 1997 (cover page shown on right).

(a)

(b)

Plate 8. Design of t-shirt used to advertise CFRAMP's Large Pelagic Fish Tagging Programme: (a) t-shirt front design, and (b) t-shirt back design.

A QUESTIONNAIRE STUDY PROVIDING AN OVERVIEW OF FISHERIES MANAGEMENT PRIORITIES AND THE EXISTING SUPPORTING TECHNICAL FRAMEWORK WITHIN 13 CRFM COUNTRIES

Maren Headley[1] and Susan Singh-Renton[2]

[1]Research Graduate, CRFM Secretariat, 3rd Floor Corea's Building, Halifax Street, Kingstown, St. Vincent and the Grenadines. Email: marenheadley@vincysurf.com
[2]Programme Manager, Research and Resource and Assessment, CRFM Secretariat, 3rd Floor Corea's Building, Halifax Street, Kingstown, St. Vincent and the Grenadines.
Email: ssinghrenton@vincysurf.com

Abstract

The Ad Hoc Working Group on Methods is expected to develop recommendations for application of fisheries analysis and assessment methods suitable to the CRFM region. In working towards this goal, some specific information and advice in respect of available technical skills and resources were sought from fishery managers within CRFM Member Countries by means of a questionnaire survey conducted by the CRFM Secretariat during the period January 2005 to May 2006. During this period, completed questionnaires were submitted to the Secretariat by: Anguilla, Belize, British Virgin Islands, Dominica, Grenada, Guyana, Jamaica, Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and the Turks and Caicos Islands. The most commonly identified fisheries management objectives were to maintain the fisheries at sustainable levels; protect juvenile stocks and maximize employment opportunities, while the most frequently identified management measures were: size limits for the fin fish resources, and; size limits and maturity limits for the conch, lobster and shrimp resources. Catch/ landings and effort data were the type of data collected most frequently to monitor achievement of the management objectives set by the countries. However, in most cases, countries' management objectives gave only general aims, and not surprisingly, this is reflected in the nature and development of the associated data collection programs.

KEYWORDS: Caribbean fisheries management, management objectives, data

INTRODUCTION

The CRFM Ad Hoc Working Group on Methods has been established to investigate and develop methods of fishery data analysis and assessment that are suited to the types of data and information systems that are utilized by CRFM Member Countries, and also which are able to address the particular management needs identified by fishery managers in the region (CRFM, 2006). Furthermore, the Working Group is expected to develop recommendations for application of data analysis and assessment methods, particularly during CRFM scientific meetings. In working towards this goal, some specific information and advice in respect of available technical skills and resources for fishery management were sought from fishery managers within CRFM countries by means of a questionnaire survey (Appendix 1).

This paper summarizes the information that was gathered by the CRFM Secretariat during the survey and also provides a compilation of the questionnaires completed by countries that participated in the survey (Appendix 2).

METHOD

The questionnaire content and format, shown in Appendix 1, were prepared by the Secretariat and distributed in January 2005 to all CRFM Member States. Chief Fisheries Officers, Directors of Fisheries, or persons holding a related position and responsibility at the national level were the target correspondents. Completed questionnaires were submitted to the Secretariat between January 2005 and May 2006.

RESULTS

Completed questionnaires were submitted to the Secretariat by the following 13 countries: Anguilla, Belize, British Virgin Islands, Dominica, Grenada, Guyana, Jamaica, Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and the Turks and Caicos Islands. A compilation of the 13 questionnaires received is given in Appendix 2.

Establishment of Management Objectives and Monitoring the Achievements of Management Objectives

At the time of the survey, the most common source of information used for establishing management objectives was reported to be stakeholder interview survey data, whereas the least common source of information was the social and economic component of fisheries (Table 1). Only the British Virgin Islands, Jamaica and St. Lucia reported active monitoring/measuring of the achievement of their management objectives (Table 1). Countries identified a number of factors, which contributed to the lack of such monitoring (Table 2). Of these, the three most common contributing factors identified were:

i) Insufficient skills and experience to analyse available data and prepare management advice (62%);
ii) Insufficient data collected for monitoring and evaluation (46 %);
iii) Insufficient time to analyse available data and prepare management advice (46%).

Management Objectives by Resource Groups

All the countries except Grenada provided management objectives for their fisheries resources.

Reef and Slope Fish Resources

At the time of the survey, the most frequently identified management objectives for the reef fish fisheries were to: maximize employment opportunities, protect juvenile stocks, maintain the fishery at

sustainable levels and facilitate habitat recovery and conservation (Table 3). Additionally, St. Vincent and the Grenadines identified reducing fishing effort on the inshore reef resources as an objective, while the Turks and Caicos Islands identified the determination of biological parameters and the assessment of stock status as a management objective (Table 3). Nevis and the Turks and Caicos Islands were the only countries, which provided management objectives for the deep slope fisheries. Maximization of catches within the potential yield for the deep slope fisheries was identified as an objective by Nevis, while the determination of biological parameters and the assessment of stock status were identified as objectives by the Turks and Caicos Islands.

Conch and Lobster Resources

The most common management objectives for the conch fisheries were to maximize employment opportunities, protect juvenile stocks, maintain the fishery at sustainable levels and facilitate habitat recovery and conservation (Table 4). Jamaica was the only country that identified compliance with international obligations (CITES) as a management objective for the conch fishery. For the lobster fisheries, the most common management objective noted was the protection of juvenile lobsters (Table 5). Additionally, the BVI listed the involvement of all stakeholders in fishery management processes as a management objective for its lobster fishery.

Shrimp and Groundfish Resources

In the case of the shrimp fisheries; maximization of employment opportunities, protection of juvenile stocks and fishery development were the most frequently identified objectives (Table 6). Additionally, Belize identified the maximization of biological yield as a management objective for its shrimp fishery (Table 6).

For the groundfish fisheries, maximization of biological yield and fishery expansion utilizing the precautionary approach were the two objectives frequently listed (Table 7). In addition, Belize listed the objective of protection of juvenile stocks. Suriname listed the aim of maintenance of the fishery at a sustainable level, and Jamaica identified rehabilitation of the fishery as one of its objectives.

Small Coastal Pelagic Resources

For small coastal pelagic fisheries, maximization of biological yield and the protection of juvenile stocks were the most common management objectives (Table 8). Trinidad and Tobago also listed maintenance of the fishery at sustainable levels as an objective. The Turks and Caicos Islands was the only country that identified the determination of biological parameters and the assessment of stock status as an objective.

Large Coastal Pelagic Resources

In the case of large pelagic fisheries, the protection of juveniles stocks, the promotion of sustainable fishery development and compliance with international conventions were the most frequently identified management objectives (Table 9). The maximization of employment opportunities was listed only by Anguilla, while the maximization of biological yield was identified only by the British Virgin Islands (Table 9). Jamaica was the only country which identified maintenance of the fishery at sustainable levels as a management objective for these fisheries, while the Turks and Caicos Islands was the only country which listed, as a management objective, the determination of biological parameters and stock status assessment.

The Use of Management Measures

Management measures are regulations, established to control fishing activities in order to achieve the management objectives.

Reef and Slope Fish Resources

All the countries, except Grenada and Guyana, indicated the use of management measures for reef and slope fish resources. At the time of the survey, the most commonly utilized measure was the restriction of gears. All the countries, except Belize, Suriname and the Turks and Caicos Islands, listed the use of this measure (Table 10). The British Virgin Islands was the only country that indicated the use of closed seasons as a management measure for its reef and slope fishery.

Conch and Lobster Resources

Size limits, maturity limits, closed seasons and effort control were the most frequently reported management measures for the conch fisheries (Table 11). In addition, Dominica, Jamaica and Belize listed the use of the following management measures for their conch fisheries: gear restrictions, protected areas and co-management. In the case of lobster fisheries, the most common measures were size limits, maturity limits and gear restrictions. The use of effort control as a management measure for the lobster resource was indicated only by St. Lucia (Table 12).

Shrimp and Groundfish Resources

Only Suriname and Trinidad and Tobago reported the use of management measures for their shrimp fisheries; both countries identified gear restrictions, effort control and fleet restriction zones (Table 13). Jamaica, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago were the only countries that indicated the use of management measures for the groundfish resources; they all noted the use of gear restrictions (Table 14). In addition, Jamaica indicated the use of size limits for the groundfish resource. Suriname and Trinidad and Tobago also reported use of fleet zone restrictions for their groundfish fisheries.

Small Coastal Pelagic Fish Resources

Gear restrictions and size limits were the only measures indicated for managing small coastal pelagic fisheries (Table 15). In particular, Dominica, Jamaica, Nevis, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago confirmed the use of gear restrictions. Dominica and Jamaica indicated the use of size limits along with gear restrictions (Table 15).

Large Pelagic Fish Resources

The only countries that indicated the use of management measures for the large pelagic fisheries were: British Virgin Islands, Jamaica, St. Lucia and the Turks and Caicos Islands. Both the British Virgin Islands and St. Lucia reported utilization of effort controls in their large pelagic fisheries, while Jamaica confirmed use of size limits (Table 16). The Turks and Caicos Islands indicated the use of a range of the management measures, consistent with the obligations of this country's adherence to the ICCAT Convention (Table 16).

Data Collected to Measure the Achievement of Management Objectives

Reef and Slope Fish Resources

Anguilla, British Virgin Islands, Dominica, Jamaica, Nevis, St. Lucia, Suriname, Trinidad and Tobago and the Turks and Caicos Islands reported the collection of catch and effort data for the reef fish fishery. Dominica and Suriname both had the highest sampling coverage percentage (80%) for the catch and effort data category, while Jamaica had the lowest (13%) (Figure 1). The collection of biological data for the reef fish fishery was reported by Jamaica, Trinidad and Tobago and the Turks and Caicos Islands and the sampling coverage percentages were 13%, 20% and 20% respectively (Figure 1). Jamaica, Trinidad and Tobago and the Turks and Caicos Islands reported on the collection of social and economic data for the reef fish fishery, and the sampling coverage percentages were 100%, 30% and 20% respectively (Figure 1).

Nevis and the Turks and Caicos Islands were the only countries that reported on data collection for the deep slope resource category. Both countries confirmed the collection of catch and effort data for the deep slope resources and the sampling coverage percentages were: Nevis (20%) and the Turks and Caicos Islands (10%) (Figure 2). Nevis indicated the collection of social and economic data for the deep slope fishery with a sampling coverage percentage of 20% while the Turks and Caicos Islands indicated the collection of biological data with a sampling coverage percentage of 20% (Figure 2).

Conch and Lobster Resources

Anguilla, Belize, British Virgin Islands and St. Lucia reported on the collection of catch and effort data for their conch fisheries (Figure 3). Out of these four countries, Jamaica had the highest sampling coverage percentage (100%) for catch and effort data while Nevis had the lowest sampling coverage (15%) (Figure 3). Jamaica, Nevis and the Turks and Caicos Islands reported on the collection of biological data for the conch fisheries. In this case, Jamaica had the highest sampling coverage (100%), followed by the Turks and Caicos Islands (35%) and then Nevis (15%). The Turks and Caicos Islands was the only country that reported on the collection of social and economic data for the conch fishery, with a sampling coverage of 85% (Figure 3).

Eight countries reported on their catch and effort data collection programs for the lobster fishery: Anguilla, Belize, British Virgin Islands, Dominica, Jamaica, Nevis, St. Lucia and the Turks and Caicos Islands. For the catch and effort data collection, Nevis had the highest sampling coverage (60%), while Jamaica had the lowest (13%) (Figure 4). Additionally, British Virgin Islands, Jamaica, Nevis and the Turks and Caicos Islands, confirmed the collection of biological data on lobster. For the biological data collection, Nevis also had the highest sampling coverage (60%), while again, Jamaica had the lowest (13%) (Figure 4). The collection of social and economic data for the lobster fishery was reported only by the Turks and Caicos Islands, and the sampling coverage was (10%) (Figure 4).

Shrimp and Groundfish Resources

Catch and effort data collection for the shrimp fishery was reported by Belize, Guyana, Jamaica, Suriname and Trinidad and Tobago. Suriname had the highest sampling coverage percentage (90%) for the catch and effort data category while Belize had the lowest (20%) (Figure 5). Only Belize, Jamaica and Trinidad and Tobago reported on the collection of biological data for the shrimp fishery. Jamaica and Guyana had the same sampling coverage percentage (50%) for the biological data category while it was 20% for Belize (Figure 5). The collection of social and economic data for the shrimp fishery was reported by Guyana and Jamaica; the sampling coverage percentages were 30% and 40 % respectively (Figure 5).

Guyana, Jamaica, Suriname and Trinidad and Tobago reported on the collection of catch and effort data for the groundfish fishery. Guyana and Suriname both had the highest sampling coverage percentage (80%) for the catch and effort data category while Jamaica had the lowest (13%). The collection of biological data for the groundfish fishery was indicated by Guyana, Jamaica and Trinidad and Tobago and the sampling coverage percentages were 60%, 13% and 50% respectively (Figure 6). Jamaica was the only country that reported the collection of social and economic data for the groundfish fishery, with a sampling coverage of 13% (Figure 6).

Small Coastal Pelagic Resources

Dominica, Jamaica, Nevis, St. Lucia, Trinidad and Tobago and the Turks and Islands reported on the collection of catch and effort data for their small coastal pelagic fisheries. Dominica had the highest sampling coverage for the catch and effort data category (80%), while the Turks and Caicos Islands had the lowest (5%) (Figure 7).

Jamaica was the only country that reported on the collection of biological data for the small coastal pelagic fishery, and the sampling coverage was 7%. The collection of social and economic data for the small coastal pelagic fisheries was indicated by Trinidad and Tobago and the Turks and Islands; the sampling coverage percentages were 30% and 5% respectively (Figure 7).

Large Pelagic Resources

Anguilla, British Virgin Islands, Guyana, Jamaica, Nevis, St. Lucia, Trinidad and Tobago and the Turks and Caicos Islands reported on the collection of catch and effort data for their large pelagic fisheries. Trinidad and Tobago had the highest sampling coverage percentage for the catch and effort data category (100%) while Jamaica had the lowest (4%) (Figure 8).

Biological data collection for the large pelagic fishery was reported by Guyana, Jamaica, Nevis and the Turks and Caicos Islands. Guyana had the highest sampling coverage percentage (50%) for the biological data category, while Jamaica had the lowest (4%) (Figure 8). The collection of social and economic data for the large pelagic fishery was reported by Guyana, Nevis and the Turks and Caicos Islands; the sampling coverage percentages were 40%, 20% and 50% respectively (Figure 8).

Data Analysis Tools and Work Time Allocation for Data Analysis

Of 13 countries that participated in the survey, 10 countries indicated the use of Excel as an analysis tool (Figure 9). The use of analysis and reporting tools such as TIP, FISAT, SPSS, ASPIC was reported with less frequency (Figure 9). Twelve countries provided information on the percentage of work time allocated for fishery data analysis and review: of these, 1 country reported a time allocation of 20-30 %; 3 countries reported a time allocation of 15-20%; 6 countries reported a time allocation of 10-15%, and; 2 countries reported a time allocation of < 5% (Figure 10).

Qualifications of Fisheries Officers

All of the countries that participated in the survey, except Dominica, Grenada and St. Lucia, provided information about the qualifications of their officers. Officer qualifications included Bachelor of Science degrees, Master of Science degrees, Master of Philosophy and Master of Library and Information Science degrees (Table 17). The Bachelor of Science degree was the most common qualification. The short-term training in which officers were involved included: CFRAMP/FAO training programs in Assessment and Data Management; Fisheries Statistics; certificate and diploma programs in Fisheries Technology, Fisheries Resource Management, Fish Quality Management; computing, e.g. MS Excel, MS Access, and SPSS.

DISCUSSION/CONCLUSION

Not all CRFM Member States participated in the questionnaire survey. The 13 countries that participated in the survey provided responses to the majority of questions. These responses provided valuable updated information about the technical framework supporting fisheries management in CRFM countries, with emphasis on countries' management objectives, the management measures used to monitor the achievement of these objectives, the types of data collected, human resource skills, and time devoted to fisheries evaluation work.

The survey results indicated that in many cases, management objectives were noted in broad terms. While it may be argued that broad management objectives may simply be a reflection of developing fisheries administrations and the fact that CRFM countries need to maintain broad options to take advantage of fisheries development opportunities as and when they arise, there was also apparent inconsistency between the management objectives established by the countries and the management measures used to monitor the achievement of these objectives. Additionally, there was often no correlation between the types of data collected and the agreed management objectives. For example, some countries listed the maximization of employment as an objective, but the collection of social and economic data was not reported.

Considering the level of responses for different types of data collection, it is clear that most countries collect basic catch /landings data and some type of fishing effort data. Understandably, the collection of biological, social and economic data was given less importance, usually reserved for those fisheries with high commercial value. Examples of this included: the collection of biological data and

social and economic data for the reef fisheries of Jamaica; the conch fisheries of Jamaica and the Turks and Caicos Islands; the lobster fishery of the Turks and Caicos Islands, and; the shrimp fishery of Jamaica.

The present survey has provided important insight on the present fisheries management environment in CRFM countries, including existing constraints with regard to human resource skills and expertise, and availability of data and staff time.

REFERENCES

CFRM (2006) Report of the Second Annual CRFM Scientific Meeting. *CRFM Fishery Report –2006*, Volume 1. 193 pp.

Table 1: A Summary of Information Sources Used by Countries to Establish Fisheries Management Objectives.

Information Sources/ Country	**National Consultations**	**Social and Economic Data**	**Stakeholder Interview Survey Data**	**Ethno-scientific Information**	**Adopted Objectives**	**International fisheries instruments**	**Other**	**Achievement of objectives actively monitored**
Anguilla	X	-	X	X	-	-	-	No
Belize	X	X	X	X	X	X	-	No
British Virgin Islands	X	X	-	X	X	X	-	Some
Dominica	-	-	X	X	X	X	Fishermen consultations	No
Grenada	X	-	X	X	-	X	Government's policy	No
Guyana	-	-	X	-	-	-	-	No
Jamaica	X	X	X	X	-	X	-	Yes
Nevis	-	-	-	-	X	-	-	No
St. Lucia	X	X	X	X	X	X	Scientific literature, international seminars and conventions	Some
St. Vincent and the Grenadines	X	X	X	X	X	X	-	No
Suriname	X	-	X	-	-	X	-	No
Trinidad and Tobago	X	-	X	-	-	X	-	No
Turks and Caicos Islands	X	X	X	X	X	X	-	No

Table 2: Factors that negatively impact Monitoring of Achievement of Management Objectives

Factors	**Percentage of Countries (%)**
Insufficient data collected to allow evaluation	46
Insufficient time to analyse available data and hence prepare management advice	46
Insufficient skills and experience to analyse available data and hence prepare management advice	62
Inappropriate assessment tools being used by officers, since these tools do not provide answers to the management questions of direct concern	15
Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern	8
Insufficient officers and the lack of appropriate motivational structure necessary to complete the tasks	8
Lack of institutional capacity, which inhibits the ability to monitor resources in large EEZs	8
Appropriate monitoring resources (e.g. vessels, surveillance systems etc.) are expensive	8

Table 3: Management Objectives, by Country, for the Reef Fish Fisheries.

Management Objective/ Country	Maximize Employment Opportunities	Maximize Biological Yield	Protect Juvenile Stocks	Maintenance of fishery at sustainable levels	Habitat Recovery and Conservation	Rehabilitation of fisheries	Involve all stakeholders in fishery management processes	Reduce fishing effort on in shore resources	Determine biological parameters and assess stock status
Anguilla	X	-	-	-	-	-	-	-	-
Belize	X	X	X	-	-	-	-	-	-
British Virgin Islands	-	-	-	X	X	-	X	-	-
Dominica	-	X	X	-	X	-	-	-	-
Jamaica	-	-	-	-	-	X	X	-	-
Nevis	-	-	X	-	-	-	-	-	-
St. Lucia	-	-	-	X	-	X	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-	-	-	X	-
Suriname	X	-	-	X	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-	-	-
Turks and Caicos Islands	-	-	-	-	X	-	-	-	X

Table 4: Management Objectives, by Country, for the Conch Fisheries.

Management Objective/ Country	Maximize Employment Opportunities	Maximize Biological Yield	Protect Juvenile Stocks	Maintenance of fishery at sustainable levels	Habitat Recovery and Conservation	Rehabilitation of fisheries	Involve all stakeholders in fishery management processes	Reduce fishing effort on in shore resources	Determine biological parameters and assess stock status	Comply with International Obligations
Anguilla	X	-	-	-	-	-	-	-	-	-
Belize	X	X	X	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	X	X	-	X	-	-	-
Dominica	-	X	X	-	X		-	-	-	-
Jamaica	-	-	-	-	-	X	X	-	-	X
Nevis	-	-	X	-	-	-	-	-	-	-
St. Lucia	-	-	-	X	-	X	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-	-	-	X	-	-
Suriname	X	-	-	X	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-	-	-	-
Turks and Caicos Islands	-	-	-	-	X	-	-	-	X	-

Table 5: Management Objectives, by Country, for the Lobster Fisheries.

Management Objective/ Country	Maximize Employment Opportunities	Maximize Biological Yield	Protect Juvenile Stocks	Maintenance of fishery at sustainable levels	Habitat Recovery and Conservation	Rehabilitation of fisheries	Involve all stakeholders in fishery management processes	Reduce fishing effort on in shore resources	Determine biological parameters and assess stock status
Anguilla	X	-		X	-	-	-	-	-
Belize	X	X	X	-	-	-	-	-	-
British Virgin Islands	-	-	X	X	X	-	X	-	-
Dominica	-	X	-	-	-		-	-	-
Jamaica	-	-	X	-	X	-	-	-	-
Nevis	-	-	X	-	-	X	-	-	-
St. Lucia	-	-	-	X	-	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-	X	-	X	-
Suriname	-	-	-	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-	-	-
Turks and Caicos Islands	X	-	-	-	-	-	-	-	X

Table 6: Management Objectives, by Country, for the Shrimp Fisheries.

Management Objective/ Country	Maximize Employment Opportunities	Maximize Biological Yield	Protect Juvenile Stocks	Develop Fishery By Utilizing Efficient Exploitation
Anguilla	-	-	-	-
Belize	-	X	X	-
British Virgin Islands	-	-	-	-
Dominica	-	-	-	-
Guyana	X	-	-	X
Jamaica	-	-	-	X
Nevis	-	-	-	-
St. Lucia	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-
Suriname	X	-	X	-
Trinidad and Tobago	-	-	-	-
Turks and Caicos Islands	-	-	-	-

Table 7: Management Objectives, by Country, for the Groundfish Fisheries.

Management Objective/ Country	Maximize Biological Yield	Protect Juvenile Stocks	Maintenance of fishery at sustainable levels	Rehabilitate Fishery	Expand fishery Using Precautionary Approach
Anguilla	-		-	-	-
Belize	X	X	-	-	-
British Virgin Islands	-	-	-	-	-
Dominica	-	-	-	-	-
Guyana	-	-	-	-	X
Jamaica	-	-	-	X	X
Nevis	-	-	-	-	-
St. Lucia	-	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-
Suriname	-	-	X	-	-
Trinidad and Tobago	X	-	-	-	-
Turks and Caicos Islands	-	-	-	-	-

Table 8: Management Objectives, by Country, for the Small Coastal Pelagic Fisheries.

Management Objective/ Country	Maximize Employment Opportunities	Maximize Biological Yield	Protect Juvenile Stocks	Maintenance of fishery at sustainable levels	Habitat Recovery and Conservation	Determine Biological Parameters and Assess Stock Status
Anguilla	-	-	-	-	-	-
Belize	X	X	X	-	-	-
British Virgin Islands	-	X	-	-	-	-
Dominica	X	-	X	-	X	-
Guyana	-	-	-	-	-	-
Jamaica	-	X	-	-	-	-
Nevis	-	-	-	-	X	-
St. Lucia	-	-	X	-	-	-
St. Vincent and the Grenadines	-	-	X	-	X	-
Suriname	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	X	-	-
Turks and Caicos Islands	-	X	-	-	-	X

Table 9: Management Objectives, by Country, for the Large Pelagic Fisheries.

Management Objective/ Country	Maximize Employment Opportunities	Maximize Biological Yield	Protect Juvenile Stocks	Maintenance of fishery at sustainable levels	Promote Sustainable development of fisheries	Determine biological parameters and assess stock status	Comply with International Obligations
Anguilla	X	-	X	-	-	-	-
Belize	-	-	-	-	-	-	-
British Virgin Islands	-	X	-	-	-	-	-
Dominica	-	-	-	-	-	-	-
Guyana	-	-	-	-	-	-	X
Jamaica	-	-	-	X	-	-	-
Nevis	-	-	X	-	X	-	-
St. Lucia	-	-	X	-	X	-	X
St. Vincent and the Grenadines	-	-	-	-	X	-	-
Suriname	-	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	X
Turks and Caicos Islands	-		-	-	-	X	-

Table 10: Management Measures, by Country, for the Reef and Slope Fish Fisheries.

Management Measure/ Country	Gear Restrictions	Size Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Integrated Management
Anguilla	X	-	-	-	-	-	-
Belize	-	-	-	X	-	X	
British Virgin Islands	X	X	X	-	X	X	X
Dominica	X	-	-	-	X	-	-
Jamaica	X	X	-	-	-	-	-
Nevis	X	X	-	-	-	-	-
St. Lucia	X	-	-	X	X	X	-
St. Vincent and the Grenadines	X	-	-	X	-	-	-
Suriname	-	-	-	-	X	-	-
Trinidad and Tobago	X	-	-	-	X	-	X
Turks and Caicos Islands	-	-	-	-	-	-	-

Table 11: Management Measures, by Country, for the Conch Fisheries.

Management Measure/ Country	Gear Restrictions	Size and Maturity Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Integrated Management
Anguilla	-	X	-	-	-	-	-
Belize	-	X	X	-	-	-	-
British Virgin Islands	-	-	X	-	X	X	-
Dominica	X	X	X	-	-	-	-
Jamaica	-	X	X	X	X	-	-
Nevis	-	X	-	-	-	-	-
St. Lucia	-	X	-	-	X	-	-
St. Vincent and the Grenadines	-	X	-	-	-	-	-
Suriname	-	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-
Turks and Caicos Islands	-	X	-	-	X	-	-

Table 12: Management Measures, by Country, for the Lobster Fisheries.

Management Measure/ Country	Gear Restrictions	Size and Maturity Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Integrated Management
Anguilla	X	X	-	-	-	-	-
Belize	-	X	X	-	-	-	-
British Virgin Islands	X	X	-	X	-	-	-
Dominica	X	X	X	-	-	-	-
Jamaica	-	X	X	-	-	-	-
Nevis	-	X	-	-	-	-	-
St. Lucia	X	X	-	-	X	-	-
St. Vincent and the Grenadines	X	X	-	X	-	-	-
Suriname	-	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-
Turks and Caicos Islands	X	X	-	-	-	-	-

Table 13: Management Measures, by Country, for the Shrimp Fisheries.

Management Measure/ Country	Gear Restrictions	Size and Maturity Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Fleet Restriction Zones
Anguilla	-	-	-	-	-	-	-
Belize	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-
Dominica	-	-	-	-	-	-	-
Jamaica	-	-	-	-	-	-	-
Nevis	-	-	-	-	-	-	-
St. Lucia	-	-	-	-	-	-	-
St. Vincent and the Grenadines	-	-	-	-	-	-	-
Suriname	X	-	-	-	X	-	X
Trinidad and Tobago	X	-	-	-	X	-	X
Turks and Caicos Islands	-	-	-	-	-	-	-

Table 14: Management Measures, by Country, for the Groundfish Fisheries.

Management Measure/ Country	Gear Restrictions	Size Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Fleet Restriction Zones
Anguilla	-	-	-	-	-	-	-
Belize							
British Virgin Islands	-	-	-	-	-	-	-
Dominica	-	-	-	-	-	-	-
Jamaica	X	X	-	-	-	-	-
Nevis	-	-	-	-	-	-	-
St. Lucia	-	-	-	-	-	-	-
St. Vincent and the Grenadines	X	-	-	-	-	-	-
Suriname	X	-	-	-	X	-	X
Trinidad and Tobago	X	-	-	-	X	-	X
Turks and Caicos Islands	-	-	-	-	-	-	-

Table 15: Management Measures, by Country, for the Small Coastal Pelagic Fisheries.

Management Measure/ Country	Gear Restrictions	Size Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Integrated Management
Anguilla	-	-	-	-	-	-	-
Belize	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-
Dominica	X	X	-	-	-	-	-
Jamaica	X	X	-	-	-	-	-
Nevis	X	-	-	-	-	-	-
St. Lucia	X	-	-	-	-	-	-
St. Vincent and the Grenadines	X	-	-	-	-	-	-
Suriname	-	-	-	-	-	-	-
Trinidad and Tobago	X	-	-	-	-	-	-
Turks and Caicos Islands	-	-	-	-	-	-	-

Table 16: Management Measures, by Country, for Large Pelagic Fisheries.

Management Measure/ Country	Gear Restrictions	Size Limits	Closed Seasons	Protected Areas	Effort Control	Co-management	Integrated Management
Anguilla	-	-	-	-	-	-	-
Belize	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	X	-	-
Dominica	-	-	-	-	-	-	-
Jamaica	-	X	-	-	-	-	-
Nevis	-	-	-	-	-	-	-
St. Lucia	-	-	-	-	X	-	-
St. Vincent and the Grenadines	-	-	-	-	-	-	-
Suriname	-	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-
Turks and Caicos Islands*	X	X	X	X	X	X	X

Table 17: A Summary of the Qualifications of Staff Conducting Fisheries Assessments, by Country.

Long- term training				Short-term training		
Country/ Qualifications	BSc	MSc	MPhil	MLIS	CFRAMP/FAO training	Certificates and Diplomas
Anguilla	X	X	-	-	-	-
Belize	X	X				
British Virgin Islands	X	-	X	X	X	-
Dominica	-	-	-	-	-	-
Grenada	-	-	-	-	-	-
Guyana	X	-	-	-	-	-
Jamaica	X	X	X	-	-	-
Nevis	X	X	-	-	-	X
St. Lucia	-	-	-	-	-	-
St. Vincent and the Grenadines	X	X	-	-	X	X
Suriname	X	-	-	-	X	X
Trinidad and Tobago	X	X	X	X	X	-
Turks and Caicos Islands	X	X	X	-	-	-

* Follows ICCAT Convention

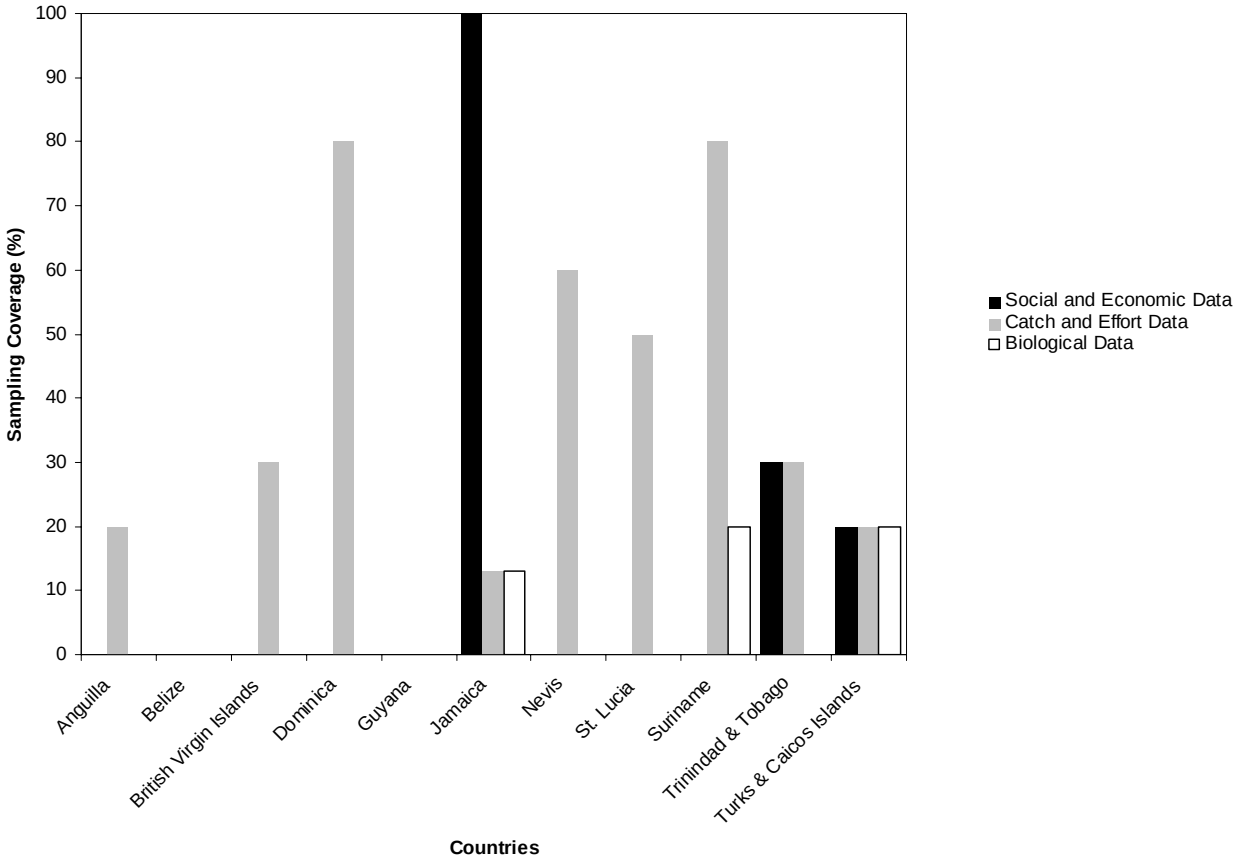


Figure 1: % Sampling Coverage, by country and type of data, for the Reef Fish Fisheries.

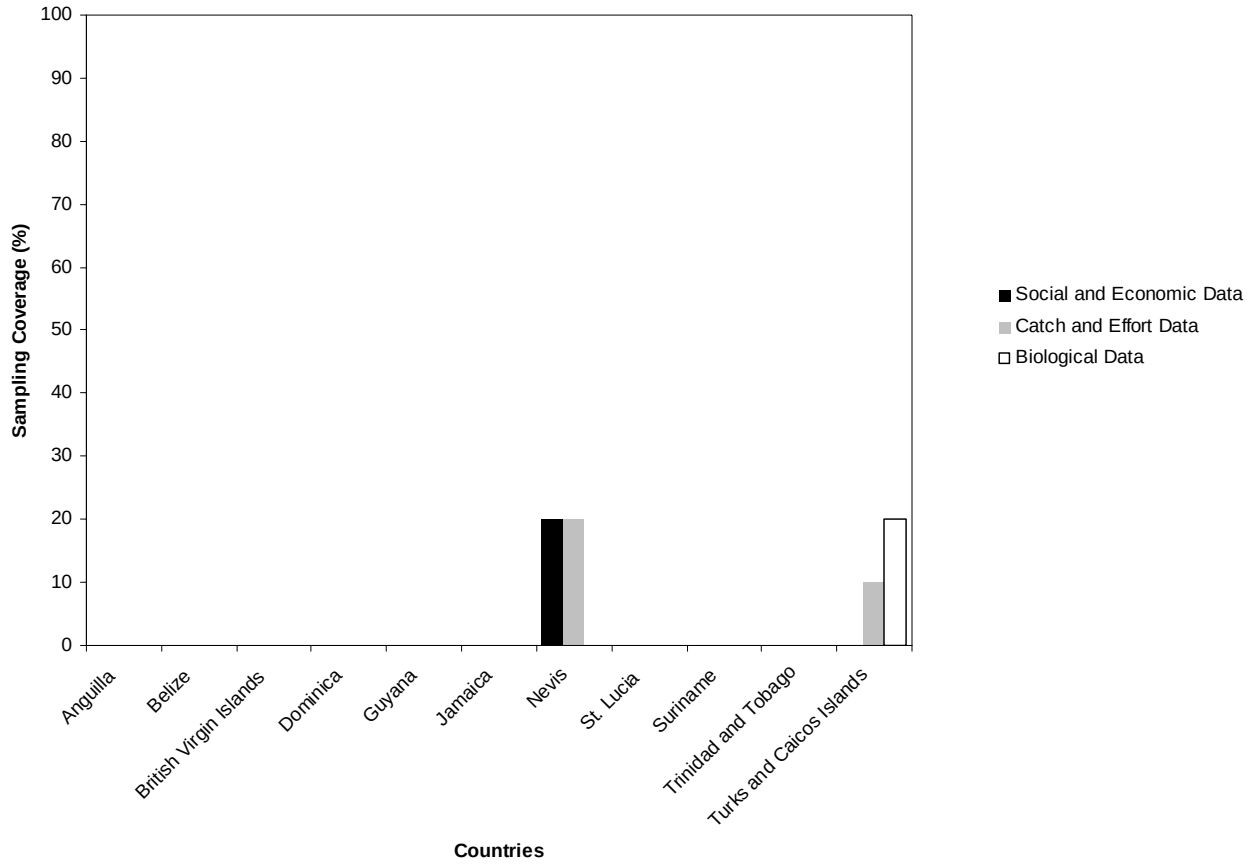


Figure 2 : % Sampling Coverage, by country and type of data, for the Deep Slope Fish Fisheries.

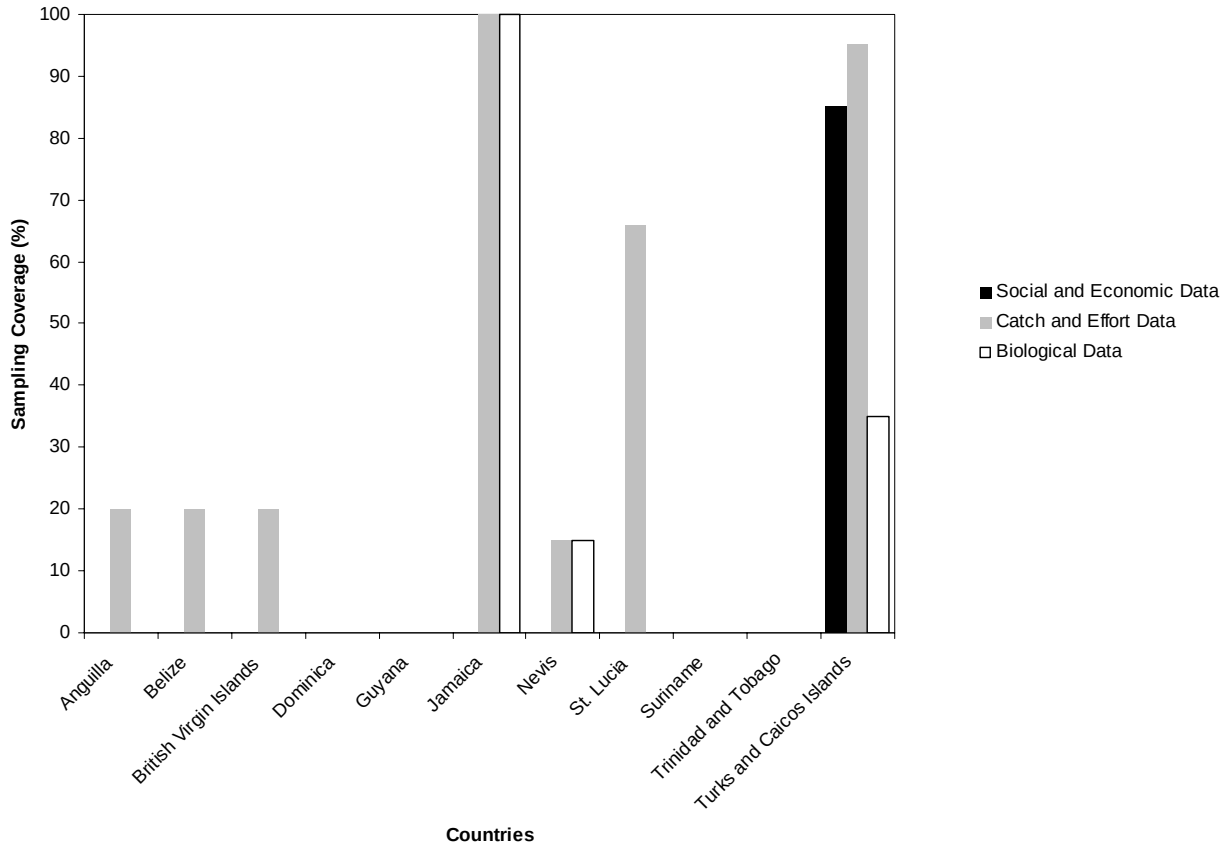


Figure 3 : % Sampling Coverage, by country and type of data, for the Conch Fisheries.

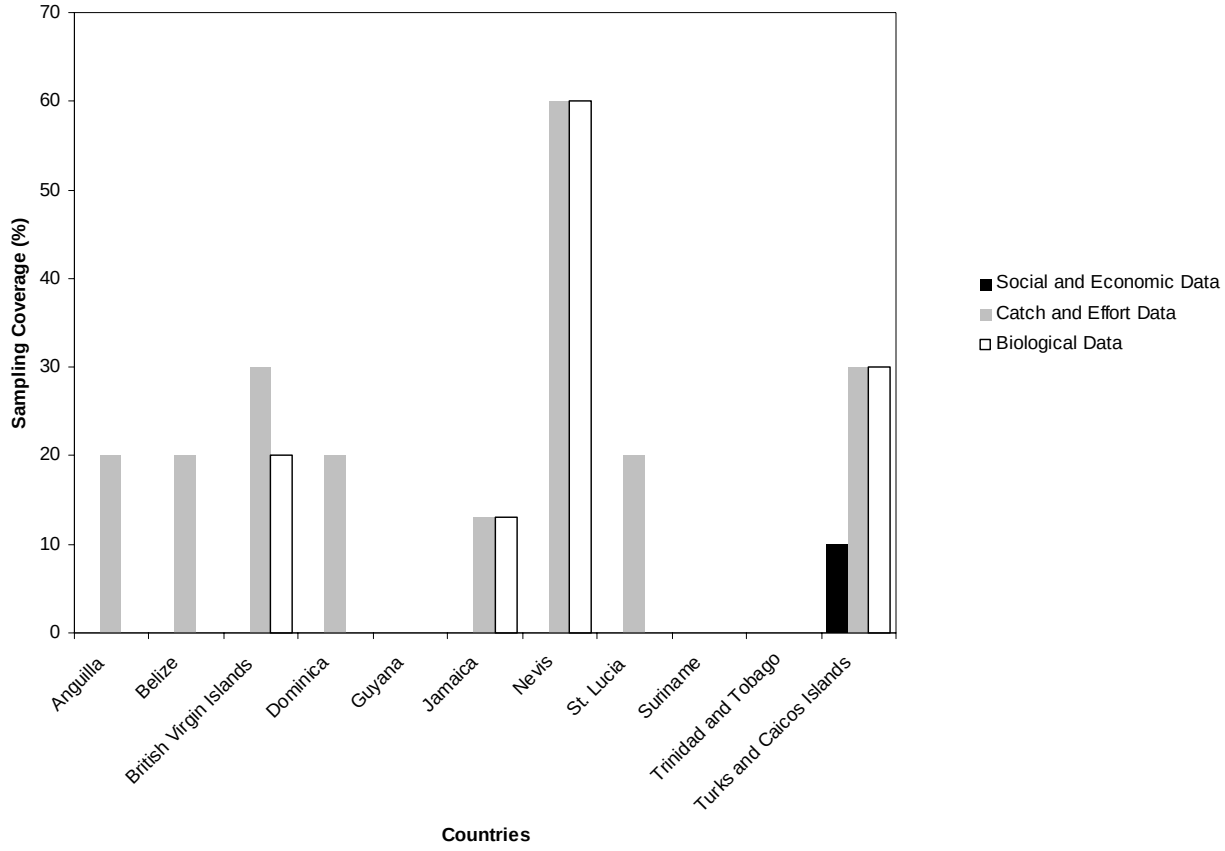


Figure 4 : % Sampling Coverage, by country and type of data, for the Lobster Fisheries.

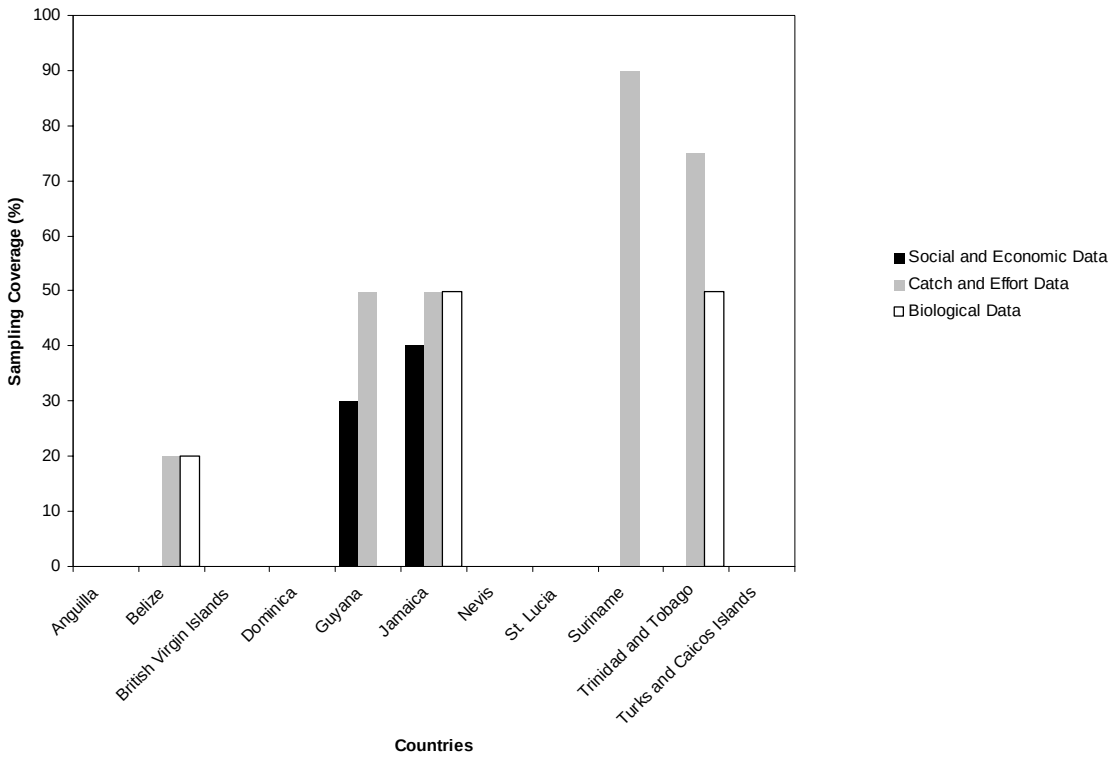


Figure 5 : % Sampling Coverage, by country and type of data, for the Shrimp Fisheries.

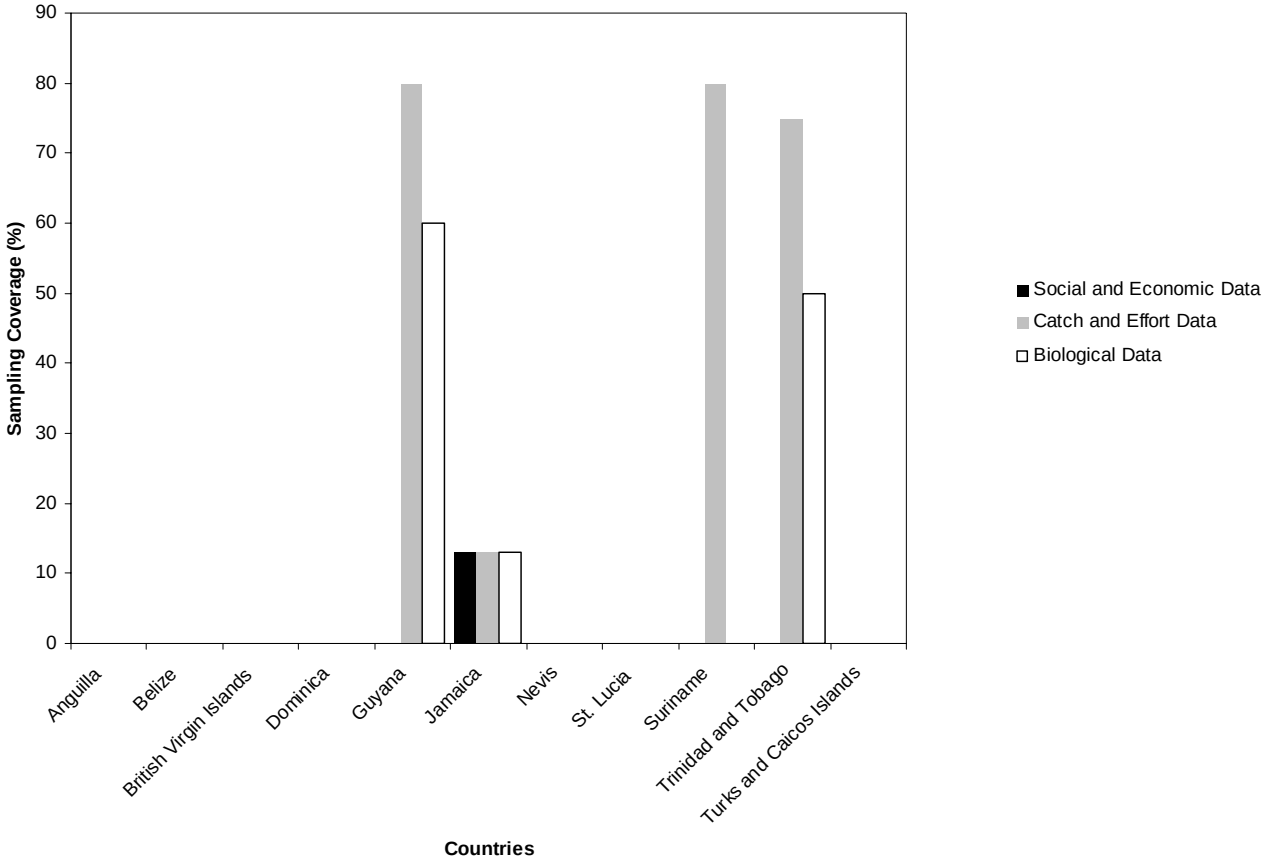


Figure 6 : % Sampling Coverage, by country and type of data, for the Groundfish Fisheries.

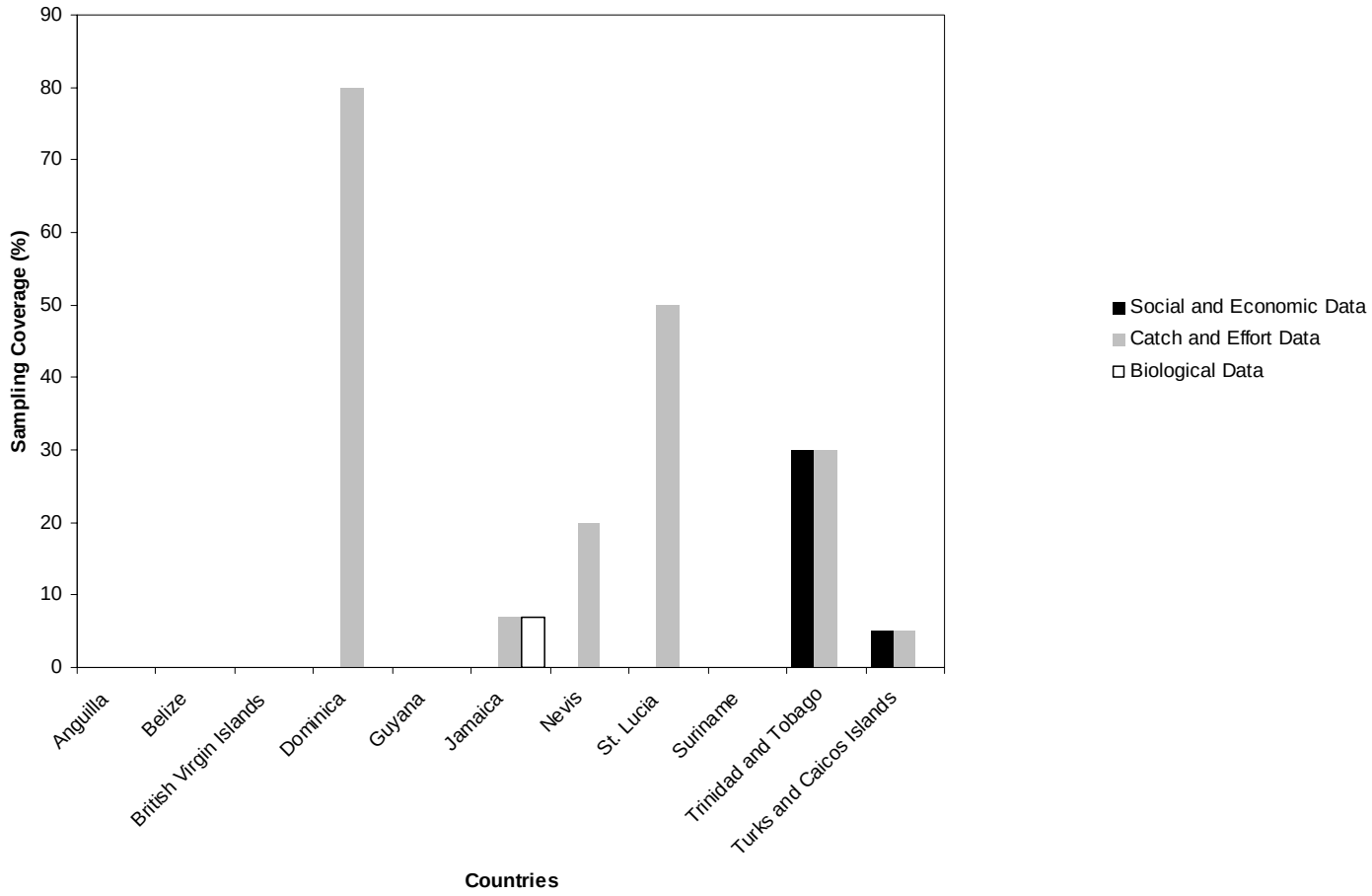


Figure 7 : % Sampling Coverage, by country and type of data, for the Small Coastal Pelagic Fish Fisheries.

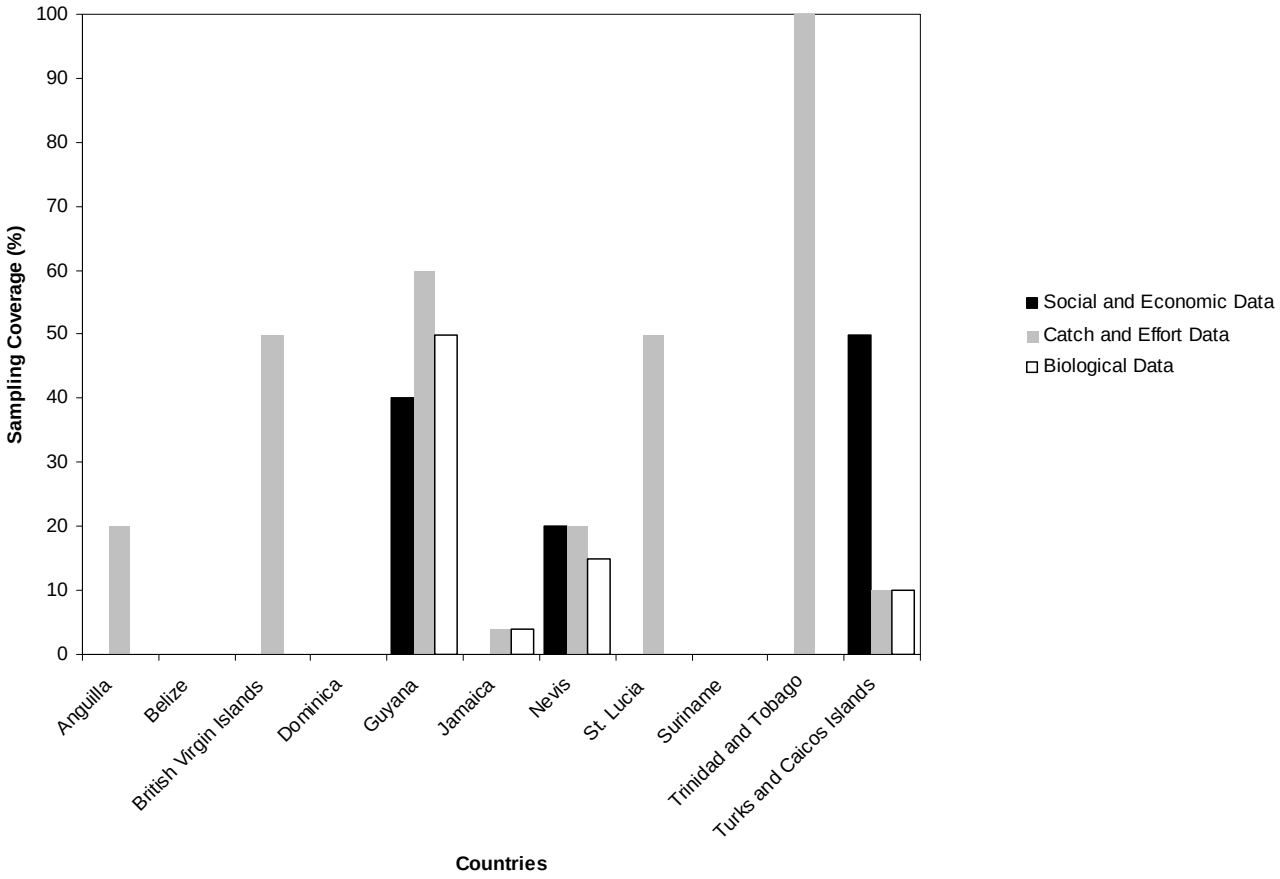


Figure 8 : % Sampling Coverage, by country and type of data, for the Large Pelagic Fish Fisheries.

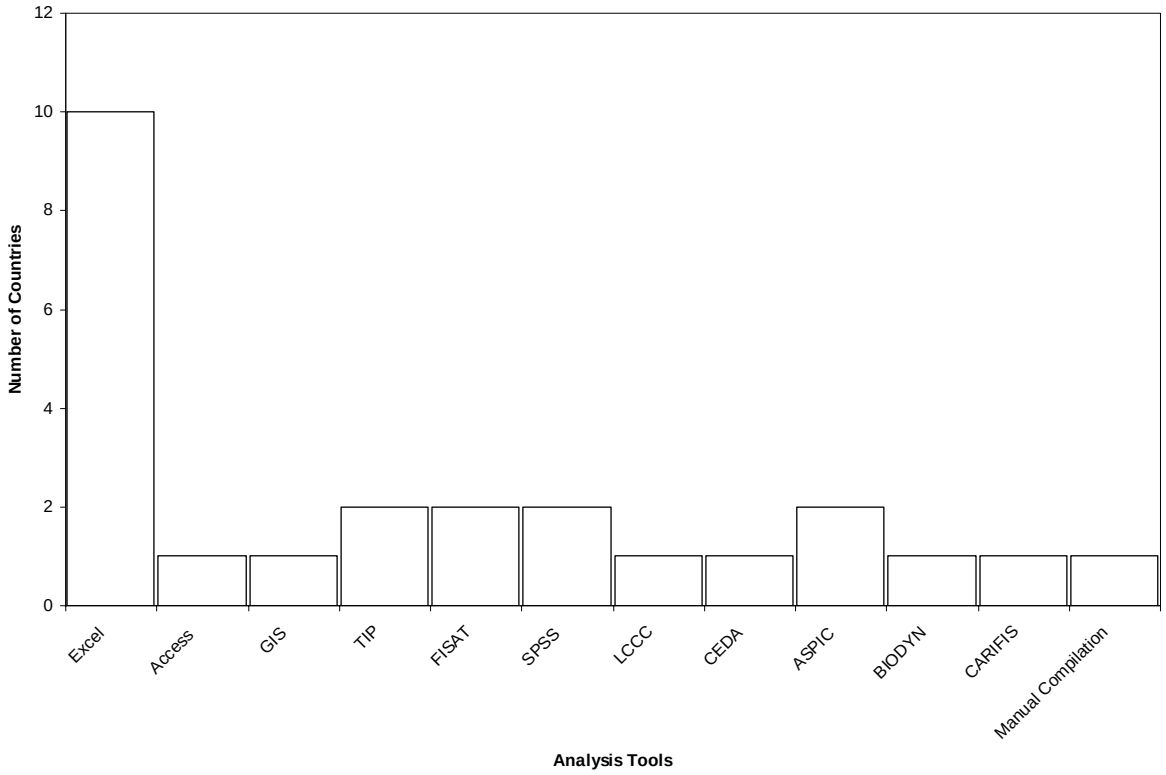


Figure 9 : The Frequency of Use of the Various Tools for Reporting and Data Analysis

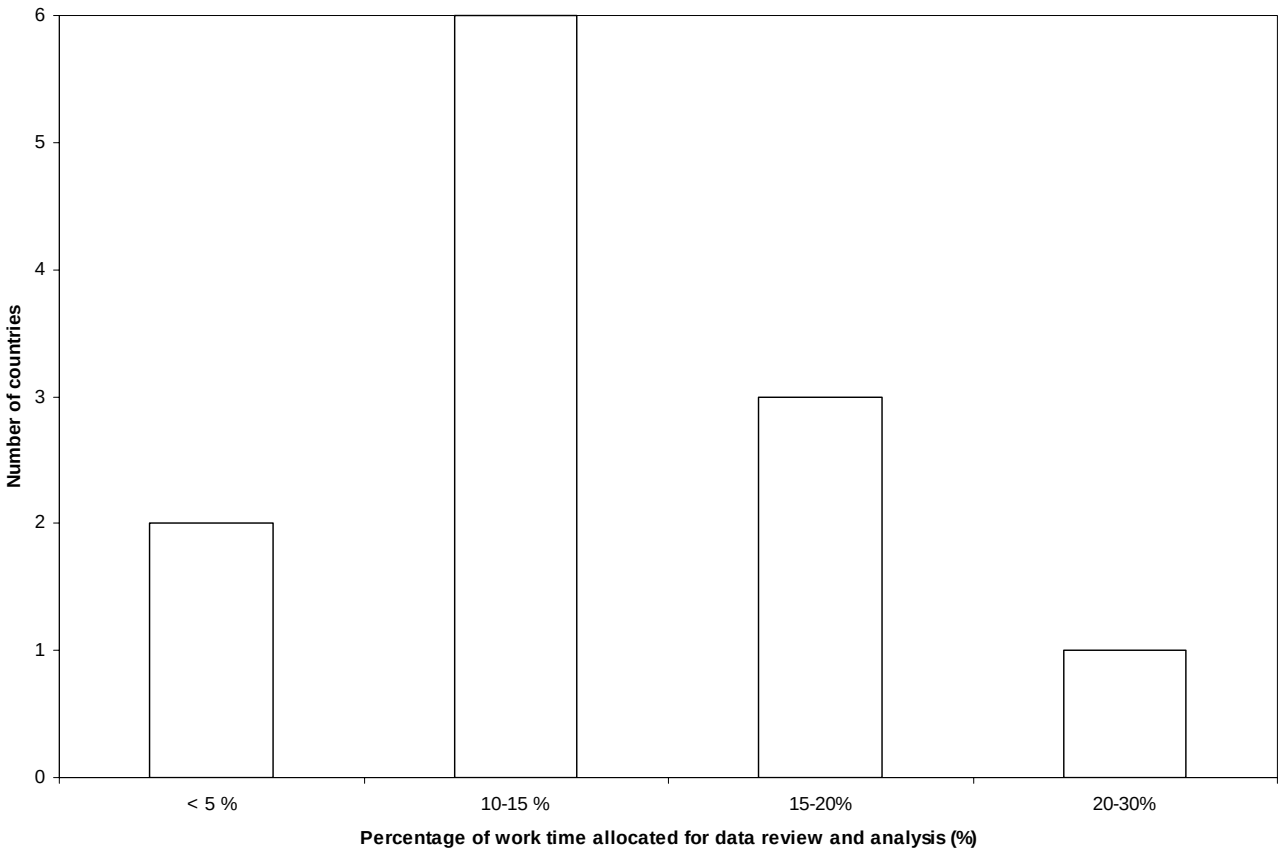


Figure 10 : A Summary of the Work Time Allocation for Data Review and Analysis

APPENDIX 1

FISHERY MANAGER'S QUESTIONNAIRE

Note to Fishery Managers: This questionnaire has been designed to gather information useful for re-evaluating current management advice needs and existing constraints to the provision of this within CRFM countries. The information provided will be used to optimize, as well as customize, the development and application of assessment tools in respect of the management process.

Instructions for completion: *Please tick or encircle your answer choices. In the case of multiple choice questions, you may tick or encircle all the choices that apply. Please print all responses.*

1. Fishery Manager's Name (Director or CFO) ……..

2. What sources of information are currently used for establishing management objectives for your fisheries?
   (a) National consultations
   (b) Social and economic data available from national statistics authority
   (c) Stakeholder interview survey data
   (d) Local/Traditional ecological knowledge (ethno-scientific information)
   (e) Adopt objectives used by other countries with similar fisheries situations.
   (f) International fisheries instruments
   (g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?
   (a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.
   (a) Insufficient data collected to allow evaluation.
   (b) Officers do not have sufficient time to analyse available data and hence prepare management advice
   (c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice
   (d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
   (e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
   (f) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	**Management objectives**	**Priority of objective**	**Data collected to measure achievement of objective**	**Sampling coverage (% total)**	**Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]**	**Decision-making rules / reference points used, if any**	**Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure**
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -							
Conch fishery -							
Lobster fishery -							
Shrimp fishery -							
Ground fish -							
Small coastal pelagic fish -							
Large pelagic fish -							

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1		
Officer 2		
Officer 3		
Officer 4		

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1)	
2)	

NB: The CRFM is grateful for your time and attention in completing this questionnaire

APPENDIX 2

ANGUILLA

1. Fishery Manager's Name (Director or CFO) **Mr. Othlyn Vanterpool**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) National consultations
(b) Social and economic data available from national statistics authority
(c) Stakeholder interview survey data
(d) Local/Traditional ecological knowledge (ethno-scientific information)
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) International fisheries instruments
(g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(f) Other, specify ……

* **Technical capabilities are limited due to the lack of necessary equipment and tools for assisting with the trend in harvesting; thus monitoring maximum sustainable yields.**

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	**Management objectives**	**Priority of objective**	**Data collected to measure achievement of objective**	**Sampling coverage (% total)**	**Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]**	**Decision-making rules / reference points used, if any**	**Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure**
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 3) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -	1) Maximize employment opportunities	1) 1	Catch & effort data	20%			- Wire mesh size limit - Ban on gillnets
Conch fishery -	1) Maximize employment opportunities	1) 1	Catch & effort	20%			- size limit
Lobster fishery -	1) Maximize employment opportunities 2) Protect juvenile stock	1) 1 2) 2	Catch & effort	20%			- size limit - mesh wire size limit - No taking of egg bearing lobsters
Large pelagic fish -	1) Maximize employment opportunities 2) Protect juvenile stock	*1) 1*	Catch & effort	*20%*			
Mammals	1) Maximize employment opportunities	*1) 1*	Catch & effort	*20%*			

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) <u>10-15% of work time</u>
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1:	*MSc in Tropical Coastal Management*	Excel & FISAT
Officer 2:		
Officer 3:		
Officer 4:		

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	**Question**
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Lobster Fishery	At what rate is the Stock replenishing itself?
2) Reef Fishery	**<u>Is the stock over fished?</u>**

BELIZE

1. Fishery Manager's Name (Director or CFO) …**Beverly Wade**……..

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) **National consultations**
(b) **Social and economic data available from national statistics authority**
(c) **Stakeholder interview survey data**
(d) **Local/Traditional ecological knowledge (ethno-scientific information)**
(e) **Adopt objectives used by other countries with similar fisheries situations.**
(f) **International fisheries instruments.**
(g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) **No (*please go to question 4*)** (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) **Insufficient data collected to allow evaluation.**
(b) Officers do not have sufficient time to analyze available data and hence prepare management advice
(c) **Officers do not have sufficient skills and experience to analyze available data and hence prepare management advice**
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(f) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyze the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -	1,2,3	1	2	-	1	Currently – open for fishing without restriction	No gill nets or traps should be placed within a distance of 100m from the coral reef. No management measures except for 11 spawning aggregation Marine Reserves for snappers, groupers, jacks and other species
Conch fishery -	1,2,3	1	2	1	1	2	Minimum shell length – 7 inches, minimum weight of 3 ounces (market clean) closed season = 1 July – 30 Sept. it is illegal to buy, sell or have fillet or diced lobster meat.

Lobster fishery -	1,2,3	1	2	1	1	2	Minimum carapace length of 3 inches, minimum tail weight of 4 ounces. The closed season is 15th Feb – 14th June. It is illegal to buy, sell or have fillet or diced lobster meat.
Shrimp fishery -	2,3	2	3	1	1	Depending on abundance (max – 69 %) of juvenile shrimp in catches.	
Ground fish -	2,3	2	-	-	-	Currently – open for fishing without restriction.	
Small coastal pelagic fish -	1,2,3	2	-	-	-	Currently – open for fishing without restriction.	
Large pelagic fish -	-	3	-	-	-	Currently – open for fishing without restriction.	

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) <u>15-20% of work time</u>
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1 **M. Gongora**	B.Sc., M.Sc. General Fishery Biology	Excel, SPSS
Officer 2 **R. Carcamo**	B.Sc. General Fishery Biology	Excel, SPSS
Officer 3 **J. Villanueva**	B.Sc. General Fishery Biology	Excel, SPSS

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	**Question**
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Lobster Fishery	1. How effective are the current minimum size and minimum weight limits? 2. Is the current closed season effective? 3. What is the main source of larval recruitment for Belize?
2) Conch Fishery	1. How effective are the current minimum size (shell length) and minimum weight limits? 2. Is the current closed season effective? 3. What is the main source of larval recruitment for Belize?
3) Shrimp Fishery	1. What is the size of the stock? 2. How many shrimp trawlers can fish the stock? 3. For how long can the stock be fished on any given year?

BRITISH VIRGIN ISLANDS

1. Fishery Manager's Name: **Bertrand Lettsome *Chief Conservation and Fisheries Officer***

2. What sources of information are currently used for establishing management objectives for your fisheries?

- **(a) National consultations**
- (b) **Social and economic data available from national statistics authority**
- (c) Stakeholder interview survey data
- **(d) Local/Traditional ecological knowledge (ethno-scientific information)**
- **(e) Adopt objectives used by other countries with similar fisheries situations.**
- (f) **International fisheries instruments**
- **(g)** Other (specify) **Social and economic data from *ad hoc* surveys.**
  Economic data from relevant establishments (BVI Fishing Complex)

3. Do you actively measure/monitor the achievement of management objectives?
(a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

This is neither a strict yes or no, some measures are easier to monitor than others. The response is both yes and no.

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

- **(a) Insufficient data collected to allow evaluation.**
- **(b) Officers do not have sufficient time to analyse available data and hence prepare management advice**
- **(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice**
- (d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
- (e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
- (f) Other, specify:

Insufficient officers and appropriate motivational structure to get the volume of work done. Regardless of the size of the country and the number of fishermen or vessels once a party to UNCLOS the EEZ is relatively large compared to the size of the country. The ability to monitor (resources and harvesting of resources) is hampered by the institutional capacity to do so. Appropriate monitoring resources such as vessels, research equipment, surveillance systems etc. are costly and possibly cannot be dedicated to fisheries work. The variety of tasks involved in assessment and management directs that careful evaluation be made of the human resources necessary for this to be effective.

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 3) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery - For fin fish	1) Stock and habitat recovery and maintenance of fishery at sustainable levels 2) Reef resources managed for sustainable multiple use and maximum benefits to all stakeholders	1) 1 2) 2	Catch and effort data Spatial, data (monitoring of reefs etc. there is a marine biologist dedicated to this and monitoring of other habitats)	30% 30%	Excel spreadsheets. Access database. GIS (there is a GIS Officer for mapping spatial data and staff who assist with ground truthing and digitizing)	- -	Effort control Closed seasons Size and gear limits Co management arrangements Integrated management for multiple use
Conch fishery -	Sustainable level of harvest	1) 1	Catch Data	Approx. 20%	Excel spreadsheet	-	Effort control Closed areas and seasons Co-management arrangements

Lobster fishery -	1) Maintain sustainable level of effort. 2) Protect juveniles 3) Protect berried females.	1) 1 2) 2 3) 2	Catch and some effort data Carapace Length Reproductive state data	Approximately 30% Approx. 20% Approx. 20%	Excel spreadsheet Excel spreadsheet Excel spreadsheet	No lobster >3.5in. to be landed No berried lobsters to be landed.	Minimum mesh size limits. No spear fishing for lobster Minimum carapace length of 3.5 inches. No capture of berried females Certain closed reserve areas.
Shrimp fishery -							
Ground fish -							
Small coastal pelagic fish -	1) Increase yields from the fishery.	1) 1	Ad hoc unstructured socio-economic information	-	-	-	-
Large pelagic fish -	1) Increase yields in accordance with prescribed management quotas where required. 2) Reduce reliance on imported supplies.	1) 1 2) 2	Some catch and effort data Import/export data (ad-hoc)	50% 40%	Excel Spreadsheet Excel Spreadsheet	Landings at 100mt of swordfish. Virtually zero imports of swordfish and tunas	Licensing of vessels on payment of prescribed fee. No licensing of foreign vessels.
Recreational fishery	1) Rationalise recreational fishing effort. 2) Increase revenue from the recreational fishery.	1) 1 2) 2	Number of fishing licenses sold monthly/annually	80%	Excel Spreadsheet	Increasing revenue from the recreational fishery.	Licensing of vessels on payment of prescribed fee.

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) <u>15-20% of work time</u>
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1	B.Sc., MPhil., (1984) MLIS, (2003) FAO training programmes in assessment and data management. CFRAMP/FAO training in assessment and data management	Excel, (require refresher FISAT ECOPATH, Access)
Officer 2	BSc.	Excel, Access

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Reef fishery for fin fish	What is the most appropriate methodology for conducting an assessment of the fish pot fishery? (There are variations in the dimensions of the traps)
2) Conch Fishery	How effective are closed areas/marine protected areas in improving spawning stock biomass?
3) Lobster Fishery	What is the socioeconomic value of the Fishery? How feasible is lobster farming or head-starting programme in the BVI?
4) All Fisheries	What are the best, simplest (most appropriate) methodologies for stock assessments and what are the data requirements? How can effort data be standardized for fleets with various fishing power and non-standard gears?

DOMINICA

1. Fishery Manager's Name (Director or CFO) **Andrew Magloire**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) National consultations
(b) Social and economic data available from national statistics authority
(c) Stakeholder interview survey data
(d) Local/Traditional ecological knowledge (ethno-scientific information)
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) International fisheries instruments
(g) Other (specify) ……Fishermen Consultations

3. Do you actively measure/monitor the achievement of management objectives?

(b) **No (*please go to question 4*)** (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(f) **Other, specify Officers need training in the use of specific management tools**……..……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
Large Pelagic Fishery Yellowfin Tuna 2, Marlin, Wahoo, Dolphin Fish, skipjack,	1). Maximize employment 2). Maximize catches 3). Collaborate with international agencies for conservation of juvenile stocks (Same as Above)	1.) 1 2.) 2 a (Same as Above)	Catch and effort and economic data. 2.) Catch and effort data. 3) feed back from IC CAT analyses (Same as Above)	1.) 80% 2.) 80% 40% (Same as Above)	1.) Excel Spread sheets 2.) Excel N.A (Same as Above)	Follow trends in catches and landings patterns (Same as Above)	Hook size limits (Same as Above)
Reef fishery - All species	1). Protect juvenile stocks 2. Maximize biological yield 3. Habitat conservation	1). 2).	Catch and effort data	80%	Excel Spreadsheets, CRFM	Decisions based on observed decline in landings based on historic data	Mesh size limits for nets and fish pots. 2. Shift fishing effort away from reef fisheries.

Conch fishery -	Allow some level of harvest. (no active fishery) 2). Use precautionary approach	1). 2).	No Catch and effort data occurs in this fishery	0%	No analyses done to date. Precautionary approach is used and independent survey needs to be done	Decisions made on anecdotal information and traditional knowledge.	Closed season, flared lip, restricted fishing methods (SCUBA gear prohibited for this fishery)
Lobster fishery -	Maximize biological yield	1).	Catch and effort data	20%	No analyses done to date. Precautionary approach is used	Decisions made on anecdotal information and traditional knowledge	Closed season, minimum size limits, restricted fishing methods
Shrimp fishery -							
Ground fish -							
Small coastal pelagic fish -	1). Maximize employment 2). Protect juveniles 3. Habitat conservation	1). 3). 2).	Catch and effort data.	80%	Excel and TIP	1). Habitat survey especially for beach seine fishery 2). Visual inspection of size	Mesh size limits for gill nets, minimum size limits, restricted fishing methods.
Large pelagic fish -							

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) >5% of work time
(b) <u>10-15% of work time</u>
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1		
Officer 2		
Officer 3		
Officer 4		

Detailed assessments are not conducted. Persons involved presently do not have experience with

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Coastal Pelagic Fishery	To what extent does habitat degradation caused by land based activity affect abundance and distribution of coastal pelagic fisheries?
2) Conch Fishery	Should the catching of conch using SCUBA be allowed to some limited extent?

3) Large Pelagic Fishery	What proportion of this fishery is captured by Dominica? To what extent should Dominica continue to expand into this fishery? What is the extent of IUU fishing by the French in Dominican waters?
4) Deep slope fishery	How can greater economic benefit be produced from this under-exploited resource?
5) Coral reef fishery	Is the reduction in reef fish landings on the west coast of Dominica due to over fishing or habitat degradation?

GRENADA

1. Fishery Manager's Name (Director or CFO) **JUSTIN RENNIE**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) **National consultations**
(b) Social and economic data available from national statistics authority
(c) **Stakeholder interview survey data**
(d) **Local/Traditional ecological knowledge (ethno-scientific information)**
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) **International fisheries instruments**
(g) Other (specify)……...**Government's policy……**

3. Do you actively measure/monitor the achievement of management objectives?

(a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice
(c) **Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice**
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(g) Other, specify …**There is need to recruit trained and trainable staff.**

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -							
Conch fishery -							
Lobster fishery							
Shrimp fishery							
Ground fish -							
Small coastal pelagic fish -							
Large pelagic fish -							

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1 **NIL**		
Officer 2		
Officer 3		
Officer 4		

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Large Oceanic Pelagic Fishery - Tunas, Billfishes, Wahoo, Mackerels, Dolphin fish, Sword Fisheries Division.	What are the potential for expanding effort sustainably (assessment of abundance), and the possibilities for providing for regional and sub-regional management?
2) **Small Coastal Pelagics** - Big-eye scads, Round scads etc.	What minimum size of mesh is necessary for effectiveness stock conservation minimizing growth overfishing.

3) **Shallow Coral Reef Fishery** - Snappers, Groupers, Grunts, Doctor fishes, Hinds.	What is the effectiveness of MPAs as a management tool for increasing spawning stock biomass?
4) **Deep Slope Shelf Edge Fishery** - Snappers, Groupers	What conservation measures are required to prevent growth overfishing and the possibilities for providing for sub-regional management?
5) **Lobster Fishery**	How effective is the improvement in habitat in increasing stock yields.
6) **Queen Conch Fishery**	How effective is the development and protection of coastal habitat in enhancing juvenile stock and what is the most suitable conservation measures for conserving adult stock.
7) **Turtle Fishery**	What is the effect of coastal transformation on stock recruitment?
8) **Sea moss fishery Gracilaria spp**.	What are the most suitable harvesting techniques for maintaining and enhancing yields; and what is the impact of coastal development, sand mining and pollution (marine and land-based) on yields.
9) **Sea urchin**	What effects do land-based sources of pollution and coastal transformation have on improvement in biomass?

GUYANA

1. Fishery Manager's Name (Director or CFO) **MS. DAWN MAISON**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) National consultations
(b) Social and economic data available from national statistics authority
(c) **Stakeholder interview survey data**
(d) Local/Traditional ecological knowledge (ethno-scientific information)
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) International fisheries instruments
(g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?
(a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice.
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice

(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.

(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.

(f) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -							
Conch fishery -							
Lobster fishery -							

Shrimp fishery -	1. Develop and increase the shrimp resources 2. Maximize employment opportunities 3. Protect juvenile stock 4. Increase the net foreign exchange earnings	1) 1 2) 2 3) 3 4) 4	1) Catch & Effort data 2) Social and economic data	1) 50% 2) 30%	1. EXCEL		
Ground fish -	1. Expand fishery using precautionary approach 2. Investigate the feasibility of a directed fishery 3. Consider traditional knowledge and interest of local communities, small-scale artisanal fishers	1) 3 2) 1 3) 2	1. Catch & effort data 2. Biological Data Collection\ length frequency	1) 80% 2) 60%	1. EXCEL		
Small coastal pelagic fish -							

Large pelagic fish -	1. Promote the development of selective fishing gear and practices that minimize waste in the catch of target species and minimize by-catch of non-target species. 2. Cooperate with member of ICCAT 3. Investigate the feasibility of directed fishery	1) 1 2) 2 3) 3	1) Catch & effort data 2) Social & economic data 3) Biological Data Collection \ length frequency	1) 60% 2) 40% 3) 50%	EXCEL		

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) <u>10-15% of work time</u>
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example).

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1	BSc Agriculture	EXCEL,
Officer 2	BSc Agriculture	EXCEL
Officer 3	BSc Management	EXCEL

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) SHRIMP	How to restrict conflict between gears sector that is, trawlers and artisanal fishers? What is the specific time to implement closed season \closed areas? How and when to protect nursery habitat for shrimp? What is the biomass of this fishery?
2) GROUNDFISH	Whether to ban \ eliminate \ increase the mesh size of certain gear type? Query production of one species versus destruction of juvenile. What is the biomass of this fishery?
3) DEEP SLOPE	When to phase out traps? How to stop illegal fishing?

JAMAICA

1. Fishery Manager's Name (Director or CFO) …**Mr. G. A Kong**……..

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) **National consultations**
(b) Social and economic data available from national statistics authority
(c) Stakeholder interview survey data
(d) **Local/Traditional ecological knowledge (ethno-scientific information)**
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) International fisheries instruments
(g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) No (*please go to question 4*) **(b) Yes (*please go to question 5*).**

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(f) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).

Reef fishery -	1) To rehabilitate reef fisheries to sustainable levels 2) Involvement of all stake-holders in the fisheries management process, including monitoring, surveillance, control and even data collection.	1) 1 2) 2	1) Catch and effort, and biological data (length, weight, size and stage of maturity). 2) Social and economic data,	1) 13% monthly of all sights 2) 100 % Census carried out about once every 10 years. Island-wide stakeholder consultations are carried out from time to time. The Fisheries Division registers all fishers during which process social and economic data is collected. All fishers also must get a permit each year to fish.	1) Excel Spreadsheets, FISAT and other stock assessment methods. 2) SPSS, CARIFIS and Excel spreadsheets.	Protection of juvenile and spawning fish stocks.	1) No juvenile fish should be taken by fishers (juvenile for each species) 2) Mesh size limit 1.5 inches (adopted)

Conch fishery -	1) To exploit stocks at optimum sustainable yields. 2) To fulfil obligations in respect of conch		1a) Conch abundance surveys 1b) Catch and effort, data and biological data (length, weight, size and stage of maturity). 2a) Conch abundance surveys 2b) Catch and effort, data and biological data (length, weight, size and stage of maturity).	a) 30% b) 100% All conch producers must return log forms	1a) Excel Spreadsheets, 1b) and other stock assessment methods suitable for conch. 2a) Excel Spreadsheets, 2b) and other stock assessment methods suitable for conch.	1) Total allowable catch set below MSY 2) Conch is on the endangered species list of CITES continuous stock assessment (using methods suitable for conch) must be done.	1) Closed season August 1-January 5 each year. 2) No person shall fish collect or offer for sale immature conch (lip less than 22 cm) 3) National total allowable catch set below MSY each year. 4) Fishery Management area declared (standing biomass). See CITES regulations.

Lobster fishery -	1) Protection of lobsters 2) Protection of lobster habitat	1) 2)	1) Catch and effort, data and biological data (length, weight, size and stage of maturity). 2) Social and economic data.	1) 13% of all sites monthly 2)	1) Excel Spreadsheets 2) Excel Spreadsheets	1) Carapace length at first capture should be greater than 7.62 cm 2) Protection of juvenile and spawning stocks. 2) Capture of lobster should not damage habitat	Closed season April 1- June 30 yearly (adopted). Lobsters of carapace length less than 7.62 and all egg carrying females must not be taken (adopted). 2) Lobster casita (not yet in place
Shrimp fishery -	Efficient exploitation of the fishery by introduction of more efficient gear		1) Catch and effort, data and biological data (length, weight, size and stage of maturity). 2) Social and economic data.	1) 50% of all sites monthly 2) 40%	1) Excel Spreadsheets 2) FISAT 2) Excel Spreadsheets	Protection of juvenile and spawning fish stocks	Gear restrictions being considered (not yet in place)

Ground fish -	1) To rehabilitate ground fish fisheries to sustainable levels 2) Efficient exploitation of the fishery by introduction of more efficient gear		1) Catch and effort, data and biological data (length, weight, size and stage of maturity). 2)) Catch and effort, data and biological data (length, weight, size and stage of maturity). Social and economic data.	1) 13% of all sites monthly 2) 13% of all sites monthly	1) Excel Spreadsheets 2) FISAT 1) Excel Spreadsheets 2) FISAT	Protection of juvenile and spawning fish stocks	1) No juvenile fish should be taken by fishers (juvenile for each species) 2) Mesh size limit 1.5 inches (adopted) Gear restrictions being considered (not yet in place)
Small coastal pelagic fish -	To exploit stocks at optimum sustainable yields.		1) Catch and effort, data and biological data (length, weight, size and stage of maturity).	1) 7% of all sites monthly	1) Excel Spreadsheets 2) FISAT	Protection of juvenile and spawning fish stocks	1) No juvenile fish should be taken by fishers (juvenile for each species) 2) Mesh size limit 1.5 inches (adopted)
Large pelagic fish -	1) To exploit stocks at optimum sustainable yields. 2) To protect the resources		Catch and effort, data and biological data (length, weight, size and stage of maturity).	) 4% of all sites monthly	1) Excel Spreadsheets 2) FISAT	Protection of juvenile and spawning fish stocks	No juvenile fish should be taken by fishers (juvenile for each species)

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) **15-20% of work time**
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danita training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1	B.Sc., M. Phil, 2006 (submitted)	Excel, FISAT, SPSS, Statistica
Officer 2	B.Sc., M. Sc., 2003	Excel, FISAT, SPSS, Statistica
Officer 3	B.Sc., M. Phil, 2004	Excel, FISAT, SPSS, Statistica
Officer 4	B.Sc., (3) Officers B. Sc. M. Sc. (1) Officer	Excel, SPSS,

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Queen conch and Lobster fisheries	The effect of illegal unreported and unregulated (IUU) fishing on the conch and lobster fishery of Jamaica, but more so how to control/stop IUU fishing especially poaching by foreign vessels
2) Lobster Fishery	There has been a decline in production of lobsters, what is the cause of the decline, could this decline be a function of the escape gap in the gear used. How to address definition of management parameters eg. MCD, CL etc.
3) All underutilized fisheries	What is the status of these potential fisheries and how to develop them?

NEVIS

1. Fishery Manager's Name (Director or CFO) **Mr. Audra Barrett**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) National consultations
(b) Social and economic data available from national statistics authority
(c) Stakeholder interview survey data
(d) Local/Traditional ecological knowledge (ethno-scientific information)
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) International fisheries instruments
(g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice.
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice.
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(f) Other, specify ……

* Technical capabilities are limited due to the lack of necessary equipment and tools for assisting with the trend in harvesting; thus monitoring maximum sustainable yields.

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -	Protect juveniles to promote stock recovery	1) 1	Catch & effort data	60%	Present: training in Excel. Data compiled manually		- size restriction on meshed gears - dynamite, noxious substances prohibited.
Conch fishery -	- Reduce over-exploitation. - Protect habitat, which will enhance stock recovery.	1) 1	Catch, effort, size and maturity data	15%	Present: training in Excel. Data compiled manually		- size restrictions - minimum shell length and meat weight - harvest only flared lip conch
Lobster fishery -	- Protect juvenile stock - Rebuild stocks in depleted areas	1) 1 2) 2	Catch, effort, size and maturity data	60%	Present: training in Excel. Data compiled manually		- size restrictions - prohibition on taking berried females or moulting individuals

Deep slope fishery	- Maximise catches within the potential yield	1) 1	Economic, catch and effort data	20%	Present: training in Excel. Data compiled manually		- size restriction on mesh - no specific management measures on this fishery
Small coastal pelagic fish -	- Maintain fish habitat which will enhance stock recovery	1) 1	Catch & effort data	20%	Present: training in Excel. Data compiled manually		-minimum mesh size for beach seine and Ballahoo nets
Large pelagic fish -	- Promote development of this fishery. - If possible protect juvenile stock	1) 1 2) 2	Social, economic, catch and effort data Size and maturity data	20% 15%	Present: training in Excel. Data compiled manually		- no management measures to control harvest

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) **< 5% of work time**
(b) 10-15% of work time
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1: Audra Barrett	Certificate in Fisheries Technology; *DIP Fisheries Conservation*	20 years of compiling fish landings
Officer 2: Alex Percival	**Training in TIP & CARIFIS**	
Officer 3: Shawn Isles	Training in Fisheries Resource Management	
Officer 4: Lemuel Pemberton	MSC in Natural Resource Management	6 years in Excel & SPSS

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	**Question**
Example: queen conch fishery	**1) How effective are marine reserves in enhancing the spawning stock biomass?**
1) Conch & Lobster Fishery	How efficient are marine resources in enhancing the spawning stock biomass?
2) Reef Fishery	What measures could be put in place to counteract the over-exploitation of the reef fishery?
3) Sea Turtle Fishery	To what extent can co-management help in increasing levels of conservation in Nevis?

ST. LUCIA

1. Fishery Manager's Name (Director or CFO) **Vaughn Charles**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) **National consultations (on occasions)**
(b) **Social and economic data available from national statistics authority (limited availability)**
(c) **Stakeholder interview survey data (on occasions)**
(d) **Local/Traditional ecological knowledge (ethno-scientific information) (informal sources)**
(e) **Adopt objectives used by other countries with similar fisheries situations. International fisheries instruments (and other multilateral environmental agreements)**
(f) Other (specify) **scientific literature when available, international seminars and conventions (participation and interaction with other participants and also proceedings of such fora).**

3. Do you actively measure/monitor the achievement of management objectives?

(a) No (*please go to question 4*) (b) Yes (*please go to question 5*). **Fish production; levels of use and revenue within marine reserves of SMMA and CAMMA; reef habitat health; sea urchin abundance and sizes over time; lobster length frequencies and sex ratios over time; also focused short term species-specific and/or gear specific assessments (biological) when project funding can be obtained for such; beach profile monitoring at select sites; water quality monitoring at select sites (in collaboration with Ministry of Health).**

Note: the section below is still relevant as it allows for indicating limitations and constraints

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation. **(true in some cases)**
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice **(very true: no dedicated officers for much of our data analysis and interpretation)**
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice **(true in some cases, particularly socio-economic data and information)**
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern. **(limited access to up-to-date statistical programmes and training in such programmes)**
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool. **(many focus areas are not examined due to manpower limitations)**
(f) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -	i) Promote stock recovery; ii) Ensure sustainable use	1 1	Catch and effort; %live coral cover; size and abundance of indicator reef fish species; level of fecal coliforms.	~50% (stratified random sampling of 8 of 17 fish landing sites, including majority of major and intermediate sites; beach monitoring at 9 beach sites islandwide (~10-15% coverage); water quality collected at 13 sites islandwide (~10-15%coverage); Reef Check at x sites islandwide (~15-20% of key reef areas sampled)	TIP (possibly soon to change to CARIFIS) and analysis in Excel based programme designed to do the bumping up and calculate total landings by site per species group	Comparison of Reef Check values compared with international data in this database; degree to which water quality is in line with national/international standards.	Mesh size limits for traps and nets; limited entry to pot fishery, marine reserves, no trammel nets; no bottom-set gillnets in SMMA; co-management of SMMA/CAMMA; no spearing of lobsters or fishing of berried or juvenile lobsters; close season and size limits for turtles; monitoring of indicator species (ReefCheck)

Conch fishery -	i) Promote stock recovery (particularly near shore); ii) Ensure sustainable use	1 1	Catch and effort; sporadic biological data collection (associated with project periods)	~66% as both major landing sites are monitored	TIP (possibly soon to change to CARIFIS) and analysis in Excel based programme designed to do the bumping up and calculate total landings by site per species group (also use purchase data from fish marketing corporation in estimating bump-up)	none	Weight limit in place (flared lip restriction proposed); limited entry system; closed season and lip thickness proposed; international trade restricted consequent to listing under CITES (permits required).
Lobster fishery -	i) sustainable exploitation of stocks	1	i) Catch and effort; ii) biological data collection on sample collected each open season	i) ~20% or less (rarely made available to data collectors by fishers); ii) 300-500 individuals randomly sampled	TIP (possibly soon to change to CARIFIS) and analysis in Excel based programme designed to do the bumping up and calculate total landings by site per species group (also use purchase data from fish marketing corporation in estimating bump-up)	None: mean size and size ranges per sex are determined and monitored for change over time.	Limited entry into pot fishery; Size limit; close season; protection of berried and moulting females.
Shrimp fishery -	Not Applicable						
Ground fish -	Not Applicable						

Small coastal pelagic fish -	i) exploit at maximum sustainable yield ii) minimize land-based pollution; ii) support appropriate TURFS	3 1 2	i) Catch and effort;	~50% (stratified random sampling of 8 of 17 fish landing sites, including majority of major and intermediate sites	TIP (possibly soon to change to CARIFIS) and analysis in Excel based programme designed to do the bumping up and calculate total landings by site per species group	none	Mesh size limits; TURF system supported (informally)
Large pelagic fish -	i) sustainable exploitation of stocks ii) cooperate with other range states in managing stocks	1 1	i) Catch and effort	~50% (stratified random sampling of 8 of 17 fish landing sites, including majority of major and intermediate sites	TIP (possibly soon to change to CARIFIS) and analysis in Excel based programme designed to do the bumping up and calculate total landings by site per species group (also use purchase data from fish marketing corporation in estimating bump-up)	none	Licensing of vessels; monitoring CPUE of fishery; multi-lateral stock assessment; regulating sport fishing activities; sightings surveys for cetaceans.
Sea Turtles	i) Promote stock recovery; ii) Ensure sustainable use	1 1	i) Catch and effort	Relatively low (<50%) sampling as landings are sporadic and decentralized, nesting activities: only one large leatherback beach consistently monitored for nesting season	TIP (possibly soon to change to CARIFIS) and analysis in Excel based programme designed to do the bumping up and calculate total landings by site per species group; Access and Excel used for nesting data		Minimum size limit; close season; protection of nesting females and eggs; proposed: maximum size limit; protection of hatchlings; lighting restrictions; limited entry fishery.

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time

(b) 10-15% of work time X (on average- based on work programme of Department as a whole, but we have a data Unit comprising two fisheries assistants and two data clerks who spend 90% of their time on data- otherwise, one Biologist normally overshadows the work of the Unit (about 40% of his/her time) and an additional Biologist, with assistance of a fisheries assistant does habitat monitoring analysis (40% of each of their time).

(c) 15-20% of work time

(d) 20-30% of work time

(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

(The one officer we had qualified in this area to the level of MSc has recently left. We are unlikely to be able to source a replacement officer with the same level of skill- therefore, either an existing officer will have to be trained at a post graduate level or we will have to continue to try to source such expertise as and when a position becomes available. The data management staff who do the landings data collection and analysis use procedures and a programme designed internally to do that and are not trained at the degree level. One has been trying for a number of years to seek a scholarship to do a first degree- but has not been successful so far in obtaining the necessary funds). Data Unit staff are exposed to short term training as and when available.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1		
Officer 2		
Officer 3		
Officer 4		

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Reef fishery -	1) What are changes in size frequency and relative abundance of key species over time;

	2) What are the changes in relative abundance in the catch for key gears over time; 3) How effective are marine reserves in enhancing spawning stock biomass in reserve areas and beyond and how does this affect fish catches; 4) How are declines in reef quality related to abundance of key species; 5) What are changes in site-specific abundance and size frequency of black sea urchins over time (as key reef grazers); 5) Natural and fishing mortality rates, age at maturity for key species
2) Conch fishery -	1) What is current distribution and abundance of stock 2) Where are breeding aggregations located and when is peak breeding activity 3) Is nearshore pollution affecting resource abundance and health 4) What have been the historic levels of trade in conch over the years (legal and illegal)
3) Lobster fishery -	1) What are changes in size frequency, size at first maturity and sex ratio of key species over time; 2) What are the changes in relative abundance in the catch over time; 3) How effective are marine reserves in enhancing spawning stock biomass in reserve areas and beyond; 4) What are the levels of recruitment to nearshore habitats (seagrass; reefs, mangroves); 5) What is the level of accumulation of agrochemical and other toxic elements in the flesh and organs of key species
4) Small coastal pelagic fish -	1) Is there a correlation between water quality and abundance of key species; 2) What is the level of accumulation of agrochemical and other toxic elements in the flesh and organs of key species; 3) What level of gear selectivity for nets used and to what degree mesh size limits protect juveniles
5) Large pelagic fish -	1) What are changes in size frequency of key species over time; 2) What are the changes in relative abundance in the catch over time; 3) natural and fishing mortality rates, age at maturity for key species
6) Sea Turtles	1) What is the population abundance, sex distribution and age at first maturity for key species; 2) Location of foraging grounds for key species; 3) stock assessment (involving all range states) at the population level; 4) What levels of exploitation would be sustainable at the population level

ST. VINCENT AND THE GRENADINES

1. Fishery Manager's Name (Director or CFO) **Mr. Raymond Ryan**

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) **National consultations**
(b) **Social and economic data available from national statistics authority**
(c) **Stakeholder interview survey data**
(d) **Local/Traditional ecological knowledge (ethno-scientific information)**
(e) **Adopt objectives used by other countries with similar fisheries situations.**
(f) **International fisheries instruments**
(g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) No (*please go to question 4*) (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice
(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice
(d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(f) Other, specify ……

* Technical capabilities are limited due to the lack of necessary equipment and tools for assisting with the trend in harvesting; thus monitoring maximum sustainable yields.

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery -	1) Reduce effort on in-shore reef resources. 2) Shifting effort to deeper reef and slope fishery. 3) Not increasing overall effort any further in their fishery.	1) 1 2) 3 3) 2	- Social & Economic - Catch data - Catch & effort - Biological	10-20% 30-40% <10% <5%	Excel SPSS FISAT	No particular reference point.	- Protected areas. - Gear restrictions.
Conch fishery -	1) Introduce quota system. 2) Reduce effort on stocks. 3) Determine prime areas by conducting abundant studies.	1) 3 2) 1 3) 2	- Social & Economic - Catch data - Catch & effort - Biological	<10% <20 % <5% Nil	Excel SPSS FISAT	Quota system not above current harvesting levels	- Protected areas - Minimum sizes.

Lobster fishery -	1) Encourage artificial areas as alternative to rebuilding stock. 2) Reducing fishing pressure on national stocks.		- Social &Economic - Catch data - Catch & Effort - Biological	<10% <20% <5% Nil	Excel SPSS FISAT	Landings not to exceed current levels.	- Gear restrictions - Protected areas - Minimum sizes
Small coastal pelagic fish -	1) Reducing fishing pressure on juvenile stocks. 2) Reducing fishing pressures in protected and conservation areas		- Social &Economic - Catch data - Catch & Effort - Biological	10-20% 20-30% <10% Nil	Excel SPSS FISAT	No particular reference point developed.	- Mesh size limits. - Net restrictions. - Gear restrictions
Large pelagic fish -	1) Encouraging the sustainable utilization of large pelagics.		- Social &Economic - Catch data - Catch & Effort - Biological	10-20% 30-40% <10% <5%	Excel SPSS FISAT	No particular reference point developed.	- No specific measure
Mammals	1) Sustainable utilization of large pelagics. 2) Sustainable utilization of small pelagics.		- Social &Economic - Catch data - Catch & Effort - Biological	<5% Nil Limited	Excel SPSS	- Catch limit on humpback. - Complying with other IWC initiatives re: large mammals.	- Maximum of 3 humpbacks

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) <u>< 5% of work time</u>
(b) 10-15% of work time
(c) 15-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1:	BSc. *MSc.* *Various training programmes*	Excel, Minitab, FISAT, SPSS
Officer 2:	Diploma. *Various training programme*	Excel, Minitab, FISAT, SPSS
Officer 3:		
Officer 4:		

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	**Question**
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1) Conch	- How successful are minimum sizes in enhancing stock distribution and abundance of stocks in our waters? - The effect of antropogenic activities on stocks
2) Lobster Fishery	- How effective are minimum sizes in enhancing stocks? - How effective are closed seasons in enhancing stocks? - The degree to which antropogenic activities are affecting stocks?
3) Reef Fishery	- Developing useful reference points for management. - Distribution ands stock abundance

4) Small coastal pelagics	- Developing reference points for management. - The degree to which atropogenic activities are affecting stocks.
5) Large pelagics	- To what extent is illegal foreign fishing activities affecting migrating and local stocks. - Is there any room for further expansion in this fishery? - Developing reference points for management.
6) Marine mammals	- Info on the current state of small mammal stocks. - Info on the current state of large mammal stocks.

SURINAME

1. Manager's Name (Director or CFO) **Johnny Debipersad**……..

2. What sources of information are currently used for establishing management objectives for your fisheries?

(a) **National consultations**
(b) Social and economic data available from national statistics authority
(c) **Stakeholder interview survey data**
(d) Local/Traditional ecological knowledge (ethno-scientific information)
(e) Adopt objectives used by other countries with similar fisheries situations.
(f) International fisheries instruments
(g) Other (specify) ……

3. Do you actively measure/monitor the achievement of management objectives?

(a) **No (*please go to question 4*)** (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

(a) Insufficient data collected to allow evaluation.
(b) Officers do not have sufficient time to analyse available data and hence prepare management advice
(c) **Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice** Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
(d) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
(e) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Reef fishery - **Hard-substrate demersal fishery (Red Snapper)**	1. Sustainability of the fishery, not exceed MSY level 2. Local employment 3. Foreign currency earning		1. Catch & effort data 2. Biological data. Age/size and maturity data	1. 80 % of total landings 2. 20 %	1) Excel spreadsheet for yield per recruit,	Restrict fishing	1. Control of the fishing effort. 2. Collection of licence fees, provision of dissuasive fines against illegal fishing
Conch fishery -							

Lobster fishery -							
Shrimp fishery - **Penaeus shrimp**	1. Fully exploited 2. Economic optimisation 3. maximisation of the net foreign currency returns, 4. Protection of the shrimp		1. Catch & effort data 2. Biological data. Age/size and maturity data	90 %	Consultant by FAO/ Belgium Excel spreadsheet: 1. Length based cohort analysis 2. 3. Biomass per recruit	1. Reduction of fishing effort 2. Increasing the license fee 3. Exploitation of juvenile should be avoided 4. Incentive for the landing of larger sizes	
Shrimp fishery - Seabob *(Xyphopenaeus kroyeri)* Artisanal & trawl fleet	1. Sustains a large number of families 2. Optimising economic yield. 3. Generation of foreign currency		1. Catch & effort data 2. Biological data. Age/size and maturity data	90 % 30 %	Consultant by FAO/ CRFM Excel spreadsheet: 1. Length based cohort analysis 2. Biomass per recruit	1. 50 % of virgin biomass 2. freeze effort at current level	1. Depth limits 2. Zoning of the areas of operation 3. Use of TEDs in the trawlnets 4. Minimum cod-end size

Ground fish - **Soft-bottom:** **<u>1. Large Demersal Fish</u>** **<u>2. Small Demersal Fish</u>** **Sandy-bottom demersal (Lane Snapper)**	1. Sustainability of the fishery, not exceed MSY. 2. Fishing effort is above the level required for MSY. 3. Lack of shore facilities. 1.Supplying the domestic market 2. Lack of shore facilities. 1. Sustainability of the fishery, not exceed MSY level 2. Foreign currency earning		1. Catch & effort data 2. Biological data. Age/size 1. Catch & effort data 2. Biological data. Age/size 1. Catch & effort data 2. Biological data. Age/size	70 % 70 % 80 %	(*Cynoscion virescens*) 1. Estimation of fishing mortality. 2. Estimation of yield per recruit. Biological reference point. Assistance, help of FAO consultant. (*Macrodon ancylodon*) 1. estimation of fishing mortality in LCCC. 2. estimation of yield per recruit for different lengths at first capture. Excel spreadsheet, catch curve analysis foe estimation of fishing mortality. Estimation of natural mortality. Thompson-Bell model using multiplier for fishing mortality.	1. To restrain the landings abroad 2. Decrease of the fishing effort in costal fishing. 3. Gradually reduction of the fishing effort for Njawarie 4. Prohibition of catch of undersized fish by the njawarie and trawler fleets 1. Gradually reduction of the fishing effort for Bangemary Lower limit of estimated MSY range for direct fishery.	1. maximum number of boats by fleet 2. surveillance at sea, not continuous 3. Establishing of fishing ground, exploitation of different species on the same or overlapping. 4. Depth limits for fish trawlers 5. Minimum numbers of landings by boat by fleet per year. 1. Fixed numbers of fishing effort for direct fishery. 2. Depth limits 3. Fixed mesh sizes of net

Small coastal pelagic fish -							
Large pelagic fish -							

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) 15-20% of work time
(d) <u>20-30% of work time</u>
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1	• M.Sc in Progress in Natural resource Management. • Teacher trainer diploma in biology. • CFRAMP/FAO/DANIDA regional Training Course on Fish Stock Assessment training (3 wks 1996) • Training in Microsoft Office (1997). • Training in SPSS (1998, experience in 2001)	Excel , FISAT, SPSS
Officer 2	• Computer technician • Fish Quality Manager certificate (1997) • Faculty of medicine (Pre med)	Excel, Databases
Officer 3	• Teacher trainer diploma in biology • JICA/CFTDI Fish Resource assessment (4 wks, 2005)	Excel

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1)	
2)	
3)	

TRINIDAD AND TOBAGO

1. Fishery Manager's Name (Director or CFO) **Ann Marie Jobity**

2. What sources of information are currently used for establishing management objectives for your fisheries?

- **(a) National consultation**
- (b) Social and economic data available from national statistics authority
- **(c) Stakeholder interview survey data**
- (d) Local/Traditional ecological knowledge (ethno-scientific information)
- (e) Adopt objectives used by other countries with similar fisheries situations.
- **(f) International fisheries instruments**
- (g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) **No (*please go to question 4*)** (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

- (a) Insufficient data collected to allow evaluation.
- **(b) Officers do not have sufficient time to analyse available data and hence prepare management advice**
- **(c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice**
- (d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
- (f) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
- (g) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected for assessment purposes	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Recommendations / reference points used in assessments	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
THE SOFT-SUBSTRATE DEMERSAL (SHRIMP & GROUNDFISH) FISHERY							
Trawl fleet (Artisanal, Semi-industrial, Industrial trawlers) Shrimp – *Farfantepenaeus subtilis, F. notialis, F. brasiliensis Litopenaeus schmitti, Xiphopenaeus kroyeri*)	Full utilization of the resource consistent with adequate conservation and minimal conflict between the artisanal and non-artisanal components of the fishery		1) Social and economic data 2) Landings and effort data 3) Biological data- size	*Ad hoc* surveys 75% 50%	1) Prepared FAO/Consultant Excel spreadsheets: • Length-based cohort analysis • Length converted catch curve • Bio-economic dynamic model • Virtual population analysis 2) ASPIC – Surplus Production 3) BIODYN – Surplus Production 3) Excel • Length-based Thompson and Bell • Beverton and Holt Biomass per Recruit and Yield per Recruit	25% of virgin biomass (*F. subtilis)* 40% virgin biomass *(F. notialis, X. Kroyeri)* MEY - reduce effort of the Trinidad fleet to 61% and effort of the Venezuelan fleet to 82% MSY - effort should not be increased	Controls on entry of industrial and semi-industrial trawlers based on 1988 Cabinet note. Zoning of the areas of operation of each of the trawl fleets Use of TEDs by the industrial and semi-industrial. Minimum cod-end mesh size.

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected for assessment purposes	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Recommendations / reference points used in assessments	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
Trawl fleet Artisanal multigear fleet Croaker (*Micropogonias furnieri*) Salmon (*Cynoscion jamaicensis*) Lane snapper (*Lutjanus synagris)*			1) Social and economic data 2) Landings and effort data 3) Biological data -size	*Ad hoc* surveys 75% 50%	1) Prepared FAO Excel spreadsheets: • Bio-economic dynamic model 2) Excel • Depletion modeling • Beverton and Holt Yield per recruit	Limit effort for all fleets catching groundfish Increase the age of first capture of species	
THE HARD-SUBSTRATE DEMERSAL FISHERY							
Artisanal multigear fleet Semi-industrial multigear fleet Recreational fleet Snapper Plumhead (*Rhomboplites aurorubens*) Redfish (*L. purpureus*) Yellowedge Grouper (*Epinephelus flavolimbatus*) Sweetlip (*Mycteroperca*	Sustainability of the fishery		1) Economic data –ex-vessel value 2) Landings and effort data 3) Biological data – size	30% 30% *Ad hoc* surveys	1) Beverton and Holt Yield per Recruit analysis (Institute of Marine Affairs; snappers)	Restrict fishing Increase the age of first capture of species Limit effort and increase mesh size of fishpots. Restrict effort, increase mesh size of fish traps	

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected for assessment purposes	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Recommendations / reference points used in assessments	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
interstitialis)							
THE COASTAL PELAGIC FISHERY							
Artisanal multigear fleet Carite (*Scomberomorus brasiliensis*) Kingfish (*Scomberomorus cavalla*) Sharks (*Carcharinus porosus*) Fyingfish (*Hirundicthys affinis*) Herrings, anchovies, sardines	Sustainability of fisheries resources		1) Economic data 2) Catch & effort data for all species listed 3) Biological data –size, maturity, age (carite, kingfish, sharks, flyingfish) 4) Biomass estimates from RV Fridtjof Nansen surveys in 1998	30% 30% *Ad hoc* surveys *Ad hoc* surveys	1) Excel • Length-based Thompson and Bell • Beverton and Holt Yield per recruit 2) ASPIC - Surplus Production	MSY No increase in fishing effort; gillnet mesh size should not be less than 4 3/4" stretched mesh. Gillnet stretched mesh size limit Line fishing should be encouraged over the use of gillnets. Size limit re: capture, sale of specified species. Harvesting of sardines as foodfish is prohibited by law.	Size/gear regulations
THE OCEANIC (HIGHLY MIGRATORY) PELAGIC FISHERY							
Semi-industrial pelagic longline fleet	Cooperate with ICCAT to		1) Landings and effort data	100%	1) Excel (FAO methodology)		ICCAT measures to take effect upon

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected for assessment purposes	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Recommendations / reference points used in assessments	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
Semi-industrial multi-gear fleet Recreational fleet Yellowfin tuna (*Thunnus albacores*) Bigeye tuna (*Thunnus obesus)* Skipjack tuna (Katsuwanus pelamis) Albacore (north Atlantic stock) (*Thunnus alalunga)* Albacore (south Atlantic stock) (*Thunnus alalunga)* Swordfish (north Atlantic stock) *Xiphias gladius)*	assess, protect and conserve resources		(longline fleet) 2) Technological and economic characteristics of the longline fishery	*Ad hoc* survey			promulgation of new fisheries management legislation

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) 10-15% of work time
(c) **15-20% of work time**
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	**Qualifications (include training courses)**	**Experience with analysis and assessment tools**
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1	• Master of Marine Management, • BSc (General) with major in Zoology & minor in Math, • CFRAMP/FAO/DANIDA Regional Training Course on Fish Stock Assessment (3 wks, 1996), • MS Excel & Access 2000 Visual Basic for Applications Fundamentals (5 days, 2004), • Microsoft Access 2000 (Introduction to Advanced) (4 days, 2003), • Introduction to Oracle: SQL and PL/SQL (5 days, 2001) • Introduction to Generalized Linear Modelling (GLM), Maximum Likelihood Techniques, Monte Carlo Modelling and their application in Fisheries Assessment (7 days, 2003) • Training in SPSS (few days, 2003/4)	MS Excel
Officer 2	• MS Marine Policy, in progress • BS, Natural Science, Zoology major • JICA, SPSS (2004) • MS Excel & Access 2000 Visual Basic for Applications Fundamentals (2004) • Introduction to Oracle: SQL and PL/SQL (5 days, 2003) • Microsoft Access (Introduction to Advanced) (1998) • CFRAMP, Shark Stock Assessment including Ageing using vertebrae (1997) • CFRAMP/FAO/DANIDA, Tropical Fish Stock Assessment Training Workshop (1996)	MS Excel, FISAT

	• CFRAMP, Biological Data Entry, Quality Control and Reporting using Trip Interview Program (TIP) (1996) • CFRAMP, Fish Ageing using Otoliths (1996) • Ministry of Agriculture, Land and Marine Resources - Fishery Management; Tropical Fish Stock Assessment (1992) • Ministry of Agriculture, Land and Marine Resources, Age and Growth Study of Carite (*Scomberomorus brasiliensis*) using otoliths (1991)	
Officer 3	• M.Phil in Zoology • BSc (General) with major in Zoology, • CFRAMP/FAO/DANIDA Regional Training Course on Fish Stock Assessment (1996), • CFRAMP Regional Training Course in Fisheries Statistics (1998) • MS Excel & Access 2000 Visual Basic for Applications Fundamentals (2004), • Microsoft Access 2000 (Introduction) Introduction to Oracle: SQL and PL/SQL (2001) • Training in SPSS (Fundamentals) (2003/4) • IICA/CARDI Abstracting Agricultural Information (1995) • Bibliographic database development using CDS/ISIS (UNESCO) (1994)	MS Excel

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1)	What is the appropriate level of fishing effort to avoid over-exploitation of the resources and attain economic efficiency in the operation of the fleets?
2)	What impact does pollution have on the status of the stocks?
3)	What is the role of fisheries in the socio-economic well being of coastal communities?

TURKS AND CAICOS ISLANDS.

1. Fishery Manager's Name (Director or CFO)

2. What sources of information are currently used for establishing management objectives for your fisheries?

- **(a) National consultations**
- **(b) Social and economic data available from national statistics authority**
- **(c) Stakeholder interview survey data**
- **(d) Local/Traditional ecological knowledge (ethno-scientific information)**
- **(e) Adopt objectives used by other countries with similar fisheries situations.**
- (f) **International fisheries instruments**
- (g) Other (specify) ……..

3. Do you actively measure/monitor the achievement of management objectives?

(a) **No (*please go to question 4*)** (b) Yes (*please go to question 5*).

4. If you answered negatively in (3), please indicate the constraints to monitoring management objectives.

- **(a) Insufficient data collected to allow evaluation.**
- (b) **Officers do not have sufficient time to analyse available data and hence prepare management advice**
- (c) Officers do not have sufficient skills and experience to analyse available data and hence prepare management advice
- (d) Assessment tools being used by officers are not appropriate, as these tools do not provide answers to the management questions of direct concern.
- (e) Defined objectives are too broad, and so officers do not provide specific management guidance on specific issues of concern, e.g. providing advice on suitable gear restrictions and acceptance of this as an effective management tool.
- (f) Other, specify ……

5. In table I that follows, list the management objectives for each fishery/ stock, allocate a priority rank to each of the objectives by fishery (using a scale of 1 to 5, with 1 used to indicate highest priority), then list the data collected to facilitate monitoring/measuring of the achievement of the listed objectives, and finally indicate the software tools currently used to analyse the available data (the first data input row shows an example).

Table I. Management objectives by fishery / stock

Fishery (identify specific species or stock)	Management objectives	Priority of objective	Data collected to measure achievement of objective	Sampling coverage (% total)	Analysis tools used [FISAT, prepared FAO Excel spreadsheets, SPSS, Other, specify]	Decision-making rules / reference points used, if any	Current management measures in place for each fishery / stock. Indicate if decision rule was used to establish measure
EXAMPLE. Large pelagic fishery – Spanish mackerel	1) Maximize employment opportunities 2) Maximize biological yield 3) Protect juvenile stock	1) 1 2) 2 3) 3	1) Social and economic data, catch and effort data 2) Catch & effort data 3) Catch, effort, age/size and maturity data	1) 20% 2) 30% 2) 30%, 15%	1) Excel 2) Surplus Production (ASPIC) 3) Excel spreadsheet for yield per recruit, VPA	1) Minimum net profit = 5% of costs 2) Lower limit of estimated MSY range 3) $F_{0.1}$	Mesh size limit for gill nets ($F_{0.1}$ value used).
Shallow reef Fish	1. Maintain Stock Levels at above 50% of biomass 2. Increase usage for economic gain	1. 1 2. 2	1. Catch, Effort, age/size and maturity data 2. Catch & Effort Data, economic data	1. 20% 2. 20%	1. Surplus Production (Excel), CEDA 2. Excel	1. Limit reference point to the lower limit of estimated MSY 2. Establish minimum net profit = > 5% of cost	NONE

Deep Slope Fishery	1. Determine spawning sites and take steps to ensure adequate protection of these sites	1. 3	1. Visual Census Create appropriate Legislation	1. 10%	1. Excel, Minitab	1.	1. NONE
	2. Determine breeding period.	2. 2	2. Catch, effort, age/size and maturity data	2. 10%	2. Excel		2. NONE
	3. Determine Size at maturity.	3. 1		3. 10%	3. Excel		3. NONE
	4. Assess stock status and exploitation levels	4. 4	3. Age/size and maturity data	4. 20%	4. Surplus Production, CEDA		4. NONE
			4. Conduct assessment of the stocks through surplus and size maturity models.				

Large Pelagics	1. Assess Stock Status and exploitation levels. 2. Increase catch & release fishery	1. 1 2. 2	1. Catch, effort, age/size and maturity data 2. Social and economic data, catch and effort data	1. 10% 2. 50%	1. Excel, Surplus Production CEDA 2. Excel	1. Set limit to UKOT quota as a maximum limit 2. Minimum Net Profit = 5% of costs	1. NO Long line fishing Following ICCAT Convention 2. NONE
Coastal Pelagics	1. Assess stock status and exploitation levels. 2. Increase exploitation levels	1. 1 2. 2	1. Catch and effort data 2. Social and economic data, catch and effort data	1. 5% 2. 5%	1. Excel, surplus model, CEDA 2. Excel	1. Determine MSY 2. ??	1. NONE 2. NONE

Conch fishery -	1. Continue using a harvesting quota 2. Implement a buffer between the actual harvested limit and the calculated MSY level 3. Assess the effectiveness of Reserve as a tool for fisheries management 4. Conduct cost and earnings studies for the fishing operations in the queen conch fishery. 5. Collect conchs from different regions of the banks and measure morphometric parameters.	1. 1 2. 2 3. 4 4. 3 5. 5	1. Catch & Effort Data 2. Social and economic data, catch and effort data, local consumption. and assumed illegal poaching data 3. Visual Survey with age/size maturity (morphometrics) 4. Social and Economic data 5. Morphometrics on size/age and maturity	1. 95% 2. 85% 3. 30% 4. 10% 5. 5%	1. Surplus Model (Schaefer) 2. Excel (projections) 3. Excel, Minitab 4. Excel 5. Excel	1. Establish MSY through stock assessment. 2. Set target at F_{MSY} to increase higher than it is at current status of 3980 boat-days for the year. 3. Determine if there is a significant difference b/w reserves and open access areas. 4. Increase fisher's net income by at least 15% by 2008. 5. NONE	1) Management Authority sets the quota according to the assessment by the Scientific Authority. 2) Management Authority sets the quota based on a precautionary approach to protection of the current stock. 3) Size limit of 7 inches siphomal length or meat weight of 8 oz. 4) NONE 5) NONE

Lobster fishery -	1. Conduct research to estimate the MSY and establish Target and Limit Reference points. 2. Determine recruitment index for spiny lobster 3. Maximize economic earnings while protecting stocks	1. 2 2. 1 3. 3	1. Catch & Effort Data 2. Catch & effort data, age/size and maturity data 3. Social and economic data	1. 20% 2. 30% 3. 10%	1. Excel, Recruitment Model 2. Yield per recruitment Excel 3. Excel	1. Establish Lower limit and MSY for stock 2. $F_{0.1}$ 3. Increase fisher's net income by at least 15% by 2008	1. NONE 2. Size of carapace 3.25 inches, no egg bearing females, no tar spotted females 3. No underwater breathing apparatus.

6. How much work time is currently allocated for data review and analysis tasks and hence also development of assessment skills by the fisheries officers so involved? (Answer is assumed to represent time for a single individual)

(a) < 5% of work time
(b) <u>10-15% of work time</u>
(c) 5-20% of work time
(d) 20-30% of work time
(e) > 30% of work time

7. In table II that follows, please provide information the qualifications of your officers involved in stock assessment work, and list the data analysis and assessment tools with which they are familiar (the first data input row shows an example.

Table II. Qualifications and experience of staff conducting assessments

Officer (names can be omitted)	Qualifications (include training courses)	Experience with analysis and assessment tools
Example: officer 1	B.Sc., M. Phil, 1995 FAO-Danida training course in assessment	Excel, S-Plus, FISAT, ECOPATH
Officer 1	B.Sc., M.Sc. K. Lockhart, 1996.	Excel, Minitab, Statisitca
Officer 2		
Officer 3		
Officer 4		

8. In table III that follows, note the top specific management questions, by fishery or stock, which currently concern management groups in your country (the first data input row shows an example).

Table III. Current management questions of highest priority.

Fishery	Question
Example: queen conch fishery	1) How effective are marine reserves in enhancing the spawning stock biomass?
1)Lobster Fishery	1. What is the recruitment index of spiny lobster within the TCI? 2. What is the current status of the spiny lobster stocks within the TCI?
2)Conch Fishery	1. Do Protected Areas work as intended? 2. Is there such as thing as “stunting”?

A QUESTIONNAIRE STUDY OF THE AVAILABILITY OF DATA WITHIN EIGHT CRFM MEMBER COUNTRIES

Maren Headley[1] and Susan Singh-Renton[2]

[1]Research Graduate, CRFM Secretariat, 3rd Floor Corea's Building, Halifax Street, Kingstown, St. Vincent and the Grenadines. Email:marenheadley@vincysurf.com
[2]Programme Manager, Research and Resource and Assessment, CRFM Secretariat, 3rd Floor Corea's Building, Halifax Street, Kingstown, St. Vincent and the Grenadines. Email:ssinghrenton@vincysurf.com

Abstract

A Questionnaire was prepared by the Secretariat to determine the nature and availability of data within CRFM Member States. Completed questionnaires were submitted by the following countries: British Virgin Islands, Dominica, Grenada, Jamaica, St. Lucia, Suriname, Trinidad and Tobago, and the Turks and Caicos Islands. The questionnaire responses received by the Secretariat were compiled and summarized in this paper. Based on the data provided, the Turks and Caicos Islands noted the availability of data from the earliest date (1887) for conch. Catch/ landings data were commonly recorded in pounds (lbs), and the majority of the countries collected catch/landings and effort data for their resources. Data gaps were observed, and these were most likely a consequence of fluctuations in staff time, staff resources, and support services dedicated to these tasks.

KEYWORDS: Caribbean, fisheries data

INTRODUCTION

The participants of the First Annual CRFM Scientific Meeting, (CRFM, 2005) acknowledged the importance of optimising the usage of the various types, amounts and quality of data usually gathered and made available within CRFM States. Notwithstanding, it was noted that it was often not possible for fisheries staff within CRFM States to apply the more conventional assessment methods, as these usually required high quality, reliable and detailed data. Consequently, the meeting participants recommended the establishment of a CRFM *Ad Hoc* Working Group on Methods, which would give specific attention to developing and testing assessment methods that could be more widely applied to data-poor situations, would make better use of the types and quality of data collected by CRFM Member countries and also that would address the particular management needs identified by fishery managers in the region. During its first meeting, the CRFM *Ad Hoc* Working Group on Methods began to review issues pertaining to the nature, quality and extent of fisheries data normally collected by CRFM States. However, recognizing the need for countries to provide more information to facilitate a comprehensive review during its second meeting, the Working Group on Methods requested that the Secretariat conduct a questionnaire study to obtain specific details of the nature and availability of data in CRFM States.

METHOD

The Secretariat prepared a questionnaire to obtain specific details of the nature and availability of data within CRFM States (Appendix 1). This questionnaire was distributed to data managers in CRFM States by electronic mail in May 2006. The responses received were reviewed during the Second Meeting of the CRFM *Ad Hoc* Working Group on Methods, and subsequently compiled and summarized in this paper.

RESULTS

Completed questionnaires were submitted by the following eight countries: British Virgin Islands, Dominica, Grenada, Jamaica, St. Lucia, Suriname, Trinidad and Tobago, and the Turks and Caicos Islands (Appendix 2).

Data Availability for Large Pelagic Fish Resources

For the large pelagic resources, six countries provided information on data availability: Dominica, Grenada, Jamaica, St. Lucia, Suriname, and Trinidad and Tobago (Table 1). Grenada reported the existence of data from the earliest date, 1978. All six countries indicated that data were available from 1996 onwards. The most common unit for recording catch /landings data was pounds (lbs). The data collected to measure/monitor effort included: number of trips, number of fishing hours, number of vessels and number of licences and deliveries. The biological data collected by countries included weight, length, sex, and maturity data. Data collection during offloading of vessels was the most common sampling source and method (Table 1). Of five responses received, four countries, Dominica, Grenada, Jamaica, and St. Lucia, indicated that they utilized raising methods (Table 1). The number of fleet types used to fish the large pelagic resources ranged from one to five, with Suriname having the most fleet types and Dominica having the least (Table 1). Trolling appeared to be the predominant gear used in the large pelagic fishery as indicated by the responses of Jamaica and St. Lucia (Table 1).

Data Availability for Conch and Lobster Resources

Five countries provided data on the conch and lobster resources: Grenada, Jamaica, St. Lucia, Trinidad and Tobago, and the Turks and Caicos Islands (Table 2). The Turks and Caicos Islands indicated that data on conch were available from 1887, and data on lobster were available from 1947. All the countries had data available for the conch and lobster resources from 1995. The predominant unit used to record catch/ landings was the pound (lbs) and the data collected to determine fishing effort included: number of trips, vessels, fishing days, average soak time and log sheets (Table 2). Data collection during offloading of vessels and fisher interview surveys were the two most common sampling sources and methods. The majority of countries collected biological data that included: weight, carapace length (lobsters), sex, and maturity data. Additionally, Grenada, Jamaica and the Turks and Caicos Islands indicated the use of raising methods. The number of fleet types within any country ranged from one to four, with Jamaica having the largest number of fleet types harvesting these resources, and Grenada having the least. The predominant gears identified by Jamaica, St. Lucia and the Turks and Caicos Islands included: nets, Z_traps, SCUBA and Hookah (Table 2).

Data Availability for Small Coastal Pelagic Fish Resources

Dominica, Grenada, Jamaica, St. Lucia, Suriname, and Trinidad and Tobago provided information on the available data for the small coastal pelagic resources (Table 3). Trinidad and Tobago noted that data were recorded from as early as 1957. All the countries indicated that data were available from 1996 (Table 3) onwards. The pound (lbs) was the predominant unit used to record catch /landings, and a variety of data associated with fishing effort were collected; these included the number of trips, the number of vessels, hours fished, licences, deliveries, fishing days and number of hooks (Table 3). Most sampling occurred during offloading of vessels, and the following five countries indicated the use of raising methods: Dominica, Grenada, Jamaica, St. Lucia, and Trinidad and Tobago (Table 3). The majority of countries collected biological data, which included weight, length, sex, and maturity data. Weight data were collected with the highest frequency. Of the responses received, the number of fleet types per country ranged from one to nine, with Trinidad and Tobago having the most fleet types harvesting these resources and Dominica having the least (Table 3). Predominant gears were identified only by Jamaica and St. Lucia; in these instances, the main gears were nets and lines (Table 3).

Data Availability for Reef and Slope Fish Resources

Seven countries provided information on data availability for reef and slope fish resources: British Virgin Islands, Dominica, Grenada, Jamaica, St. Lucia, Suriname and the Turks and Caicos Islands (Table 4). Suriname noted the existence of data records from as early as 1969. By 1996, data were being recorded in Dominica, Grenada, Jamaica, St. Lucia, and the Turks and Caicos Islands (Table 4). Catch /landings were commonly recorded in pounds (lbs), and the data collected to monitor fishing effort included: the number of trips, hours fished, number of vessels, days fished, and licences. The most common sampling source and method were direct observations conducted during the offloading of vessels (Table 4). The majority of countries collected biological data, which included weight, length, sex, and maturity data (Table 4). Five countries indicated the use of raising methods: Dominica, Grenada, Jamaica, St. Lucia and the Turks and Caicos Islands. Suriname reported the largest number of fleet types (6) while Dominica reported the least (1). The predominant gears, based on responses from three countries, were Hookah, lines, pots and traps (Table 4).

Data Availability for Shrimp and Groundfish Resources

Information on shrimp and groundfish data was provided by three countries; Jamaica, Suriname and Trinidad and Tobago (Table 5). Trinidad and Tobago noted the existence of data records as early as 1957. Suriname's data records began in 1969, while Jamaica has data only from 1996. Catch /landings were recorded in pounds (lbs) in Jamaica and Trinidad and Tobago, and in kilograms (kgs) in Suriname (Table 5). The data collected to determine fishing effort included: the number of vessels, number of days, number of trips, licences, fishing hours and deliveries (Table 5). The countries collected biological data, which included: weight, carapace length (shrimp), length (groundfish), sex, and maturity data. Sampling most commonly occurred during direct observation of offloading of vessels. All three countries indicated the use of raising methods (Table 5). Both Suriname and Trinidad and Tobago reported the operation of nine fleet types for their shrimp and groundfish fisheries, while Jamaica reported only two fleet types (Table 5). Only Jamaica provided information on the predominant gears, noting the operation of shove and small gill nets, push nets and beach seine (Table 5).

Data Availability for Markets, Processing Plants, Landing Sites and Trading Vessels

Seven countries provided data on the number of markets, processing plants, landing sites and trading vessels: Dominica, Grenada, Jamaica, St. Lucia, Suriname, Trinidad and Tobago, and the Turks and Caicos Islands (Table 6). The number of markets identified ranged from 1 to 223; Trinidad and Tobago reported the largest number of markets, while St. Lucia had the least (Table 6). The number of processing plants ranged from 1 to 18. Additionally, Trinidad and Tobago noted that 55 processing plants operated seasonally (Table 6). Jamaica listed the largest number of landing sites (175), while the Turks and Caicos Islands had the least (5). Grenada was the only country that reported the operation of trading vessels (Table 6).

DISCUSSION/CONCLUSIONS

Not all CRFM Member States participated in the questionnaire study. Moreover, the eight countries, which participated in the study, did not provide responses to all questions. Nonetheless, the completed questionnaires provided valuable updated information about the extent of countries' fishing fleets and statistical monitoring of their operations.

Such information is useful for informing data analysis planning and preparations. It is interesting to note that all countries reported availability of data from 1996, when the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP) was providing financial and technical support to help countries to improve and expand their fishery data and information systems. However, data gaps were apparent within the national fisheries databases, and this was most likely due to fluctuations in staff time, staff resources, and local administrative support dedicated to fisheries monitoring, which were known to occur in spite of available funding support.

When the results of the questionnaire study were reviewed during the Second Meeting of the CRFM Ad Hoc Working Group on Methods (CRFM, in prep.), it was noted that only one country provided information on the availability of data that were not computerized. In view of the likelihood that several countries may have data from earlier periods that are not available in an electronic format, the Second Meeting of the CRFM Ad Hoc Working Group on Methods noted the importance of examining this issue further in the near future, with the intention of formulating a proposal to have these data computerized in an accessible electronic format.

REFERENCES

CRFM (2003) Report of The Joint Meeting of the CRFM Large Pelagic Fisheries Working Group (CRFM LPWG), the CRFM Reef and Slope Fisheries Working Group (CRFM RSWG), and the CRFM Small Coastal Pelagic Fisheries Working Group (CRFM SCPWG). *CARICOM Fishery Report* No. 10, 179 pp.

CRFM (2005) Report of the First Annual CRFM Scientific Meeting. *CRFM Fishery Report*, No. 11, 318pp.

CRFM, in prep. Report of the Second Meeting of the CRFM Ad Hoc Working Group on Methods. *CRFM Fishery Report*, in prep.

Table 1: Details of Data That Are Available On Large Pelagic Resources in CRFM States.

Country	Species	Year	Catch/ Landings	Effort	Biology	Sampling Source & Method	Raising Methods	No. of Fleet Types	Predominant Gear
British Virgin Islands	Offshore pelagics	NA (Not Available)	NA	NA	Yes	During offloading of vessels and processing plant submission	NA	NA	NA
Dominica	All species	1996-NA	lbs	NA	Yes	During offloading of vessels	Yes	1	NA
Grenada	All fin-fish species	1978-2006	lbs	No. of trips	Yes	During offloading of vessels and exporting plant and trading records	Yes	4	NA
Jamaica	Large pelagics	1996-2006	lbs	No. of hours	Yes	During offloading of vessels and fisher interview surveys at landing site	Yes	2	Trolling lines
St. Lucia	Large pelagics	1995-2005	lbs	No. of vessels	Yes	During offloading of vessels, vending and fisher interview surveys at landing site	Yes	3	Trolling
Suriname	Large pelagics	1991-2006	kg	No. of licences and deliveries	No	Fishing company submission	No	5	NA
Trinidad and Tobago	Large pelagics	1981-2006	lbs	NA	Yes	Trip reporting system	NA	3	NA
Turks and Caicos Islands	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2: Details of Data That Are Available On Conch and Lobster Resources in CRFM States.

Country	Species	Year	Catch/ Landings	Effort	Biology	Sampling Source & Method	Raising Methods	No. of Fleet Types	Predominant Gear
British Virgin Islands	Lobster	NA	NA	NA	Yes	During offloading of vessels, fisher interview survey and fishery independent surveys	NA	NA	NA
Dominica	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grenada	Lobster and queen conch	1978*-2006	lbs	No. of trips	Yes	During offloading of vessels and exporting plant and trading records	yes	1	NA
Jamaica	Lobster and queen conch	1994-2006	lbs/kg	Log sheets and hours	Yes	During offloading of vessels, fisher interview and abundance surveys	yes	4	Nets, Z-traps, SCUBA, Hookah and free dives
St. Lucia	Lobster and queen conch	1995-2005	lbs	No. of vessels	Yes	During offloading, vending and fisher interview surveys		3	Scuba tanks (Conch) Pots (lobsters)
Suriname	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trinidad and Tobago	Lobster	1957-2006	lbs	No. of vessels, trips, hours, fishing days, hooks and average soak time	NA	During offloading of vessels and vending	NA	NA	NA
Turks and Caicos Islands	Lobster and queen conch	1887-2006	lbs	No. of days (boat and man)	Yes	During offloading of vessels, fisher interview surveys, fishery independent surveys, processing plant records, and DECR-research	yes	2	Traps and free diving

Table 3: Details of Data That Are Available On Small Coastal Pelagic Resources in CRFM States.

Country	Species	Year	Catch/ Landings	Effort	Biology	Sampling Source & Method	Raising Methods	No. of Fleet Types	Predominant Gear
British Virgin Islands	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dominica	Coastal pelagics	1996-NA	lbs	NA	Yes	During offloading of vessels	Yes	1	NA
Grenada	Coastal pelagics	1978-2006	lbs	No. of trips	Yes	During offloading of vessels and exporting plant and trading vessel records	Yes	4	NA
Jamaica	Coastal pelagics	1996-2006	lbs/kg	No. of hours	Yes	During offloading of vessels and fisher interview surveys	Yes	2	Nets and lines
St. Lucia	Coastal pelagics	1995-2005	lbs	No. of vessels	Yes	NA	Yes	3	Nets
Suriname	Coastal pelagics	1991-2006	kgs	No. of licences and no. of deliveries	Yes	During offloading of vessels and observer programmes	NA	3	NA
Trinidad and Tobago	Coastal pelagics	1957-2006	lbs	No. of vessels, trips, hours, fishing days, hooks and average soak time	Yes	During offloading of vessels and vending	Yes	9	NA
Turks and Caicos Islands	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4: Details of Data That Are Available On Reef and Slope Fishes Resources in CRFM States.

Country	Species	Year	Catch/ Landings	Effort	Biology	Sampling Source & Method	Raising Methods	No. of Fleet Types	Predominant Gear
British Virgin Islands	Red hind and other species	NA	NA	NA	Yes	Observer programmes, fisher interview surveys and independent surveys	NA	NA	NA
Dominica	All species	1996-NA	lbs	NA	NA	During offloading of vessels	Yes	1	NA
Grenada	Fin-fish species	1978-2006	lbs	No. of trips	Yes	During offloading of vessels and export plant and trading vessel record	Yes	4	NA
Jamaica	Demersals on coral reefs and slopes	1996-2006	lbs	No. of hours fished	Yes	During offloading of vessels and fisher interview surveys	Yes	2	Hookah
St. Lucia	shallow shelf and reef and deep slope fishes	1995-2005	lbs	No. of vessels	Yes	During offloading of vessels, vending and fisher interview surveys	Yes	3	Lines and pots
Suriname	Demersals	1969-2006	kgs	Days fished and no. of licences	Yes	During offloading of vessels, observer programmes and fishing company submission and enumerator	No	6	NA
Trinidad and Tobago	NA	NA	NA	NA	NA	NA	NA	NA	NA
Turks and Caicos Islands	Fin-fish species	1990-2002	lbs	No. of man and boat days	No	Observer programmes and collaboration with SFS	Yes	2	Traps and line

Table 5: Details of Data That Are Available On Shrimp and Groundfish Resources in CRFM States.

Country	Species	Year	Catch/ Landings	Effort	Biology	Sampling Source & Method	Raising Methods	No. of Fleet Types	Predominant Gear
British Virgin Islands*	-	-	-	-	-	-	-	-	-
Dominica	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grenada	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jamaica	Shrimp	1996-2006	lbs	No. of hours	Yes	During offloading of vessels and fisher interview surveys	Yes	2	Shove and small gill nets, push nets and beach seine
St. Lucia*	-	-	-	-	-	-	-	-	-
Suriname	Shrimp and groundfish	1969-2006	kg	No. of days fished, no. of licences and no. of deliveries	Yes	During offloading of vessels, processing plant records, observer programmes and fishing company submission	Yes	9	NA
Trinidad and Tobago	Shrimp and groundfish	1957-2006	lbs	No. of vessels, trips, fishing hours, fishing days, hooks and average soak time	Yes	During offloading of vessels, vending, fisher interview surveys and fisher independent surveys	Yes	9	NA
Turks and Caicos Islands*	NA	NA	NA	NA	NA	NA	NA	NA	NA

* No Shrimp and Groundfish Fishery

Table 6: The Number of Markets, Processing Plants, Landing Sites and Trading Vessels for Resources by Country.

Country	Fisheries	No. of Markets	No. of Processing Plants	No. of Landing Sites	No. of Trading Vessels
British Virgin Islands	NA	NA	NA	NA	NA
Dominica	All	3	0	31	0
Grenada	Fin fish	6	4	40	6
	Lobster & Conch	2	2	14	6
Jamaica	Conch	Majority exported	3	Offshore and 5 major sites on mainland	0
	Lobster and small pelagics	General markets	3 for lobsters (same as conch)	5 major sites for lobster 44 major sites for small pelagics	0
	Demersal Reef and Slope	General markets	No specific plant	175	0
	Shrimp and Offshore pelagics	General markets	No specific plant	122 for offshore pelagics 12 for shrimp	0
St. Lucia	All	1	1	17	0
Suriname	Shrimp	2	2	2	0
	Groundfish	14	10	14	0
	Pelagics	3	10	3	0
	Sharks and rays	14	10	14	0
	Pelagics	14	10	14	0
Trinidad and Tobago	Coastal Pelagics, Hard and soft substrate demersals	223	18- year round 55-seasonal	65	0
Turks and Caicos Islands	Lobster and conch	2	5	5	0
	Fin-fish	1	5	5	0

Appendix 1

CRFM AD HOC WORKING GROUP ON METHODS
QUESTIONNAIRE TO OBTAIN DETAILS ON DATA AVAILABILITY

Note to Fishery Data Managers: At the request of the CRFM Ad Hoc Working Group on Methods, this questionnaire has been designed to gather information on the nature and extent of data currently available within CRFM countries. The information provided will be reviewed during the Second Meeting of the Working Group, scheduled to take place within the next few weeks.

Instructions for completion: ***Please print all responses.***

1. (a) Country…… (b) Fishery Data Manager's Name ……..

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

_____

_____

_____

_____

_____

_____

_____

_____.

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	**Fishery Statistics**	**Periodicity of Collection (mark the applicable columns with 'X')**					**Method of Collection (mark the applicable columns with 'X')**						**Comments (additional information can be included here)**
		once	**daily**	**monthly**	**annually**	**Ad-hoc (needs basis)**	**Direct sampling during vessel offloading operations**	**Direct sampling during vending operations**	**Observer programs**	**Fisher interview surveys**	**Fishery independent surveys**	**Other (specify)**	
EXAMPLES	landings		X				X						
	effort		X				X						
Wahoo & dolphinfish	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		

	Area of occurrence										X		
	Habitat type										X		
	depth										X		

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

_____

_____

_____

_____

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

1. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
2. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
3. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns*.
4. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
5. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.
6. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
7. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme.

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____		**FISHERY DETAILS[2]** **No. markets:** ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____		**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine overall effort totals gear type, fleet type, and hence also landing site	
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	

(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings	

EXAMPLE 2 **SPECIES[1]:** queen conch and spiny lobster_____		**FISHERY DETAILS[2]** **No. markets:** ____3 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___3_primary; 15 secondary; 15 tertiary_____		**No. fleet types:** ___2 major fleets_____ **No. gear types:** ___2 major gears_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	

(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely resource distribution	

SPECIES[1]: _____		FISHERY DETAILS[2]			
		No. markets: _____ No. processing plants: _____ No. landing sites: _____		No. fleet types: _____ No. gear types: _____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**

BRITISH VIRGIN ISLANDS

1. (a) Country**:** **BRITISH VIRGIN ISLANDS** (b) Fishery Data Manager's Name: **Ms. Abbi E. Christopher**

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

Major species include:

Caribbean Spiny Lobster (*Panulirus argus)*
Queen Conch (*Strombus gigas),*
Whelk (*Cittarium pica),*
Blue Tang (*Acanthurus coeruleus),*
Surgeon *(A. bahianus)* and Doctorfish (*A. chirurgus)*,
Parrotfish species (*Scaridae* sp.*)*,
Grunts (*Haemulidae* sp.),
Triggers (*Balistidae* sp.),
Red Hind (*Ephinephelus guttatus),*
Bonito (S*arda sarda)*
***S*ome species of Carangids (mostly blue runner and carevalle jack),**
Hardnose (*Caranx crysos),*
Yellowtail (*Ocyurus chrysurus),*
Snappers *(Lutjanus spp.)*,
Groupers (*Ephinephelus* spp.),
Shellfish (*Lactophrys* sp.*),*
Tuna (*Thunnus* sp.),
Dolphin (*Coryphaena hippurus)*,
Swordfish (*Xiphias gladius)*,
Kingfish (*Scomberomorus cavalla)*
Wahoo *(Acanthocybium solandri*).

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	**Fishery Statistics**	**Periodicity of Collection (mark the applicable columns with 'X')**					**Method of Collection (mark the applicable columns with 'X')**						**Comments (additional information can be included here)**
		once	**daily**	**monthly**	**annually**	**Ad-hoc (needs basis)**	**Direct sampling during vessel offloading operations**	**Direct sampling during vending operations**	**Observer programs**	**Fisher interview surveys**	**Fishery independent surveys**	**Other (specify)**	
Wahoo & Dolphin	Landings			X	X	X	X					Processing plant records examined annually	
	Effort			X	X	X	X						
	Weight			X	X	X	X						Size references taken to mean weight in kg
	Catch			X	X	X	X						
	Habitat Type				X								
	Area fished			X	X	X	X						
Other Offshore Pelagic Species	Landings			X	X	X	X					Processing plant records examined annually	
	Effort			X	X	X	X						
	Catch			X	X	X	X						
	Area Fished			X	X	X	X						
	Weight			X	X	X	X						
	Habitat Type				X								
Queen Conch and Whelk	Effort			X	X	X				X			
	Catch			X	X	X				X			
	Area fished			X	X	X				X			
	meat weight			X	X	X							
	Size			X	X	X				X			
	Sex					X				X			
	Maturity					X				X			Macroscopic examination
	Area of occurrence					X				X			

	Habitat type			X	X	X				X			
	Depth					X				X			
Lobster	Effort			X	X	X	X			X	X		
	Catch			X	X	X	X			X	X		
Lobster (cont.)	Area fished			X	X	X	X			X	X		
	Carapace length			X	X	X	X			X			
	Sex			X	X	X	X			X			
	Maturity			X	X	X	X			X	X		Stage of gravidity (egg colour, presence/absence of tarspot)
	Area of occurrence			X	X	X	X			X	X		
	Habitat type			X	X	X	X			X	X		
	Depth									X			
	Weight			X		X	X						
Red Hind	Effort			X	X	X				X	X		
	Catch			X	X	X				X	X		
	Area fished			X	X	X				X			
	Lengths			X	X	X			X	X	X		
	Weight			X	X	X				X	X		
	Sex					X				X	X		
	Maturity					X				X	X		Macroscopic examination and collection of gonad weight for est. of GSI
	Area of occurrence			X	X	X			X	X	X		
	Habitat type								X	X	X		

	Depth								X	X	X		
Other Reef and Slope Fish	Effort			X	X	X							
	Catch			X	X	X							
	Area fished			X	X	X							
	Lengths			X	X	X							
	Weight			X	X	X							
	Sex				X	X							
	Area of occurrence			X	X	X							
	Habitat type			X	X	X							

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **Reef Watchers, the Jerecki Foundation (baseline data and comparative studies of surrounding Marine life (mainly Guana Island), National Parks Trust, BVI Chamber of Commerce: and**
- **Hotel Association, BVI Dive Association, Agriculture, Fisheries, Construction, Mining and Quarrying Subcommittee, VISAR, and other government agencies**.

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for Wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

8. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
9. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*

There is one government operated Fishing Complex in the BVI on the main Island of Tortola.

<u>Artisanal</u>

Alimoso and Davies (1991) found that there were about 300 artisanal fishermen operating in the BVI waters. Fifty percent of these fishers own fishing gear and boats while the other 50% do not own any gear or craft and act as helpers or employees of the gear owners. Pomeroy (1999) was able to establish that in 1998, there were 174 commercial fishers and a crew of 200, giving a total of 374 fishers. Records at the Conservation and Fisheries Department show 150 registered boats, 80% of which are less than 8 m (25 feet) in length. The main fishing gears used was fish traps, hook and lines and

fishing nets (mainly gill and seine nets). A relatively small amount of hook and line (vertical long lining) is conducted in the surrounding deep water.

Pelagic Fishery

Two locally based long-liners started operating in the BVI in 1985 and 1992. They account for the majority of the commercially sold pelagic catches.

10. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns*.
11. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
12. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.
13. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
14. Include any other additional information that may assist in estimation of totals.

COMMONWEALTH OF DOMINICA

1. (a) Country…**DOMINICA**…… (b) Fishery Data Manager's Name: **Andrew Magloire**

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

Yellowfin tuna (*Thunnus albacares*)
Blue marlin (*Makaira nigricans*)
Dolphin fish (*Coryphaena hippurus*)
Skipjack tuna (*Katsuwonus pelamis*)
Blackfin tuna (*Thunnus atlanticus*)
Wahoo (*Acanthocybium solandri*)
King mackerel (*Scomberomorus cavalla*)
Flyingfish (*Hirundichthys affinis*)

Reef Fish species
Queen snapper (*Etelis oculatus*)
Coastal pelagics

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	**Fishery Statistics**	**Periodicity of Collection (mark the applicable columns with 'X')**					**Method of Collection (mark the applicable columns with 'X')**						**Comments (additional information can be included here)**
		Once	**daily**	**monthly**	**annually**	**Ad-hoc (needs basis)**	**Direct sampling during vessel offloading operations**	**Direct sampling during vending operations**	**Observer programs**	**Fisher interview surveys**	**Fishery independent surveys**	**Other (specify)**	
EXAMPLES Wahoo & dolphinfish	landings		X				X						
	effort		X				X						
	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		
	Area of occurrence										X		
	Habitat type										X		
	depth										X		
	Landings		X				X						
ALL SPECIES	Effort		X				X						

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- National census data, demographic data, customs import and export data, weather data
- Agencies involved are the national Statistics Office, Meteorological office, Customs and Excise

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question

1. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
2. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
3. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns.*
4. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
5. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season.*
6. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
7. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____		**FISHERY DETAILS[2]**			
		No. markets: ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____		**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine overall effort totals gear type, fleet type, and hence also landing site	
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	

(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings	

EXAMPLE 2 **SPECIES[1]:** queen conch and spiny lobster_____		**FISHERY DETAILS[2]** **No. markets:** ____3 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___3_primary; 15 secondary; 15 tertiary_____		**No. fleet types:** ___2 major fleets_____ **No. gear types:** ___2 major gears_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely resource distribution	

SPECIES[1]: __ALL SPECIES_____		FISHERY DETAILS[2]			
		No. markets: ___3 main_____ **No. processing plants:** _None_____ **No. landing sites:** _31_____		**No. fleet types:** ___One_____ **No. gear types:** __6 major gear types	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings by species (lbs) (individual landings for large pelagic species and aggregated for demersal species)	1996	Data is collected at 13 major landing sites	90% coverage at all sites sampled which include primary, secondary and tertiary. Non sampled sites are compared based on levels of activity . Such sites are done by observation of about 10% coverage.	Use number of sampling days and sampled totals of vessels to determine total number of fishing days and overall total landings by landing site.	A census is done at most site

GRENADA

1. (a) Country…**GRENADA**.. (b) Fishery Data Manager's Name: VACANT (COMPLETED BY JUSTIN RENNIE)

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

Great barracuda	*Sphyraena barracuda*
Common dolphin fish	*Coryphaena hippurus*
Pompano dolphinfish	*Coryphaena equiselis*
Black jack	
Spanish mackerel	*Scomberomorus brasliensis*
Cero/Spanish mackerel	
King mackeral	*Scomberomorus cavalla*
Atlantic bonito	*Sarda sarda*
Bluefin tuna	*Thunnus thynnus thynnus*
Southern sennet	*Sphyraena picudilla*
Wahoo	*Acanthocybium solandri*
Yellow fin tuna	*Thunnus albacares*
Northern Bluefin tuna	
Little tunny	
Atlantic sailfish	Istiophorus albicans
Blackfin tuna	Thunnus atlanticus
Skipjack tuna	Katsuwonus pelamis
Bullet tuna	
Blue marlin	*Makaira nigricans*
White marlin	*Tetrapturus albidus*
Rainbow runner	*Elagatis bipinnulatus*
Sword fish	*Xiphias gladius*
Frigate tuna	*Auxis thazard*
Bigeye tuna	*Thunnus obesus*
Shark	*Carcharhinidae*
Albacore	*Thunnus alalunga*
Flying fish	Exocotidae
Porpoise	
False herring	*Harengula clupeola*
Atlantic thread herring	*Opithonema olignum*
Brazilian sardine	*Sardinella brasiliensis*
Jack	Carangidae
Moon fish	Carangidae
keeltail needle fish	*Platybelone argalus*
Round scad	*Decapterus tabl*
Bigeye scad	*Selar crumenopthalmus*
Anchovie	*Anchoa hepsetus*
Ballyhoo halfbeak	*Hemiramphus brasiliensis*
Common snook	Centropomidae
Grouper	Serranidae
Snapper	Lutjanidae
Squirrel fish	Holocentridae

Parrot fish	Scaridae
Sandtile fish	*Malacanthus plumeri*
Grunt	Pomadasyidae
Goat fish	Mullidae
Red hind	*Epinephelus guttatus*
Queen trigger fish	*Balistes vetula*
Doctor fish	Acanthuridae
Coney	*Cephalopholis fulvus*
Conch	*Strombus gigas*
Lobster	*Panulirus argus*
Turtle	Chelonidae
Sea urchin	*Tripneustes ventricosus*
Squid	Loliginidae

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	**Fishery Statistics**	**Periodicity of Collection (mark the applicable columns with 'X')**					**Method of Collection (mark the applicable columns with 'X')**						**Comments (additional information can be included here)**
		once	**daily**	**monthly**	**annually**	**Ad-hoc (needs basis)**	**Direct sampling during vessel offloading operations**	**Direct sampling during vending operations**	**Observer programs**	**Fisher interview surveys**	**Fishery independent surveys**	**Other (specify)**	
EXAMPLES	landings		X				X						
	effort		X				X						
Wahoo & dolphinfish	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		
	Area of occurrence										X		
	Habitat type										X		
	depth										X		
All Species	Landings		X				X					Exporting Plant & Trading Vessel Record	

	Effort		X				X					"	
	Area fished		X				X					"	
	Gear		X				X					"	
	Export		X									"	
	Ex-vessel price		X				X					"	
Billfish	Length					X	X						

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **Import of fish and fishery products, GDP, Financing to the Fisheries Sector, Population Census – Statistics Dept., Ministry of Finance**

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

1. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
2. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
3. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns.*
4. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
5. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.
6. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
7. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____	**FISHERY DETAILS[2]** **No. markets:** ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____		**No. fleet types:** ___4 major & 2 fleets that harvest a **No. gear types:** ___2 major gears plus 3 other gear
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sa data to provide totals for entire industry**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and samp totals of vessels by fleet type out fishing at secondar to determine total number of fishing days and hence landing totals by gear type, fleet type, and hence site
(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and samp totals of vessels by fleet type out fishing at secondar to determine overall effort totals gear type, fleet typ hence also landing site
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, t into account the numbers and types of sampling strat covered.
(iv) age data	Not available		NA	NA
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, into account the numbers and types of sampling covered.
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, into account the numbers and types of sampling covered.
(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings

EXAMPLE 2 **SPECIES[1]:** queen conch and spiny lobster_____	**FISHERY DETAILS[2]** **No. markets: ____**3 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___3_primary; 15 secondary; 15 tertiary_____		**No. fleet types:** ___2 major fleets_____ **No. gear types:** ___2 major gears_____
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected sample data to provide totals industry[6]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sam sample-day totals of vessels by fleet at each site type to determine total n days and hence overall landing tota fleet type, and hence landing site
(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sam sample-day totals of vessels by fleet at each site type to determine total n days and hence overall landing tota fleet type, and hence landing site
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landi taking into account the numbers and sampling strata covered.
(iv) age data	Not available		NA	NA
(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total land taking into account the numbers sampling strata covered.
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total land taking into account the numbers sampling strata covered.
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total land taking into account the numbers sampling strata covered.
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely res distribution

SPECIES[1]: _____Fin fish_____		FISHERY DETAILS[2]		
		No. markets: ___6 main___ **No. processing plants:___ 4 main_____** **No. landing sites:** ___6 primary; 30 secondary; 4 tertiary; 6 trading vessels____		**No. fleet types:** _____4 major fleets_____ **No. gear types:** _____4 major gears_____
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample provide totals for entire industry[6]**
1. landing by species/species grouping	1978 - present	Markets, processing plants, trading vessels 4 major fishery types 4 major gear types	Total census conducted at primary landing sites, fish exporting establishments and trading vessels	Index of 1.75 and 1.4 used , depends on the level of covera on knowledge of the fishery
2. effort -trip	1996 - present	Markets, processing plants 3 major fishery types 3 major gear types	Total census conducted at primary landing sites, fish exporting establishments	Index of 1.75 and 1.4 used , depends on the level of covera on knowledge of the fishery
3. ex-vessel price (EC$/lb)	1978 – present	Markets, processing plants, trading vessels 4 major fishery types 4 major gear types	Total census conducted at primary landing sites, fish exporting establishments and trading vessels	
4. length - cm	1996 2000	Markets 2 major fishery types 2 major fishery types	Sampling conducted at 3 markets	
5. maturity data	1996 1998	Markets	Sampling conducted at 3 markets	

SPECIES[1]: ____Queen conch & Spiny lobster		FISHERY DETAILS[2]		
		No. markets: __2 main_____ **No. processing plants:** ___2 main_____ **No. landing sites:** _2 primary; 10 secondary; 2 tertiary; 6 trading vessels____		**No. fleet types:** ___1 major_____ **No. gear types:** ____1 major_____
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**
1. landing by species	1978 - present	Data collected at 2 markets, 2 processing plants and 6 trading vessels	Total census collected at primary landing sited, tertiary landing sites and trading vessels	Index of 1.75 used , depends on the level of coverage, based on knowledge of the fishery
2. effort - trip	1998 - present	Data collected at 2 markets and 2 processing plants	Total census collected at primary and tertiary landing sites	Index of 1.75 used , depends on the level of coverage, based on knowledge of the fishery
3. ex-vessel price (EC$/lb)	1978 - present	Data collected at 2 markets, 2 processing plants and 6 trading vessels	Total census collected at primary and tertiary landing sites	

JAMAICA

1. (a) Country…**JAMAICA** …… (b) Fishery Data Manager's Name: ……**June Masters** …….

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

There are seven main groups of species, of which the first two listed represent the highest commercial value:

- **Queen conch (*Strombus gigas*)**
- **Caribbean spiny lobster (*Panulirus argus*)**
- **Demersal fish living on coral reefs**
- **Demersal fish living at the drop-off of the main shelf and banks**
- **Small pelagic fish living on the shelf around the main island and small banks**
- **Shrimp living in muddy waters near shore (Area 1)**
- **Large pelagic fish living in the deep waters**

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	**Fishery Statistics**	**Periodicity of Collection (mark the applicable columns with 'X')**					**Method of Collection (mark the applicable columns with 'X')**						**Com (add infor ca inc h**
		Once	**daily**	**monthly**	**annually**	**Ad-hoc (needs basis)**	**Direct sampling during vessel offloading operations**	**Direct sampling during vending operations**	**Observer programmes**	**Fisher interview surveys**	**Fishery independent surveys**	**Other (specify)**	
EXAMPLES	landings		X				X						
	effort		X				X						
Wahoo & dolphinfish	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		
	Area of occurrence										X		
	Habitat type										X		
	depth										X		
Queen conch (*Strombus*	Landings					X	X sometimes		X				

gigas)	Effort					X	X sometimes		X			Abundance surveys (visual surveys) carried out once every 5 years.	Data colle durir open whic decla every
	Catch					X	X sometimes		X				
	Area fished					X	X sometimes		X				
	Meat weight					X	X sometimes		X				
	Depth					X	X sometimes						
	Sex					X	X sometimes		X				
	Maturity					X	X sometimes		X				
	Areas of occurrence					X	X sometimes		X				
Caribbean spiny lobster (*Panulirus argus*)	Landings			X			X		X sometimes	X			Data colle mont exce durir close seas 1Apr June year.
	Gear information			X			X		X sometimes	X			
	Depth			X			X		X sometimes	X			
	Fishing grounds			X			X		X sometimes	X			

	By-catch and target catch			X			X		X sometimes	X			
	Weight			X			X		X sometimes	X			
	Carapace length			X			X		X sometimes	X			
	Sex			X			X		X sometimes	X			
	Maturity			X			X		X sometimes	X			
	Effort			X			X		X sometimes	X			
	Ex-vessel price			X			X						
▪ Demersal fish living on coral reefs ▪ Demersal fish living at the drop-off of the main shelf and banks	Landings			X			X			X			
	Gear information			X			X			X			
	Depth			X			X			X			
	Fishing grounds			X			X			X			
	By-catch ad target catch			X			X			X			
	Weight by species			X			X			X			
	Effort			X			X			X			
	Ex-vessel price			X			X			X			
▪ Small pelagic fish living on the shelf around the main island and small banks	Landings			X			X			X			
	Gear information			X			X			X			
	Effort												
	Depth			X			X			X			
	Fishing grounds			X			X			X			
	By-catch and target catch			X			X			X			
	Weight by species			X			X			X			

	Fork length of Atlantic thread herring			X			X			X			
	Sex of Atlantic thread herring			X			X			X			
	Maturity of Atlantic thread herring			X			X			X			
	Length & weight of individual Atlantic thread herring			X			X			X			
	Ex-vessel price per species			X			X			X			
▪ Shrimp living in muddy waters near shore	Landings			X			X			X			
	Gear Information			X			X			X			
	Depth			X			X			X			
	Fishing grounds			X			X			X			
	By-catch and target catch			X			X			X			
	Weight by species			X			X			X			
	Carapace length			X			X			X			
	Total and tail length			X			X			X			
	Sex			X			X			X			
	Maturity			X			X			X			
	Effort			X			X			X			

	Ex-vessel price			X			X			X			
▪ Large pelagic fish living in the deep waters	Landings			X			X			X			
	Gear information			X			X			X			
	Depth			X			X			X			
	Fishing grounds			X			X			X			
	By-catch and target catch			X			X			X			
	Weight by species			X			X			X			
	Total length of Skip jack and Dolphin			X			X			X			
	Sex			X where possible			X where possible			X where possible			
	Maturity			X where possible			X where possible			X where possible			
	Effort			X			X			X			
	Ex-vessel price			X			X			X			

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **Ministry of Agriculture and Lands – historic data, research papers, government data; customs export data.**
- **The statistical Institution of Jamaica – Import and export data, responsible for censuses and household surveys, other economic and social data.**
- **National Environmental and Planning Agency (NEPA) – data on natural environment, e.g. license for building or discharging into the natural environment res. For turtles and sea mammals, the competent authority for CITES.**

- **Non Governmental Organizations (Fisheries related) Negril Coral Reef Preservation Society, Portland Bight Fisheries Management Council, Negril Environmental Trust.**

- **Veterinary Division – Data on processing facilities, HACCP.**

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

15. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
16. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
17. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns.*
18. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
19. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.
20. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
21. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____		**FISHERY DETAILS[2]**			
		No. markets: ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____		**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine overall effort totals gear type, fleet type, and hence also landing site	
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	

(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings	

EXAMPLE 2 **SPECIES[1]:** queen conch and spiny lobster_____		**FISHERY DETAILS[2]** **No. markets:** ____3 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___3_primary; 15 secondary; 15 tertiary_____		**No. fleet types:** ___2 major fleets_____ **No. gear types:** ___2 major gears_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely resource distribution	

SPECIES[1]: __Queen conch (*Strombus gigas*)_____		FISHERY DETAILS[2]			
		No. markets: ___Most of the product is exported **No. processing plants:** _ 3_____ **No. landing sites:** Off shore the Pedro Bank is the main industrial fishing ground. On the mainland of Jamaica there are 5 main landing sites but artisanally it can be landed at all other landing sites.		**No. fleet types:** Two (2): (1) industrial (40 ft & >), (2) Artisanal (28ft). **No. gear types:** Three (3) SCUBA dives, freelung dives & Hookah dives	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings (data collected in lbs can be converted to kg)	1994 - 1998	Log sheets collected from processing plants	Census via log sheets from processing plants during open fishing season.		Weight was collected as pound of fish.
Effort (lbs or g)	1994 – 1998	Log sheets collected from processing plants	Census or sample via log sheets from processing plants during open fishing season.	Average weight in g per one hour of dive	No direct sampling plan mainland artisanal landings landings of conch are collected the general data collection
Catch (lbs or kg)	1990 - 1998	Log sheets collected from processing plants	Census or sample via log sheets from processing plants during open fishing season.		Where conch is captured as a bycatch it is also noted.
Individual meat weight (g)	1996 - 2001	Samples done at offloading time at the processing plants.	1997 – 1580 samples 1998 – 1006 samples 1999 – 1468 samples 2001- 1023 samples		
Area fished	1994 - present	Log sheets collected from processing plants	Census or sample via log sheets from plants during open fishing season.		
Total meat weight per trip (kg)	1996 - 2001	Log sheets collected from processing plants	Census or sample via log sheets from plants during open fishing season.		
Depth (ft)	1994 - present	Log sheets collected from processing plants	Census or sample via log sheets from plants during open fishing season.		

SPECIES[1]: _Queen conch (*Strombus gigas*)_cont'd_____ _____		FISHERY DETAILS[2]			
		No. markets: _____ No. processing plants: _____ No. landing sites: _____		No. fleet types: _____ No. gear types: _____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Sex (macroscopic exam)	1996 - 2001	Samples done at offloading time at the processing plants.	1997 – 1580 samples 1998 – 1006 samples 1999 – 1468 samples 2001 – 1023 samples		
Maturity (macroscopic exam)	1996 – 2001	Samples done at offloading time at the processing plants.	1997 – 1580 samples 1998 – 1006 samples 1999 – 1468 samples 2001 – 1023 samples		
Total meat weight collected for the open season (kg)	1994 - present	Log sheets collected from processing plants	(a) Census or sample via log sheets from plants during open fishing season. (b) Exports must be equal to or less than export quota.		
Estimates of population density (number/ha) and	1994, 1997, 2002	Visual survey	Area surveyed was the Pedro bank. The surveys divided the bank into four strata defined by depth measurements. In 1994 three zones surveyed In 1997 two zones surveyed In 2002 two zones surveyed		

SPECIES[2 & 3]_: (2) Caribbean spiny lobster (Panulirus argus) (3) Small peglaic fish living on the shelf around the main islands and small banks		FISHERY DETAILS[2&3] **No. markets:** _No specific markets, sold in the general markets __ **No. processing plants**: 3 for lobsters - the same p plants that process conch also process lobsters. No processing plant for small coastal pelagics. **No. landing sites**: ___For lobsters five (5) main landing sites but artisanally it is landed at all other landing sites (secondary sites). Coastal pelagics ar main landing site	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Landings (lbs or kg)	1996 - present	At landing sites fisher interview surveys are carried out during the offloading of the catch. Three of the 44 landing sites are sampled twice monthly for coastal pelagics and 3 of 20 sampled for small lobsters.	7% of landing sites sampled for coastal pelagics monthly (3 of 44) 15% of landing sites sampled for lobsters (3 of 20)
Gear information	1996 - present	As above	As above
Depth (ft)	1996 - present	As above	As above
Fishing grounds	1996 - present	As above	As above
By-catch and target catch	1996 - present	As above	As above
Weight per species (lb or kg)	1996 - present	As above	As above
Carapace length for lobsters & fork length for coastal pelagics (cm)	1996 – present (lobsters) 1996 – 2000 (coastal pelagics)	As above	Target of 200 samples per month during open season (mos achieved)

SPECIES[2 & 3]_: (2) Caribbean spiny lobster (Panulirus argus) (3) Small peglaic fish living on the shelf around the main islands and small banks		**FISHERY DETAILS[2&3]** **No. fleet types:** Two (2) for lobsters: (1) Industrial (40 ft & >), (2) Artisinal (28 ft). One (1) for coastal pelagics Artisinal (28 ft) **No. gear types:** For Lobsters five (5) Nets, SCUBA, Hookah, freelung dive & Z traps. For coastal pelagics nets and lines.	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings (lbs or kg)	1996 - present	Average weight per boat for a landing site x total number of boats that fish per day = total weight per day by number of days fished = total weight per month or year per strata.	Industrial landings are usually exported
Gear information	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered.	
Depth (ft)	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	
Fishing grounds	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	
By-catch and target catch	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	
Weight per species (lb or kg)	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	
Carapace length for lobsters & fork length for coastal pelagics (cm)	1996 – present (lobsters) 1996 – 2000 (coastal pelagics)	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	
Sex (macroscopic exam)	1996 – present (lobsters) 1996 – 2000 (coastal pelagics)	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	

SPECIES[2&3]__ **(2) Caribbean Spiny Lobster (*Panulirus argus*)** **(3) Small pelagic fish living on the shelf around the main islands and small banks. (Cont'd)**		FISHERY DETAILS[2] **No. markets: _____** **No. processing plants: _____** **No. landing sites: _____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Maturity (macroscopic exam)	1996 – present for lobsters 1996 – 2000 for coastal pelagics.	As above	Target of 200 samples per month during open season (most months 150 is achieved)
Effort (hours fished)	1996 - present	As above	As above
Ex-vessel price $J	1996 - present	As above	7% of landing sites sampled for coastal pelagics monthly (3 of 44). 15% of landing sites sampled for lobsters (3 of 20)
Sex (macroscopic exam)	1996 – present (lobsters) 1996 – 2000 (coastal pelagics)	As above	Target of 200 samples per month during open season (most months 150 is achieved)

SPECIES[2&3]__ **(2) Caribbean Spiny Lobster (*Panulirus argus*)** **(3) Small pelagic fish living on the shelf around the main islands and small banks. (Cont'd)**		FISHERY DETAILS[2] **No. fleet types: _____** **No. gear types: _____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Maturity (macroscopic exam)	1996 – present for lobsters 1996 – 2000 for coastal pelagics.	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	
Effort (hours fished)	1996 - present	Average number of hours spent fishing per gear per strata x total number of days fished per month or year per gear per strata.	
Ex-vessel price $J	1996 - present	Use ratio of sample information to total landings estimated taking into account the different categories of fish.	
Sex (macroscopic exam)	1996 – present (lobsters) 1996 – 2000 (coastal pelagics)	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered	

SPECIES[4&5]: **(4) Demersal fish living on coral reefs (5) Demersal fish living at the drop-off of the main shelf and banks.**		FISHERY DETAILS[2]	
		No. markets: _No specific fish markets, fish is sold in the general markets of the island. **No. processing plants:** _None specifically though the 3 processing plants will process if the need arises. **No. landing sites:** _____175_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Landings (lbs or kg data collection in lbs)	1996 to present	At landings sites fisher interview surveys are carried out during the offloading of the catch. Three of the five major landing sites are sampled twice monthly	13% (22 of the 175 sites sampled per month)
Gear information	1996 to present	As above	As above
Depth (ft)	1996 to present	As above	As above
Fishing grounds	1996 to present	As above	As above
By catch and target catch	1996 to present	As above	As above
Weight by species (lb or kg)	1996 to present	As above	As above
Effort (hours fished)	1996 to present	As above	As above
Ex-vessel price $J	1996 to present	As above	As above

SPECIES[4&5]: **(4) Demersal fish living on coral reefs (5) Demersal fish living at the drop-off of the main shelf and banks.**		FISHERY DETAILS[2]	
		No. fleet types: (1) Industrial (40 ft & >) Artisanal (28 ft) **No. gear types:** (1) Line (hand line, palanka, trolling, etc. (2) Antillian Traps (3) Nets 9gill nets, casts nets, etc) (4) Freelung divers (5) SCUBA divers (6) Compressor divers (Hookah)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings (lbs or kg data collection in lbs)	1996 to present	Average weight per boat for a landing site x total number of boats that fish per day = total weight per day per strata. The multiply total weight per day by number of days fished = total weight per month or year per strata.	
Gear information	1996 to present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered.	
Depth (ft)	1996 to present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered.	
Fishing grounds	1996 to present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered.	
By catch and target catch	1996 to present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered.	
Weight by species (lb or kg)	1996 to present	Use ratio of sample information to total landings estimated taking into account the numbers and types of sampling strata covered.	
Effort (hours fished)	1996 to present	Average number of hours spent fishing per gear per strata x total number of days fished per month or year per gear per strata.	
Ex-vessel price $J	1996 to present	Use ratio of sample information to total landings estimated taking into account the different categories of fish.	

SPECIES[6&7] _(6) Shrimp & (7) off shore pelagics_____		FISHERY DETAILS[2] **No. markets: _All general markets used.** **No. processing plants: None specifically though the 3 processing plants will process if the need arises.** **No. landing sites:** ___122 offshore pelagics; 12 for shrimp_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Landings (lbs or kg data collected in lbs)	1996 - present	At the selected landing sites fisher interview surveys are carried out during the offloading of the catch twice monthly.	For offshore pelagics 18% coverage (22 of 122 landing sites sampled per month). For shrimp 17% coverage (2 of 12 landing sites sampled per month).
Gear information	1996 - present	As above.	As above.
Depth (ft)	1996 - present	As above.	As above.
Fishing grounds	1996 - present	As above.	As above.
By catch and target catch	1996 - present	As above.	As above.
Weight by species (lbs or kg)	1996 - present	As above.	As above.
Effort (hours fished)	1996 - present	As above.	As above.
Ex-vessel price $J	1996 - present	As above.	

SPECIES[6&7] _(6) Shrimp & (7) off shore pelagics_____		FISHERY DETAILS[2] **No. fleet types:** _For Offshore pelagics two (2): I Industrial (40ft & >) Artisanal (28 ft). for shrimp two (2): 28 ft & <20 ft canoes_____ **No. gear types:** __For shrimp: Shove nets, Otter Trawl, small gill nets (china nets), push nets, beach seines. For offshore pelagics: trolling lines._____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings (lbs or kg data collected in lbs)	1996 - present	Average weight per boat for a landing site x total number of boats that fish per day = total weight per day per strata. Then multiply total weight per day by number of days fished = total weight per month or year per strata.	
Gear information	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types f sampling strata covered.	
Depth (ft)	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types f sampling strata covered	
Fishing grounds	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types f sampling strata covered	
By catch and target catch	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types f sampling strata covered	
Weight by species (lbs or kg)	1996 - present	Use ratio of sample information to total landings estimated taking into account the numbers and types f sampling strata covered	
Effort (hours fished)	1996 - present	Average number of hours spent fishing per gear per strata x total number of days fished per month or year per gear per strata.	
Ex-vessel price $J	1996 - present	Use ratio of sample information to total landings estimated, taking into account the different categories of fish.	

SPECIES[6&7]: _(6) Shrimp & (7) Offshore pelagics (Cont'd)		FISHERY DETAILS[2] No. markets: _____ No. processing plants: _____ No. landing sites: _____	
Types of data available[3] – give measurement unit	Time periods for which data are available	Extent of data collection activities in relation to fishery details[4]	Statistical coverage details[5]
Total length of Skip jack and Dolphin fish and shrimp (cm)	Skip jack and Dolphin fish 1996 – present. (Very patchy) Shrimp 1998 – 2000 (some years are patchy)	As above.	Target of 200 samples per month (usually not achieved because specimens were not available)
Sex of Skip jack tuna and Dolphin fish and shrimp (macroscopic exam)	Skip jack and Dolphin fish 1996 – present (very patchy) Shrimp 1998 – 2000 9 some years are patchy)	As above.	Target of 200 samples per month (usually not achieved because specimens were not available)
Maturity of Skip jack tuna and Dolphin fish and Shrimp (macroscopic exam)	Skip jack and Dolphin fish 1996 – present (very patchy) Shrimp 1998 – 2000 9 some years are patchy)	As above.	Target of 200 samples per month (usually not achieved because specimens were not available)

SPECIES[6&7]: _(6) Shrimp & (7) Offshore pelagics (Cont'd)		FISHERY DETAILS[2] No. fleet types: _____ No. gear types: _____	
Types of data available[3] – give measurement unit	Time periods for which data are available	Where sample data collected, how are sample data to provide totals for entire industry[6]	Comments[7]
Total length of Skip jack and Dolphin fish and shrimp (cm)	Skip jack and Dolphin fish 1996 – present. (Very patchy) Shrimp 1998 – 2000 (some years are patchy)	Use ratio of sample information to total landings estimated, taking into account the numbers and types of sampling strata covered.	
Sex of Skip jack tuna and Dolphin fish and shrimp (macroscopic exam)	Skip jack and Dolphin fish 1996 – present (very patchy) Shrimp 1998 – 2000 9 some years are patchy)	Use ratio of sample information to total landings estimated, taking into account the numbers and types of sampling strata covered.	
Maturity of Skip jack tuna and Dolphin fish and Shrimp (macroscopic exam)	Skip jack and Dolphin fish 1996 – present (very patchy) Shrimp 1998 – 2000 9 some years are patchy)	Use ratio of sample information to total landings estimated, taking into account the numbers and types of sampling strata covered.	

1. (a) Country: **ST. LUCIA** (b) Fishery Data Manager's Name: **Patricia Hubert Medar**

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

Shallow shelf and Reef fishes
Deep sloop fishes
Large Pelagics
Coastal Pelagics
Lobster
Conch
Sea Urchins
Flying fish
Turtles

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comme (additio informat can be include here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programmes	Fisher interview surveys	Fishery independent surveys	Other (specify)	
EXAMPLES Wahoo & dolphinfish	landings		X				X						
	effort		X				X						
	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		
	Area of occurrence										X		
	Habitat type										X		
	depth										X		

Shallow shelf and Reef fishes Deep Sloop fishes Large Pelagics	Landings		X				X	X		X			Under periodicit of Collectio data is collected 15 rando selected days per month
	Effort		X				X	X		X			
	Ex- Vessel price		X				X	X		X			Offloadin operation may sometime overlap w vending operation since fish sometime sold duri offloadin
	Area Fished		X				X	X		X			
	Weight		X				X	X		X			
	Gear		X				X	X		X			
	Fuel consumption		X				X	X		X			
	Sex					X	X	X		X			Sex and Length da only available from 199 1999
	Length					X	X	X		X			
Lobster	Landings		X				X	X		X			
	Effort		X				X	X		X			
	Ex- Vessel price		X				X	X		X			
	Area Fished		X				X	X		X			
	Weight		X				X	X		X			
	Gear		X				X	X		X			

	Fuel consumption		X				X	X		X			
	Sex				X		X	X		X			
	Length				X		X	X		X			
	Maturity				X		X	X		X			
Conch	Landings		X				X	X		X			
	Effort		X				X	X		X			
	Ex- Vessel price		X				X	X		X			
	Area Fished		X				X	X		X			
	Weight		X				X	X		X			
	Depth		X				X	X		X			
	Gear		X				X	X		X			
	Fuel consumption		X				X	X		X			
	Sex					X	X	X		X			Sex and Length da only available from 199 1999
	Length					X	X	X		X			
Turtles	Landings		X				X	X		X			
	Effort		X				X			X			
	Ex- Vessel price		X				X	X		X			
	Area Fished		X				X			X			
	Weight		X				X	X		X			
	Gear		X				X	X		X			
	Fuel consumption		X				X	X		X			
	Sex		X				X	X	X	X			
	Length		X				X	X	X	X			
Sea Urchins	Landings/count								X	X			
	Size/frequency								X				

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **St. Lucia fish marketing Co-operation: Fish purchases and sales, costings**
- **Fisheries Co-operatives: Information on Fishermen**
- **Government Statistics Department: Export Data, employment**

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

1. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
2. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
3. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns.*
4. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
5. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.
6. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
7. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____		**FISHERY DETAILS[2]**			
		No. markets: ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____		**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine overall effort totals gear type, fleet type, and hence also landing site	
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	

(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings	

EXAMPLE 2 **SPECIES[1]:** queen conch and spiny lobster_____	**FISHERY DETAILS[2]** **No. markets:** ____3 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___3_primary; 15 secondary; 15 tertiary_____			**No. fleet types:** ___2 major fleets_____ **No. gear types:** ___2 major gears_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely resource distribution	

SPECIES[1]: _All other species including Flying fish__		FISHERY DETAILS[2] **No. markets: __1 MAIN_____** **No. processing plants: ____1 MAIN_____** **No. landing sites:** _6 PRIMAY; 5 SECONDARY; 6 TERTIARY__	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Landing by individual species group (lbs)	1995 – 2005	Landing sites: 5 primary; 5 secondary Every other vessel All gearrs	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Landings	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Effort	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Ex- Vessel price	2000-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Area Fished	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Weight	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Depth	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Gear	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Fuel consumption	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Sex	1996-1999	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Length	1996-1999	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.

SPECIES[1]: _All other species including Flying fish__		FISHERY DETAILS[2] **No. fleet types:** _3 main fleet____ **No. gear types:** _3 main gear___	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landing by individual species group (lbs)	1995 – 2005	No. of days fished * total vessels out ---------- = Raising factor No. of Sampled days Observed Weight * Raising factor = Sum Weight	
Landings	1995-2005		
Effort	1995-2005	Total No. of vessels out ---------- = Total Effort No. of sampled days	
Ex- Vessel price	2000-2005		
Area Fished	1995-2005		
Weight	1995-2005		
Depth	1995-2005		
Gear	1995-2005		
Fuel consumption	1995-2005		
Sex	1996-1999		
Length	1996-1999		

SPECIES[1]: __Turtle_____		FISHERY DETAILS[2]			
		No. markets: __1 main___ **No. processing plants:** __1 Main_____ **No. landing sites:** _6 Primary; 5 Secondary; 6 Tertiary___		**No. fleet types:** _3 main fleet____ **No. gear types:** _3 main gear_	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Com**
Sex	1995-2005	Landing sites: 5 primary; 4 Secondary.	Samples at 7 turtle landing sites 100% coverage at turtle landing sites		Turtles ar at all landi
Shell Length (cm)	1995-2005	Landing sites: 5 primary; 4 Sec	Samples at 7 turtle landing sites 100% coverage at turtle landing sites		
No. of Tumors	1995-2005	Landing sites: 5 primary; 4 Sec.	Samples at 7 turtle landing sites 100% coverage at turtle landing sites		
Landings	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition	No. of days fished * total vessels out ---------- = Raising factor No. of Sampled days Observed Weight * Raising factor = Sum Weight	
Effort	1995-2005	Landing sites:5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition	Total No. of vessels out ---------- = Total Effort No. of sampled days	
Ex- Vessel price	2000-2005	Landing sites:5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition	Sampled Value * Raising Factor = Total Value	
Area Fished	1995-2005	Landing sites: 5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition		
Weight	1995-2005	Landing sites: 5 primary;4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition		
Depth	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition		
Gear	1995-2005	Landing sites:5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition		
Fuel consumption	1995-2005	Landing sites: 5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition		

SPECIES[1]: _Lobster_____		FISHERY DETAILS[2] **No. markets: ___1 Main_____** **No. processing plants: ___1 Main_____** **No. landing sites: 6 Primary; 5Secondary; 6 Tertiary_____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Length Frequency	1995-2005	Landing sites: 5 primary; 4 secondary; 1 processing plant All vessels All gears	
Landings	1995-2005	Landing sites: 5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Effort	1995-2005	Landing sites:5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Ex- Vessel price	2000-2005	Landing sites:5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Area Fished	1995-2005	Landing sites:5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Weight	1995-2005	Landing sites: 5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Depth	1995-2005	Landing sites: 5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Gear	1995-2005	Landing sites:5 primary; 4 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Fuel consumption	1995-2005	Landing sites: 5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition
Sex	1996-1999	Landing sites: 5 primary; 4 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition

SPECIES[1]: _Lobster_____		FISHERY DETAILS[2] **No. fleet types:** _3 main fleet **No. gear types:** _3 main gear__	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Length Frequency	1995-2005		
Landings	1995-2005	No. of days fished * total vessels out ---------- = Raising factor No. of Sampled days Observed Weight * Raising factor = Sum Weight	
Effort	1995-2005	Total No. of vessels out ---------- = Total Effort No. of sampled days	
Ex- Vessel price	2000-2005	Sampled Value * Raising Factor = Total Value	
Area Fished	1995-2005		
Weight	1995-2005		
Depth	1995-2005		
Gear	1995-2005		
Fuel consumption	1995-2005		
Sex	1996-1999		

SPECIES[1]: _Conch_____		FISHERY DETAILS[2]	
		No. markets: _1 main_____ **No. processing plants: __1 main_____** **No. landing sites: 6 Primary; 5Secondary; 6 Tertiary __**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**
Landing by individual species group (lbs)	1995 – 2005	Landing sites: 3 primary; 2 secondary Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Landings	1995-2005	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Effort	1995-2005	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Ex- Vessel price	2000-2005	Landing sites:3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Area Fished	1995-2005	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Weight	1995-2005	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Depth	1995-2005	Landing sites:3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Gear	1995-2005	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Fuel consumption	1995-2005	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Sex	1996-1999	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.
Length	1996-1999	Landing sites: 3 primary; 2 secondary; Every other vessel All gears	Sample at primary and secondary sites Sampling of all other vessels and all gear used during fishing expedition.

SPECIES[1]: _Conch_____		FISHERY DETAILS[2]	
		No. fleet types: _____ **No. gear types: _____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landing by individual species group (lbs)	1995 – 2005	No. of days fished * total vessels out ---------- = Raising factor No. of Sampled days Observed Weight * Raising factor = Sum Weight	
Landings	1995-2005		
Effort	1995-2005	Total No. of vessels out ---------- = Total Effort No. of sampled days	
Ex- Vessel price	2000-2005		
Area Fished	1995-2005		
Weight	1995-2005		
Depth	1995-2005		
Gear	1995-2005		
Fuel consumption	1995-2005		
Sex	1996-1999		
Length	1996-1999		

SURINAME

1. (a) Country…**SURINAME**…… (b) Fishery Data Manager's Name …J. **DEBIPERSAD**……..

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

1. **DEEP SEA SHRIMP FISHERY**
2. **PENAEUS SHRIMP FISHERY**
3. **SEABOB FISHERY**
4. **DEMERSAL TRAWL FISHERY**
5. **SMALL PELAGIC FISHERY**
6. **LARGE PELAGIC FISHERY**
7. **RED SNAPPER & MACKEREL FISHERY**
8. **COASTAL FISHERY**
   - **DRIFTNET**
   - **LONG LINE**
   - **PIN SEINE (NJAWARIE)**
9. **INLAND FISHERY**
   - **DRIFTNET**
   - **LAGOON GILLNET**
   - **INCIRCLE NET (HARITETE)**
   - **LONGLINE**

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comment (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programmes	Fisher interview surveys	Fishery independent surveys	Other (specify)	
EXAMPLES Wahoo & dolphinfish	landings		X				X						
	effort		X				X						
	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		
	Area of occurrence										X		
	Habitat type										X		
	depth										X		
SHRIMP FISHERY	landings			X								Processing plant records	
	effort			X								Processing plant examined WEEKLY	

	size			X								Processing plant examined WEEKLY	
	age			X								Processing plant examined WEEKLY	
	sex			X								Processing plant examined WEEKLY	
	maturity			X								Processing plant examined WEEKLY	
	ex-vessel price					X							
	Area fished					X							
DEMERSAL TRAWL	landings			X			X					Fishing Company submission and enumerator	
	effort			X			X					Fishing Company submission and enumerator	
	size					X			X				
SMALL PELAGIC	landings			X			X					Fishing Company submission	
	effort			X		X	X					Fishing Company submission	
	size								X				
LARGE PELAGIC	landings			X								Fishing Company submission	
	effort			X								Fishing Company submission	
RED SNAPPER & MACKEREL	landings			X	X							Fishing Company submission	Submission through Ceviha (Venezuelan)
	effort			X								Fishing Company submission	
	landings		X				X						

COASTAL FISHERY	effort		X				X						
	size					Whenever there is a sampling programme						Sampling at landing sites and in fish processing plants	
INLAND FISHERY	landings		X				X						
	effort		X				X						
	size					Whenever there is a sampling programme						Sampling at landing sites and in fish processing plants	

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **Planning Division, Ministry of Agriculture**
- **Central Buro for Statistics**
- **Central Bank of Suriname**
- **Immigration Office (Nieuwe Haven)**
- **Chamber of Commerce**

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

1. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
2. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
3. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns*.
4. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
5. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.
6. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
7. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____		**FISHERY DETAILS[2]**			
		No. markets: ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____		**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	

(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine overall effort totals gear type, fleet type, and hence also landing site	
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	

(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings	

EXAMPLE 2 **SPECIES[1]:** queen conch and spiny lobster_____	**FISHERY DETAILS[2]** **No. markets:** ____3 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___3_primary; 15 secondary; 15 tertiary_____			**No. fleet types:** ___2 major fleets_____ **No. gear types:** ___2 major gears_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	
(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely resource distribution	

SPECIES[1]: _Penaeus subtilis, P. brasisliensis, P. notialis_/ Solenocera spp / Plesiopenaeus edwardssiannus		FISHERY DETAILS[2] No. markets: _____ No. processing plants: _2_____ No. landing sites: _2_____		No. fleet types: ___2_____ No. gear types: ____1_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings by size category in kg	1973- today (penaeus species). Other 1998- today	(a) Markets and processing plants: 2 processing plants. Main markets from there. (b) Landing sites: 2 at the processing plants (c) Fleet types: 2 fleets, Japanese and Korean & others. (d) Fishing grounds & operation: Japanese fleet deeper grounds, > 60 m depth. Korean & others fish shallower, 20-100 m depth. (e)Gear types: shrimp trawl	Submission of landing & effort data by size category by boat for each fishing company, provided by the processing plant. For both head-on and headless size category.	Samples are collected for headless shrimp at processing plant. For head-on shrimp and deep sea shrimp from fishing companies for different size category. Shrimp in 1 box are sort by sex, maturity and count. Each size category at least 1 box in a month. Shrimp are measured one by one sort by sex, total weight, total length, carapax length, abdomen length and abdomen weight and maturity.	
(ii) effort, Lumped for all species. (days fished, # of license) # of deliveries	Days fished, 1983`- today (penaeus species).# of deliveries, 1977 – today. Other 1998- today	Same as above	Same as above	Same as above	
(iii) size data – total length (mm) & carapace length (mm)	1. 1991-1993, 2. 1998-2001 3. 2002- today These data is only available for penaeus shrimp	From samples	1. 80 % of all size category 2. 60 % of all size category 3. 60 % of all size category	Samples are required from all size category in a month. Because this does not happened most of the time the coverage vary as shown in the former column.	
(v) sex data	Same as above	From samples			
(vi) maturity data	Same as above	From samples			

SPECIES[1]: Seabob (Xyphopenaeus kroyeri)		FISHERY DETAILS[2]			
		No. markets: ___2_____ **No. processing plants: __2_____** **No. landing sites: _____2_____**		**No. fleet types: _1_____** **No. gear types: _1_____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings by size category in kg & lbs	1997 - today	(a) Markets and processing plants: 2 processing plants. Main markets from there. (b) Landing sites: 2 at the processing plants (c) Fleet types: 1 fleet (d) Fishing grounds & operation: 10 – 18 fathom depth, from east to west (e)Gear types: seabob trawl	Submission of landing & effort data by size category by boat provided by fishing company.		
(ii) effort, (days fished, # of license) # of deliveries	1997 - today	Same as above	Same as above		
(iii) size data – total length (mm) & carapace length (mm)	1998 - 2001	From samples	80 % of all catch	Samples are collected by observer on the boat from each hall at sea. The company with 15 boat, 2 samples every month. The other 1 sample every month	
(v) sex data	1998 - 2001	From samples		Same as above	
(vi) maturity data	1998 - 2001	From samples		Same as above	

SPECIES[1]: Lutjanus purpureus, L. Synagris, Rhomboplites aurorubens, Scomberomorus cavalla, Sc. Brasiliensis,		FISHERY DETAILS[2] No. markets: 3 No. processing plants: __10____ No. landing sites: _3_____		No. fleet types: __5_____ No. gear types: ___5_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landing data in kg	1991 - today	a) Markets and Landing sites: .3 major landing sites. Main markets from there. b) Processing plants: 10 processing plants (c) Fleet types: 6 fleet (d) Fishing grounds & operation: Coastal fleets. Fish trawlers, 15 fathom and upwards. Snapper & Mackerel boats, from 10 fathom, on hard substrate dead reefs. (e)Gear types: Drifting gillnets, Bottom & midwater trawl nets. Vertical handlines and Pelagic longlines	60 % coverage		
(ii) effort, (, # of licenses, # of deliveries)	1991 - today		60 % coverage		
(iii) size data – total length (mm)	Only for L. synagris & Sc. Brasiliensis, from trawlers. 1996 – 1999 (observer)			measurement where collected by observers on the boat	

SPECIES[1]: _Cynoscion acoupa, C. steindachneri, C.virescens, Arius parkeri, A. proops, A. grandicasis, A. quadriscuris, Macrodon ancylodon, Nebris microps	FISHERY DETAILS[2]				
	No. markets: 14____ **No. processing plants: _10_____** **No. landing sites: 14 (same as markets)___**			**No. fleet types: _6_____** **No. gear types: __6_____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings by weight in kg & numbers of fishes	1969- today	a) Markets and Landing sites: .14 major landing sites, are sampled every day. Main markets from there. b) Processing plants: 10 processing plants (c) Fleet types: 6 fleet (d) Fishing grounds & operation: Main Rivermouth up to 8 fathom, Coastal fleets. Fish trawlers, 15 fathom and upwards. Bycatch of shrimp fleets (e)Gear types: Drifting gillnets, Bottom Longlines, Pin seine, Chinese seine. Bottom & midwater trawl nets. Minor, shrimp & seabob trawlnets.	Coastal - & Inland Fishery: 60 % of total landing covered by enumerator. Fish trawlers: 80 % by landings reported by fishing companies. Shrimp trawlers: bycatch, only 30 % Seabob trawlers: bycatch, 50 – 60 % covered by landing reports.		
(ii) effort, (days fished, # of license)	1991 - today	Major Landing sites by enumerators	Same as above		
(iii) size data – total length (mm)	1. 1991- 1992 2. 1998 3. 1996 – 1999 (observer)			1. sampled at landing sites, 200 fishes for each species in a month 2. sampled at 1 processing plant, all fishes landed by one boat. 3. measurement where collected by observers on the boat.	
Price data	1. 1969 – 1979 1991 - today			1. Retail prices are collected at the Central Market in Paramaribo by personnel from the Planning division of the Ministry. 2. From 1991 price data collected by enumerators for Central Buro of Statistics of Suriname	

SPECIES[1]: Shark and Rays		**FISHERY DETAILS[2]**			
		No. markets: _: 14_____ **No. processing plants: : _10_____** **No. landing sites: : 14 (same as markets)___ _____**		**No. fleet types:** __6_____ **No. gear types:** __6_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landing data in kg	1991 - today	a) Markets and Landing sites: .14 major landing sites, are sampled every day. Main markets from there. b) Processing plants: 10 processing plants (c) Fleet types: 6 fleet (d) Fishing grounds & operation: Main Rivermouth up to 8 fathom, Coastal fleets. Fish trawlers, 15 fathom and upwards. (e)Gear types: Drifting gillnets, Bottom Longlines, Bottom & midwater trawl nets.	Coastal - & Inland Fishery: 60 % of total landing covered by enumerator. Fish trawlers: 80 % by landings reported by fishing companies.		
ii) effort, (, # of licenses, # of deliveries)	1991 - today		Coastal - & Inland Fishery: 60 % of total landing covered by enumerator. Fish trawlers: 80 % by landings reported by fishing companies.		

SPECIES[1]: _Centropomodae spp,plagioscion surinamensis, Mugilidae		FISHERY DETAILS[2]			
		No. markets: __: 14_____ **No. processing plants:** 10_____ **No. landing sites: : 14 (_____**		**No. fleet types: 3 _____** **No. gear types: 3 _____**	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landing data in kg	1991 - today	a) Markets and Landing sites: .14 major landing sites, are sampled every day. Main markets from there. b) Processing plants: 10 processing plants (c) Fleet types: 3 fleet (d) Fishing grounds & operation: Main Rivermouth up to 8 fathom, Coastal fleets. (e)Gear types: Drifting gillnets, Bottom Longlines, Pin seine, Chinese seine.	Coastal - & Inland Fishery: 60 % of total landing covered by enumerator		
ii) effort, (, # of licenses, # of deliveries)	1991 - today		Coastal - & Inland Fishery: 60 % of total landing covered by enumerator		

TRINIDAD AND TOBAGO

1. (a) Country: **TRINIDAD & TOBAGO** (b) Fishery Data Manager's Names: Lara Ferreira, Suzuette Soomai, Louanna Martin, Elizabeth Mohammed

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

Coastal pelagics: *Scomberomorus brasiliensis, S. cavalla, S. regalis, Carcharhinus limbatus, C. porosus, Rhizopronodon lalandii, Sphyrna media, S. tudes, S. tiburo, S. lewini, Caranx hippos, C. crysos, Chloroscombrus chrysurus, Oligoplites saurus,* Clupeidae: mainly *Opisthonema oglinum, Harengula jaguan; Decapterus* spp*.,* Engraulidae: *Anchoviella* spp, *Anchoa* spp, *Cetengraulis edentulous, Engraulis eurystole; Sardinella* spp*.,* Belonidae: *Tylosurus* spp*.*, *Hemiramphus brasiliensis*, *Hirundichthys affinis*

Oceanic (highly migratory) pelagics: *Thunnus albacares*, *T. obesus, T. alalunga*, *T. atlanticus*, *Euthynnus alletteratus*, *Katsuwonus pelamis*, *Sarda sarda*, *Auxis thazard*, *Xiphias gladius*, *Makaira nigricans*, *Tetrapturus albidus*, *T. pfluegeri*, *Istiophorus albicans*, *Acanthocybium solandri, Coryphaena hippurus*, *Prionace glauca*, *Galeocerdo cuvier*, *Ginglymostoma cirratum*, *Mustelus* spp, *Alopias* spp, *Isurus* spp, *I. paucus*, *I. oxyrinchus*

Soft-substrate demersals: *Litopenaeus schmitti, Farfantepenaeus subtilis, F. notialis, F. brasiliensis, Xiphopenaeus kroyeri*, *Micropogonias furneri, Cynoscion jamaicensis, C. acoupa, Macrodon ancylodon, Micropogonias furnieri, Lutjanus* spp*., Rhomboplites aurorubens*, Engraulids, *Haemulon* spp*., Genyatremus luteus, Orthopristis* spp., *Bagre* spp*, Arius* spp

Hard-substrate demersals: *Lutjanus* spp., *Rhomboplites aurorubens*, *Epinehelus* spp., *Mycterperca* spp. *Panuliris* spp., *Haemulon* spp.

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
Coastal pelagics	Landings		X				X	X					All species / groupings listed are covered.
	Effort		X				X	X					All species / groupings listed are covered
	Size			X			X	X					Trinidad - S. brasiliensis, S. cavalla, C.hippos, H. affinis, C. hippirus, C. limbatus, C. porosus, R. lalandii, R. porosus, S. lewini, S. tudes, Sardinella spp. (1989 to 1990 only)
	Age					X	X	X					S. brasiliensis, C.hippos, A. solandri
	Sex					X	X	X					S. brasiliensis, S. cavalla, C.hippos, H. affinis, C. porosus, R. lalandii, S. lewini,

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Maturity					X	X	X					S. brasiliensis, S. cavalla, C.hippos, H. affinis, C. porosus, R. lalandii, S. lewini,
	Ex-vessel price		X					X					All species / groupings listed are covered
	Area fished		X				X						All species / groupings listed are covered
	Social									X			Gulf of Paria
	Economic									X			Gillnet fishery, Gulf of Paria

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Abundance					X					X		Individual species catch rates and combined biomass estimates for Clupeids, Carangids, Engraulids, Scombrids and Sharks off north, east and south coasts of Trinidad from a 1988 survey conducted by the Institute of Marine Research
Oceanic (highly migratory) pelagics	Landings			X								Trip reporting system (Owners submit data after the completion of trips)	All species caught by Trinidad based vessels
	Effort			X								Trip reporting system	All species caught by Trinidad based vessels

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Size			X								[1]Trip reporting system, [2]Fishing tournaments	[1]All species caught by Trinidad based vessels [2]For both Trinidad and Tobago caught fish
	Area fished			X								[1]Trip reporting system, [2]Fishing tournaments	[1]All species caught by Trinidad based vessels [2]For both Trinidad and Tobago
	Economic					X				X			Trinidad based longliners, Tobago Drifting fishery
Soft-bottom demersals	Landings		X				X	X				Logbook system for semi-industrial and industrial trawlers	All species caught by Trinidad based vessels
	Effort		X				X	X					All species caught by Trinidad based vessels

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Size			X		X	X	X					M. furnieri, L.synagris, L. schmitti, F. subtilis, F. notialis, F. brasiliensis, X. kroyeri
	Age					X							M. furnieri, L.synagris
	Sex			X		X	X	X					L. schmitti, F. subtilis, F. notialis, F. brasiliensis, X. kroyeri
	Maturity					X							M. furnieri, L.synagris
	Ex-vessel price		X					X					All species caught by Trinidad based vessels
	Area fished		X				X						All species caught by Trinidad based vessels
	Social					X				X			Study of socio-economic importance of bycatch and discards in trawl fishery in progress (Sep 2006)

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Economic					X				X		Costs and earnings studies of trawl, gillnet and line fleets	Costs and earnings data for trawl fleets (1997, 1999-2000); gillnet and line (1999)
	Abundance					X					X		Individual species catch rates and combined biomass estimates for Sciaenids, Serranids Lutjanids and Haemulids off north, east and south coasts of Trinidad from a 1988 survey conducted by the Institute of Marine Research, Norway
Hard-bottom demersals	Landings		X				X	X					All species caught by Trinidad based vessels
	Effort		X				X	X					All species caught by Trinidad based vessels

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Size			X		X						Fishpot fishery off northeast Trinidad and off Tobago (January 1990 – December 1991)	L. pupureus, L. jocu, R. aurorubens, E. flavolimbatus, M. interstitialis
	Age					X						Processing plant in Tobago (January 1990 – December 1991)	L. purpureus, R. aurorubens, E. flavolimbatus, M. interstitialis
	Sex					X						Fishpot fishery off northeast Trinidad and off Tobago (January 1990 – December 1991)	L. pupureus, R. aurorubens, E. flavolimbatus, M. interstitialis

Fishery type (list by species or resource type, whichever is more suitable)	Fishery Statistics	Periodicity of Collection (mark the applicable columns with 'X')					Method of Collection (mark the applicable columns with 'X')						Comments (additional information can be included here)
		once	daily	monthly	annually	Ad-hoc (needs basis)	Direct sampling during vessel offloading operations	Direct sampling during vending operations	Observer programs	Fisher interview surveys	Fishery independent surveys	Other (specify)	
	Maturity					X						Fishpot fishery off northeast Trinidad and off Tobago (January 1990 – December 1991)	L. pupureus, R. aurorubens, E. flavolimbatus, M. interstitialis
	Ex-vessel price		X					X					All species caught by Trinidad based vessels
	Area fished		X				X						All species caught by Trinidad based vessels
	Social												
	Economic												

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **Water quality, oceanographic, social (studies off Mayaro) and fish age and growth data – Institute of Marine Affairs**
- **Fish import and export – Agriculture Data and Information Unit MALMR, Customs and Excise Division, Central Statistical Office (CSO)**
- **Employment, demographic, economic information from national census – CSO**
- **Fish quality – levels of heavy metals and mercury in selected species of fish – Chemistry/Food and Drugs Division**
- **Facilities at Fish Markets – National Agricultural Marketing Development Company (NAMDEVCO)**
- **Economic data - Agricultural Development Bank (ADB), Ministry of Finance, University of the West Indies**
- **General studies on fisheries – The University of the West Indies**
- **Marine Protected Areas (Tobago Buccoo Reef) – Tobago House of Assembly**
- **Environmental – Meteorological Office, Environmental Management Authority**
- **GIS - Institute of Marine Affairs, University of the West Indies (campuses in Trinidad, Barbados and Jamaica), Land and Water Resources Division, Forestry Division, PETROTRIN, (Industrial petrochemical industry in Trinidad), Central Statistical Office, Water and Sewerage Authority, Caroni (1975) Limited, PLIPDECO (Point Lisas Industrial Development Company, Trinidad), Town and Country Planning Division, BP Amoco Trinidad Oil Company, Geopetrin Associates Limited**

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

8. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
9. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
10. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns*.
11. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
12. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season*.

13. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
14. Include any other additional information that may assist in estimation of totals.

Table providing further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	**FISHERY DETAILS** **No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY)** **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
TRINIDAD					
Landings (lb) by species and gear; some species grouped	1957 – present (1995 to present computerized) Nov 1991 – April 1992	**Artisanal multigear fleet, artisanal trawl, semi-industrial trawl, industrial trawl:** Data collected at the 3 wholesale fish markets and at 18 main landing sites in Trinidad. All Trinidad fleets are covered except semi-industrial multi gear and foreign fleets. Data collected from semi-industrial and industrial trawl fleets through a logbook system.	Refer to Annex 1	Refer to Annex 1	Because of the nature of the beach seine operations the recorded landings may not be representative of the catch. Spear fishing not well represented in data collection system. Industrial trawl fleet covered from mid-2000 to present.
Landings (lb) by species; some species grouped	2001 – present	**Semi-industrial longline:** Data collected from semi-industrial longliners through a	~ 100%		

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	FISHERY DETAILS **No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY)** **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
		trip reporting system. Owners submit trip data after a trip is completed. This system is a precursor to a Logbook programme.			
Landings (lb) by species	1981 – present	**Recreational:** The recreational fleet is covered only through fishing tournaments.	~ 100% coverage of tournaments		
Effort (# trips, # boats, # hours)	1957 – present (1995 to present computerized) Nov 1991 – April 1992	**Artisanal multigear fleet, artisanal trawl, semi-industrial trawl, industrial trawl:** Data collected at the 3 wholesale fish markets and at 18 main landing sites in Trinidad. All Trinidad fleets are covered except semi-industrial longline, recreational and foreign fleets. Data collected from semi-industrial and industrial trawl	Refer to Annex 1	Refer to Annex 1	Total effort is estimated as number of fishing days and number of hours fished for the respective gears. Effort is therefore applicable to the entire multi-species landings of the gear rather than individual species. Industrial trawl fleet covered from mid-2000 to present.

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	FISHERY DETAILS				
	No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY) **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
		fleets through a logbook system.			
Effort (# fishing days, # hooks, # sets, average soak time)	2001 – present	**Semi-industrial longline:** Data collected from semi-industrial longliners through a trip reporting system. Owners submit trip data after a trip is completed. This system is a precursor to a Logbook programme.	~ 100%		Total effort is estimated as number of fishing days, number of hooks, number of sets and average soak time. The effort is applicable to the entire catch (multi-species) rather than individual species.
Ex-vessel price (TT$)	1957 – present (1995 to present computerized)	**Artisanal multigear fleet, artisanal trawl, semi-industrial trawl, industrial trawl:** All the respective gears are covered.	Refer to Annex 1 Data are not collected for the semi-industrial longline and multi-gear fleets, nor the recreational fleet.	Refer to Annex 1	Industrial trawl fleet covered from mid-2000 to present. The semi-industrial longline fleet and to a certain extent the semi-industrial mutli-gear fleet both target the export market.
Size data (mm or cm FL or TL)	1992; 1996 – 1998;	**Artisanal multigear fleet:** Trinidad - *S. brasiliensis, S. cavalla, C.hippos, C. limbatus, C. porosus, R. lalandii, R. porosus, S. lewini, S. tudes, L.*	Trinidad: Data are not collected from the semi-industrial multigear and semi-industrial longline fleets		A target of 200 fish per species per gear and month is set. However, there may be data gaps (missing month or gear data). Data computerised

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	FISHERY DETAILS				
	No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY) **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
		synagris, L.purpureus			in EXCEL.
Size data (mm or cm FL or TL)	1989 - 1990	**Artisanal multigear fleet:** Trinidad (north coast) – Sardinella spp.	A directed study by the Fisheries Division focusing specifically on the bait fishery		Monthly samples of between 174 and 1064 fish were collected. Data computerised in EXCEL.
Size data (FL or TL in mm or cm)	2004	**Artisanal multigear fleet:** Trinidad - *S. brasiliensis, S. cavalla, C.hippos*	Data are not collected from the semi-industrial multigear and semi-industrial longline fleets	Length distributions are applied to estimates of total landings for the respective species and gears each month.	A target of 200 fish per species per gear and month is set. However, there may be data gaps (missing month or gear data). Data computerised in EXCEL.
Size data (carapace length in mm)	1992 - 2002	**Artisanal and semi-industrial trawl fleets:** *Litopenaeus schmitti, Farfantepenaeus subtilis, F. notialis, F. brasiliensis, Xiphopenaeus kroyeri*	Weekly sampling. Landings of these fleets are restricted to the west coast of Trinidad. Sampling occurs at 7 major sites.		

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	FISHERY DETAILS				
	No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY) **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
Size data (carapace length in mm)	1999 - 2002	**Industrial trawl fleet** *Litopenaeus schmitti, Farfantepenaeus subtilis, F. notialis, F. brasiliensis, Xiphopenaeus kroyeri*	Weekly sampling. Landings of this fleet are restricted to the west coast of Trinidad. Sampling occurs at the 2 major sites.		
Size data (FL or TL in mm or cm)	2004 - present	**Artisanal, semi-industrial and industrial trawl fleets** *L. synagris, M. furnieri*	Weekly sampling at 5 of the major sites.		
Species composition of landings (proportion by species)	2004 - present	**Artisanal, semi-industrial and industrial trawl fleets** *L. synagris, M. furnieri and also C. jamaicensis spp.*	Weekly sampling at 5 of the major sites.		Data used to disaggregate estimated total landings into species components and species groups
Species composition of landings (proportion by species)	2004 - present	**Artisanal, semi-industrial and industrial trawl fleets** *Litopenaeus schmitti, Farfantepenaeus subtilis, F. notialis, F. brasiliensis, Xiphopenaeus kroyeri*	Weekly sampling at 5 of the major sites.		Data used to disaggregate estimated total landings into species components

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	FISHERY DETAILS				
	No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY) **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
Size data (FL or TL in mm or cm)	1981 - present	**Recreational:** The recreational fleet is covered only through fishing tournaments.	~ 100% coverage of tournaments		Data computerised in EXCEL.
Maturity, Sex, Age Data	1996 - 1998	**Artisanal multigear:** *S. brasiliensis, S. cavalla, C.hippos, C. limbatus, C. porosus, R. lalandii, R. porosus, S. lewini, S. tudes, L. synagris, L.purpureus*			A target of 50 fish per species per gear and month is set. However, there may be data gaps (missing month or gear data). Data computerised in EXCEL. Otoliths are available for determining age for *S. brasiliensis, S. cavalla* and *C.hippos* only.
Sex	1992 – 2002	**Artisanal, semi-industrial and industrial trawl fleets** *Litopenaeus schmitti, Farfantepenaeus subtilis, F. notialis, F. brasiliensis, Xiphopenaeus kroyeri*	Weekly sampling at 8 of the major sites.		Industrial trawl fleet not covered prior to 1999.

SPECIES: Refer to 2: Coastal pelagics, Soft-substrate demersals, Hard-substrate demersals	FISHERY DETAILS				
	No. markets: 3 wholesale fish markets, 70 wholesale markets, 150 retail markets (TRINIDAD ONLY) **No. processing plants: 18 operating year round, 55 seasonal operations** **No. landing sites: 65 in Trinidad, 32 in Tobago**		**No. fleet types: (9) artisanal multigear (includes Tobago), artisanal trawl, semi-industrial trawl, industrial trawl, semi-industrial multi gear (includes Tobago), semi-industrial longline, semi-industrial ice boat (Tobago only), recreational (includes Tobago), foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, Italian seine, bottom longline, surface longline, monofilament gillnet, multifilament gillnet, mullet net, shark net, switcher line, trawl net, troll line, tuck seine, turtle net, harpoon**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
	2004 - present		Weekly sampling at 5 of the major sites.		

SPECIES: Refer to 2: Oceanic (highly migratory) pelagic species	FISHERY DETAILS				
	No. markets: **No. processing plants:** **No. landing sites:**		**No. fleet types: (3) semi-industrial, recreational (includes Tobago), foreign** **No. gear types: (2) pelagic longline, pole and line**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
Landings (lb) by species	2001 – present	**Semi-industrial longline:** Data collected from semi-industrial longliners through a trip reporting system. Owners submit trip data after a trip is completed. This system is a precursor to a Logbook programme.	~ 100%		Data computerised in EXCEL
Size data (FL or TL in mm or cm)	1981 - present	**Recreational:** The recreational fleet is covered only through fishing	~ 100% coverage of tournaments		Data computerised in EXCEL

SPECIES: Refer to 2: Oceanic (highly migratory) pelagic species	FISHERY DETAILS				
	No. markets: **No. processing plants:** **No. landing sites:**		**No. fleet types: (3) semi-industrial, recreational (includes Tobago), foreign** **No. gear types: (2) pelagic longline, pole and line**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
		tournaments.			

SPECIES: Refer to 2: Coastal pelagics, Oceanic (highly migratory) pelagic species, Hard-substrate demersals	FISHERY DETAILS				
	No. markets: one main market at Scarborough **No. processing plants:** **No. landing sites: 32**		**No. fleet types: (5) artisanal multigear, semi-industrial multi gear, semi-industrial ice boat, recreational, foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, bottom longline, surface longline, gillnet, switcher line, troll line,**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
TOBAGO: Note that data listed here are available at the Fisheries Division in Trinidad, however, there may be additional data at the Department of Marine Resources and Fisheries of the Tobago House of Assembly which are not listed.					
Landings (lb) by species and gear; some species grouped	1979 - 1982 1988 - 1992	**Artisanal multigear fleet** Data collected from a government implemented Collector Vessel System to encourage development of the fishery **Artisanal multigear fleet** Data collected at the 3 major landing sites (Buccoo, Pigeon Point and Mt Irvine)	Only the artisanal multi-gear fleet involved in the drifting fishery (using gillnets, troll lines, banklines) is covered The entire data collection programme was directed at the drifting fishery i.e., almost all fishing days were recorded during the	Data not raised Refer to Annex 1	Data for the drifting fishery were initially stored in an R-based system developed in the late 1980s, then transferred to Dbase IV in the early 1990s. Only data from 1988 have been raised to estimate total landings. This was based on the methodology outlined in Appendix 1, however, the data are not included

SPECIES: Refer to 2: Coastal pelagics, Oceanic (highly migratory) pelagic species, Hard-substrate demersals	**FISHERY DETAILS**				
	No. markets: one main market at Scarborough **No. processing plants:** **No. landing sites: 32**		**No. fleet types: (5) artisanal multigear, semi-industrial multi gear, semi-industrial ice boat, recreational, foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, bottom longline, surface longline, gillnet, switcher line, troll line,**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
	1993 - 1994 1995 - 1998	Data collected at 5 landings sites for the drifting fishery: Buccoo, Mt Irvine, Bon Accord and 2 sites at Pigeon Point Data collected at two sites only (Buccoo and Pigeon Point) In all time periods: *H. affinis*; Coryphaena hippurus; *Scomberomorus cavalla*; *Acanthocybium solandri; Istiophorus albicans*; Shark; Snapper; Grouper; Grunt; Bonito; Tuna	November to July season. However, two sites, one at Bon Accord and the other, a smaller site at Pigeon Point, were not included until 1993. Data collected 8 days per month in accordance with a randomized and expanded sampling system introduced under the CFRAMP to include sampling of other fisheries. However, only data for drifting fishery computerized. Some data for the troll and fishpot fishery available as hard copy	Refer to Annex 1	in the ORACLE-based system. Estimates accounted for fishing days not recorded at enumerated sites. For 1993-1994 only, estimates were derived as well for 5 unrecorded (minor) sites using data from a 1991 Vessel Census. Data were raised in spreadsheets however the associated files are not available. Published accounts of estimated total landings exist while raw data are now available in EXCEL spreadsheets.
Landings (lb) by	1981 – present	**Recreational:**	~ 100% coverage of		Data computerised in

SPECIES: Refer to 2: Coastal pelagics, Oceanic (highly migratory) pelagic species, Hard-substrate demersals	**FISHERY DETAILS** **No. markets:** one main market at Scarborough **No. processing plants:** **No. landing sites: 32**		**No. fleet types: (5) artisanal multigear, semi-industrial multi gear, semi-industrial ice boat, recreational, foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, bottom longline, surface longline, gillnet, switcher line, troll line,**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
species		The recreational fleet is covered only through fishing tournaments.	tournaments		EXCEL
Effort (# trips, # boats)	1979 - 1982 1987 - 1992 1993 - 1994 1995 - 1998	**Artisanal multigear fleet** Data collected from a government implemented Collector Vessel System to encourage development of the fishery **Artisanal multigear fleet** Data collected at the 3 major landing sites (Buccoo, Pigeon Point and Mt Irvine) for the drifting fishery Data collected at 5 landings sites for the drifting fishery: Buccoo, Mt Irvine, Bon Accord and 2 sites at Pigeon Point Data collected at two sites only (Buccoo and Pigeon Point)	Only the artisanal multi-gear fleet involved in the drifting fishery (using gillnets, troll lines, banklines) is covered The entire data collection programme was directed at this fishery i.e., almost all fishing days were recorded during the November to July season. However, two sites, one at Bon Accord and the other, a smaller site at Pigeon Point, were not included until 1993. Data collected 8 days per month in accordance		Data for the drifting fishery were initially stored in an R-based system developed in the late 1980s, then transferred to Dbase IV in the early 1990s. Only data from 1988 have been raised to estimate total landings. This was based on the methodology outlined in Appendix 1, however, the data are not included in the ORACLE-based system. Estimates accounted for fishing days not recorded at enumerated sites. For 1993-1994 only, estimates were derived as well for 5 unrecorded (minor) sites using data from a 1991 Vessel Census. Data were

SPECIES: Refer to 2: Coastal pelagics, Oceanic (highly migratory) pelagic species, Hard-substrate demersals	**FISHERY DETAILS** **No. markets:** one main market at Scarborough **No. processing plants:** **No. landing sites: 32**		**No. fleet types: (5) artisanal multigear, semi-industrial multi gear, semi-industrial ice boat, recreational, foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, bottom longline, surface longline, gillnet, switcher line, troll line,**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
			with a randomized and expanded sampling system introduced under the CFRAMP to include sampling of other fisheries. However, only data for drifting fishery computerized. Some data for the troll and fishpot fishery available as hard copy.		raised in spreadsheets however the associated files are not available. Published accounts of estimated total landings exist while raw data are now available in EXCEL spreadsheets.
Ex-vessel price (TT$)	1993 - 1998	**Artisnal multi-gear** Data collected for the drifitng fishery only			Data entered in Dbase IV but not transferred to EXCEL spreadsheet. Further investigation necessary to ascertain if this information can be retrieved, however information available in hard copy
Size data (mm or cm FL or TL)	1992; 1996 – 1998	**Artisanal multigear fleet** 1992 : *H. Affinis* 1996 – 1998 : *H. Affinis, C. hippurus*	1992 Data were collected from the artisanal multi-gear fleet operating in the drifting fishery and are restricted to *H. affinis*. The drifting		A target of 200 fish per species per gear and month is set. However, there may be data gaps (missing month or gear data). Data

SPECIES: Refer to 2: Coastal pelagics, Oceanic (highly migratory) pelagic species, Hard-substrate demersals	**FISHERY DETAILS**				
	No. markets: one main market at Scarborough **No. processing plants:** **No. landing sites: 32**		**No. fleet types: (5) artisanal multigear, semi-industrial multi gear, semi-industrial ice boat, recreational, foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, bottom longline, surface longline, gillnet, switcher line, troll line,**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
			fishery utilizes both gillnets and pelagic lines from southwest Tobago. 1996 – 1998 data are collected from both the drifting fishery and pelagic line fisheries (troll, a la vive) operating at up to 8 main landing sites.		computerised in EXCEL.
Size data (FL or TL in mm or cm)	1981 - present	**Recreational:** The recreational fleet is covered only through fishing tournaments.	~ 100% coverage of tournaments		Data computerised in EXCEL
Size data (FL or TL in mm or cm)	1990 - 1991	**Artisnal multigear** *L. pupureus, L. jocu, R. aurorubens, E. flavolimbatus, M. interstitialis*	Directed sampling at one processing plant		Data collected under an FAO project in collaboration with the Institute of Marine Affairs (IMA). Data collected and computerised at the IMA but not available at the Fisheries Division
Maturity, Sex, Age Data	1991 - 1992	**Artisanal multigear** *H. affinis*	Sampling from the commercial catch		A monthly target of 50 fish per snapper and grouper species was set. Data computerised in EXCEL.

SPECIES: Refer to 2: Coastal pelagics, Oceanic (highly migratory) pelagic species, Hard-substrate demersals	**FISHERY DETAILS**				
	No. markets: one main market at Scarborough **No. processing plants:** **No. landing sites: 32**		**No. fleet types: (5) artisanal multigear, semi-industrial multi gear, semi-industrial ice boat, recreational, foreign** **No. gear types: : (18) a la vive, bank line, spear, drift line, fish pot, bottom longline, surface longline, gillnet, switcher line, troll line,**		
Types of data available – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details**	**Statistical coverage details**	**Where sample data collected, how are sample data raised to provide totals for entire industry**	**Comments**
Maturity, Sex, Age Data	1990 -1991	**Artisanal multigear** *L. purpureus, R. aurorubens, E. flavolimbatus, M interstitialis.*	Directed sampling at one processing plant		Data collected under an FAO project in collaboration with the Institute of Marine Affairs (IMA). Data collected and computerised at the IMA but not available at the Fisheries Division
Maturity, Sex	1996 - 1998	**Artisanal multigear** *H. affinis, C. hippurus* (sex only)	Sampling from the commercial catch		A target of 50 fish per species per gear and month is set. However, there may be data gaps (missing month or gear data). Data computerised in EXCEL.

ANNEX 1: Excerpt from: Ferreira , L. 2003. National Report – Trinidad and Tobago prepared for CFU/FAO Fisheries Statistics and Data Management Workshop, March 10 – 22, 2003, UWI Campus, Barbados. p 4-10.

3. METHODS OF DATA COLLECTION AND STORAGE

The data collection system of the Fisheries Division includes collection of information on fishermen, fishing vessels, engines and gear; fish landings and fishing effort data; fisheries biological data including species, length, weight, maturity, sex, age, location/time/depth of capture, associated physical and chemical parameters; fish exports and imports; fisheries economic data including costs and earnings data on fishing activities. Fisher, vessel and engine information are collected via the Fisherman, Vessel, and Engine Registration Forms. Data on fisheries subsidies and fish imports and exports are obtained via application forms submitted to the Division. Economic data collection is limited largely to ad hoc costs and earnings studies of specific fisheries. This would involve conduct of interviews with fishermen and filling out of questionnaires. With regard to data storage, except for the fisherman, vessel and engine data which are computerized in the Licensing and Registration System (LRS), the export data which is computerized in Microsoft Access, and the economic data which is stored and analysed in Microsoft Excel, much of these data are not yet computerized. With regard to the ongoing programmes for the collection of catch and effort data and biological data, further details are provided below.

3.1 CATCH AND EFFORT DATA

3.1.1 Data Collection

Statistical Collectors are employed to record landings and effort data at nineteen (19) beaches out of a total of 65 landing sites around Trinidad. These persons live in close proximity to the landing sites and record data as vessels come in from fishing. The main document used for collection purposes is the "Return of Fish Landed" form. Data are collected for each vessel on: Vessel Registration Number; Times departed and returned; Number of crew; Gear type used; Weights of "species" landed (grouped by "Local Names"); Ex-Vessel price per "species", and Area Fished. These data are obtained either from fishermen directly or from the vendors who meet the fishermen on the beach to purchase catches.

Collectors record the above data for at least 20 days (selected at random by the Fisheries Division) in a month. A Boat Activity Sheet is also used by the Collector to record the numbers of boats active by fishing method on each day of the month. This sheet can thus be used to determine: whether or not the Collector was able to record data from all the fishing vessels on each of the days on which he worked; and the total number of fishing days at a particular site. Staff of the Statistical Unit of the Division also interview the Collectors and fill out a questionnaire each month to establish the total number of fishing days on the beach.

The existing system of data collection covers only the artisanal fleet such that each enumerated site is assumed to be representative of artisanal fishing activity within a zone. In 1991 the coastline of Trinidad was divided into nine statistical sampling regions such that fisheries within a region were similar. This was based on a national fisheries census of vessels, which provided information on vessel distribution, gear type, species composition of landings.

This system does not cover the semi-industrial and industrial fisheries. In 1991 under a UNDP/FAO project, logbooks were introduced for the semi-industrial and industrial shrimp trawlers. In these, the captains recorded catch data for each of the shrimp and fish components of the catch (including quantities discarded) by haul. However, after only six months owners stopped submitting logbook returns due to a number of commercial developments in the industry. A trip report system, a simplified version of the logbook, was implemented for the local longline fleet at the end of 2001 to collect data on effort as well as landings and

discards by species. A similar system will be implemented for the industrial trawlers over the next few months.

Monitoring programmes for large migratory pelagics will be implemented in the near future to ensure compliance and enforcement of ICCAT resolutions and recommendations, and Trinidad & Tobago's port state obligations as indicated in the United Nations 1995 Agreement relating to the Conservation and Management of Straddling Stocks and Highly Migratory Fish Stocks. Programmes will include data collection and reporting on transshipment operations; vessel sightings and at-sea transshipments; port inspection and identification of vessels engaged in illegal, unregulated and unreported (IUU) fishing activities and import prohibition.

3.1.2 Data Storage

Catch and effort data from 1995 to the present are computerized in Oracle. This database represents the Commercial Landings component of the Harvest Module of a general fisheries management information system (FISMIS) which was conceptually designed under a technical co-operation project with the International Development Research Centre (IDRC) of Canada 1991. The Harvest Module will also comprise components for the Recreational Landings, and Observer/Logbook Records. The other two modules of FISMIS are: Socio-Economic Module comprising Fisherman Registrations, Vessel Registrations, Beach Facility Profiles, Imports/Exports, and Financial Incentives; and Stock Assessment Module comprising Ageing Data, Resource Survey Data, Catch Sampling Data, Oceanographic Data, and Remote Sensing Data. Appendix 2 illustrates the concept of FISMIS.

The FISMIS Application is deployed on an MS Windows platform utilizing Oracle Database Server (Standard Edition) Release 8i with Oracle Internet Developer Suite. The Fisheries Division maintains a small intranet comprising 14 PCs, network hubs, and one domain server on which the Oracle RDBMS resides. A staff of six persons comprising the Statistical Unit insert, update, delete, and retrieve data from the database via Oracle's multi-user capabilities.

3.2 BIOLOGICAL DATA

3.2.1 Data Collection

The ongoing biological data collection programme is limited to the major commercially important species, namely shrimp, carite, kingfish and shark. The shrimp biological sampling programme commenced in March 1991 under a UNDP/FAO project. Weekly sampling is conducted at five of the major trawl landing sites. Each sample of shrimp landings is sorted by species (5 species: *Penaeus subtilis, P. notialis, P. schmitti, P. brasiliensis, Xiphopenaeus kroyeri*) and gender, and carapace lengths recorded. The total weight of shrimp sampled per vessel is recorded as well as the total weight of shrimp landed by the vessel sampled. If the catch sampled is sorted then these weights are recorded by size category.

During 1992 and between 1995 and 1997 length frequency, maturity, and age and growth data were collected for King mackerel (*Scomberomorus cavalla*) and Serra Spanish mackerel (*Scomberomorus brasilensis*) and some species of shark (*Carcharinus porosus, C. limbatus, Rhizoprionodon lalandii, Sphyrna lewini,* and *S. tudes*). The data were captured monthly for the major gears of the artisanal fisheries that target the two mackerel species (gillnets and pelagic handlines). Sharks are considered as by-catch. It is expected that this programme will resume within the coming months. Currently, no length data are collected for the semi-industrial/ industrial longline fishery.

In addition to the ongoing shore-based programme, an at-sea sampling programme was initiated for the artisanal and semi-industrial trawl fishery in 1999 to capture data on discards. There are also plans to implement an Observer Programme around mid-2003 for the offshore trawl, longline and multi-gear fleets.

3.2.2 Data Storage

Shrimp monthly length frequency data as well as the fish biological data are entered into Microsoft Access databases.

4. DATA ANALYSIS AND REPORTING

4.1 CATCH AND EFFORT DATA

4.1.1 Estimation of Total Artisanal Landings

Landings and effort statistics collected at major (enumerated) sites are used to generate data for secondary (non-enumerated) sites, where it is assumed similar fishing occurs, at the same intensity. The recorded landings and effort data are raised by two factors (MIS 1996). The First Raising Factor (1^{st} RF) adjusts the statistics recorded at an enumerated site to account for the non-enumerated fishing days, that is, fishing days on which the Collector did not work. This factor is a monthly ratio (Total Number of Fishing Days divided by Total Number of Enumerated Fishing Days) that is determined for each of the 19 enumerated beaches. The Second Raising Factor (2^{nd} RF) adjusts the first raised statistics to account for non-enumerated vessels, that is, vessels based at sites where no data were recorded. This factor is determined as the ratio of the Total Number of Boats to Total Number of Enumerated Boats and is applicable to a zone. The number of boats is obtained from a fishing vessel census, which is conducted every few years.

Reports can be generated from the system based on recorded data, first raised data or second raised data. Further details are provided on the first and second raised reports. The value of landings each month is determined as the product of the raised landings and the average price. Totals for the year are estimated as well as the mean (x), variance (S^2), and standard deviation (S) for all parameters.

Landing statistics (Landings (kg); Value; Trips; Landings/Trip) are generated for each month of the year in the following reports (Price/kg and Value/trip will soon be included in these reports):

First Raised Artisanal Statistics Reports

- Beach/Month Landing Report
- Gear/Species/Month Beach Landing Report
- Species/Month Beach Landing Report

Second Raised Artisanal Statistics Reports

- Zone/Month Landings Summary Report
- Species/Month Landings Summary Report For All Zones Combined
- Gear/Month Landings Summary Report For All Zones Combined
- Gear/Species/Month Landings Summary Report For All Zones Combined (Appendix 3)

Fishing effort statistics (Hours, Men, Trips, Hours/Trip) are generated for each month of the year in the following reports:

First Raised Artisanal Statistics Reports

- Gear/Month Effort Beach Report

Second Raised Artisanal Statistics Reports

- Zone/Gear/Month Effort Summary Report
- Gear/Month Effort Summary For All Zones Combined

4.1.2 Trawling Raised Statistics Reports

The trawling raised landings reports use a subset of the overall landings data: only the landings for which the fishing method is trawling. The trawl data extracted are summarized for each beach by trawler type (I, II, III, or IV) and fishing area (North Gulf of Paria, South Gulf of Paria, South coast, Venezuela). The application of the 1st RF adjusts the recorded statistics to account for non-enumerated days and is identical to the one used for landings from other methods (Shim 1997).

Landing statistics (Landings (kg); Value; Trips; Landings/Trip) are generated for each month of the year in the following report (Price/kg and Value/trip will soon be included in the report):

- Trawl Type/Fishing Area/Species Beach Landings Report

Fishing effort statistics (Hours, Men, number of boats, Trips, Hours/Trip, days/trip) are generated for each month of the year in the following report:

- Trawl Type/Fishing Area Beach Effort Report

The first raised trawler landings and effort generated in the above reports, by fleet type and fishing area, for individual sites are then used to estimate total trawler landings for Trinidad by fleet type and fishing area. This process is conducted in a spreadsheet application and has not been programmed in Oracle since user input is necessary throughout the procedure.

4.2 BIOLOGICAL DATA

With regard to the analysis of the shrimp length frequency data, catch in numbers and catch in weight are estimated for a particular shrimp species and gender for a particular trawl fleet, fishing area and month. The length frequency distribution for the particular shrimp species and gender for the particular trawl fleet, fishing area and month obtained from each sample is first raised to the landed weights of shrimp of the vessel sampled. The raising factor would be the total landed weight of all shrimp from the trawler divided by the weight of shrimp sampled from that trawler. Such raised length frequency distributions for a particular species and gender from all samples from a particular trawl fleet, fishing area and month are added across length classes. This is then raised to the total shrimp catch for the fleet, area, and month by applying the raising factor: total shrimp catch (all species) for fleet, area, month divided by total landed weight of shrimp from all vessels sampled. This total catch in numbers by species and gender is then converted to weights using length weight relationships.

The reports generated from the database are as follows:

- Total Landings (number of individuals and weight) by Length Class /species /gender /trawler type/fishing area/month
- Shrimp species and gender composition (% by weight) by trawler type/fishing area/month
- Total number of shrimp sampled by species/gender/trawler type/fishing area/month

With regard to the MS Access fish biological database, some examples of reports currently being created are as follows:

- Number of length samples by species, landing site, and gear
- Monthly length frequency distributions by species, landing site and gear
- Number of maturity samples by species, gender, fishing gear and stage of maturity
- Stage of maturity at length by species, gender and month

5. QUALITY CONTROL IN THE DATA MANAGEMENT SYSTEM

5.1 CATCH AND EFFORT DATA

Data are recorded by the Collector in a notebook and later transcribed onto the "Return of Fish Landed Forms". The data entry staff of the Statistical Unit verifies the forms with the notebooks and conduct trips to the beaches to clarify any queries with the Collectors. Annual Data Collectors training workshops are held to ensure consistency in recording data and address problems arising.

The forms via which data maintenance is accomplished have context-sensitive help and controls incorporated to prevent invalid data entry.

Data entered are verified with the raw data sheets and edited accordingly prior to report generation.

5.2 BIOLOGICAL DATA

Biological data collectors are trained and supervised by Fisheries Officers. Raw data are reviewed by the Fisheries Officers prior to data entry. Data entered are verified with the raw data sheets and edited accordingly prior to report generation.

TURKS AND CAIÇOS ISLANDS

1. (a) Country …**TURKS AND CAIÇOS ISLANDS** (b) Fishery Data Manager's Name: **Kathy Lockhart, Scientific Officer DECR**

2. Please provide a complete list of all major species/ fishery resources harvested by your fishing industry.

***Strombus gigas* (Queen Conch)**
***Panulirus argus* (Spiny lobster)**
Fin-fish (ex. Scale fish such as Grouper, Snapper, etc.)

3. In the table below, please list all types of fisheries statistics collected by your Fisheries Division/Department, and please indicate the periodicity and methods of collecting these statistics. Examples are shown in the grey cells and extra rows are provided for adding your own national information.

Fishery type (list by species or resource type, whichever is more suitable)	**Fishery Statistics**	**Periodicity of Collection (mark the applicable columns with 'X')**					**Method of Collection (mark the applicable columns with 'X')**						**Comments (additional information can be included here)**
		once	**daily**	**monthly**	**annually**	**Ad-hoc (needs basis)**	**Direct sampling during vessel offloading operations**	**Direct sampling during vending operations**	**Observer programs**	**Fisher interview surveys**	**Fishery independent surveys**	**Other (specify)**	
EXAMPLES Wahoo & dolphinfish	landings		X				X						
	effort		X				X						
	size		X				X						
	age			X			X						
	sex		X				X						
	maturity		X				X						
	ex-vessel price			X			X						
	Area fished	X								X			
Other offshore pelagic species	landings		X				X					Processing plant records examined regularly	
	effort		X				X						
Queen conch	catch							X		X			
	effort									X			
	Area fished									X			
	meat weight							X					
	size										X		
	sex										X		
	maturity										X		

	Area of occurrence										X		
	Habitat type										X		
	depth										X		
Queen Conch	Catch		X				X					Process-ing plant records (examined regularly)	
	Effort		X				X					Process-ing plant records (examined regularly)	
	Area fished					X				X			
	Meat Weight					X					X		
	Size					X					X		
	Habitat type					X					X		
Spiny Lobster	Catch		X				X					Process-ing plant records (examined regularly)	
	Effort		X				X					Process-ing plant records (examined regularly)	
	Area fished		2X							X			

	Gender		2X								X	DECR-RESEARCH	
	Size		2X								X	DECR-RESEARCH	
	Maturity		2X								X	DECR-RESEARCH	
	Weight		2X								X	DECR-RESEARCH	
Fin-fish (reef fish)	Catch					X			X			Collaboration with SFS	
	Effort					X			X			Collaboration with SFS	
	Size					X			X			Collaboration with SFS	
	Weight					X			X			Collaboration with SFS	
	Maturity					X			X			Collaboration with SFS	
	Sex					X			X			Collaboration with SFS	

4. List data that are collected by other agencies or entities that are potentially useful for providing additional data on fishers and other stakeholders, markets, resources, and the health of the aquatic environment (also indicate agencies/entities involved), e.g. employment data; customs export data.

- **Customs export data**
- **Department of Environment and Coastal Resources (export permits, local exports)**
- **Local Restaurant Purchase Forms (monthly returns to the DECR)**
- **Fishing Tournament organizers (Local Billfishing tournaments)**

5. Please complete the tables on the following pages to provide further details on the data that are collected by your Division/Department as part of your routine fisheries statistical monitoring programme – see the two examples provided (rows with grey fill) to guide completion of the table. If the details are the same for more than one species, simply list all the species in the 'Species' column, for which the same details are applicable, e.g. in the first example, the details are the same for wahoo and dolphinfish, while in the second example, the details are the same for Caribbean spiny lobster and queen conch. Seven additional tables are provided for insertion of your national fisheries information.

Explanatory notes for completing tables for question 5:

15. If the same fishery and sampling details are relevant to more than one species please list the names of all the relevant species here.
16. Give details on the number of markets, processing plants, landing sites, fleet and gear types relevant to the respective species. *This information will be used to understand the full nature and distribution of various activities related to the fishing operations, and if and how these feature in the currently implemented statistical monitoring programme.*
17. Types of data may include landings, fishing effort, area fished, size data, age data, sex data, maturity data (*indicate whether macroscopic examination or collection of gonad weight for estimation of gonado-somatic indices*), ex-vessel price, and other data such as habitat type, depth data, water salinity, etc.. Please give the unit of measurement in brackets. *List each data type on a separate line as specific details are required in the following columns.*
18. Based on the specified fishery details, indicate the extent of statistical coverage e.g., number of each type of market, plant, landing site, fleet, and gear, for which data are collected.
19. Based on the already specified extent of statistical coverage (in numbers of markets, plants, sites, fleets, and gears), indicate further details on whether a census or sample is/was taken. *Kindly be reminded that a census, in relation to a particular landing site, implies that data are collected on every vessel and gear type operated each day at the site. In comparison, a sample, in relation to a landing site, implies that data are collected on a subset of the total number of vessels of each fleet and each gear type at the site and for a subset of the total number of fishing days of the season.*
20. In cases where samples are taken, briefly describe how the species data are raised to obtain total estimates for the entire industry. If the raising procedures have been formally documented, this documentation should be submitted along with the completed questionnaire.
21. Include any other additional information that may assist in estimation of totals.

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____	**FISHERY DETAILS[2]** **No. markets:** ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____			**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species (lbs)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Markets and processing plants: 2 main markets & 5 processing plants (b) Landing sites: 5 primary, 2 secondary, 0 tertiary. (c) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (d) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at markets and plants (b) Census at primary sites; 30% coverage at secondary sites (c) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (d) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(ii) effort, lumped for both species (hours fished)	1970-1994 (primary sites only); 1995-present (expanded to other sites)	(a) Landing sites: 5 primary, 2 secondary, 0 tertiary. (b) Fleet types: 4 major fleet types, plus 1 of the minor fleet types. (c) Gear types: 2 major gears plus 2 gears that also catch wahoo in small amounts	(a) Census at primary sites; 30% coverage at secondary sites (b) Census of 4 major fleets at primary sites; 30% coverage of fleets at secondary sites (1 minor fleet operating at tertiary sites and not sampled) (c) Census of major gears at primary sites; 30% coverage of gears at secondary sites (1 minor gear used by minor fleet at tertiary site not sampled)	For a, b, & c, use number of sampling days and sample-day totals of vessels by fleet type out fishing at secondary sites to determine overall effort totals gear type, fleet type, and hence also landing site	
(iii) size data – fork length (cm)	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-2003	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____	**FISHERY DETAILS[2]** **No. markets:** ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____			**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(v) sex data	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998; 2002-2003	Markets and processing plants, and 2 primary sites only	30% in 1996-1998; 15% in 2002-03	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1970-1994 (main sites only); 1995-present (expanded to other sites)		30% before 1995; 40% from 1995	(vii) Use ratio of sample to total landings	

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____	**FISHERY DETAILS[2]** **No. markets:** ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____			**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) landings by individual species – meat weight (ozs)	1950-1994 (processing plants only); 1995-present (expanded to actual landing sites)	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	(a) Census at plants during open fishing season (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (d) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(ii) effort, indistinguishable for both species (hours fished)	1995-present (primary, secondary, and tertiary sites)	(a) Landing sites: 2 primary, 5 secondary, 5 tertiary. (b) Fleet types: 2 major fleet types (c) Gear types: 2 major gears	(a) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (b) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites (c) 30% coverage at primary sites; 15% coverage at secondary sites; 15% coverage at tertiary sites	For b, c, & d, use number of sampling days and sample-day totals of vessels by fleet type out fishing at each site type to determine total number of fishing days and hence overall landing totals by gear type, fleet type, and hence landing site	
(iii) size data – shell length (mm) for conch & carapace length (mm) for lobster	1996-1998	Visual surveys (conch only) and primary sites only for lobster	20% of grounds in 1996-1998 for conch; 40% coverage for lobster	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(iv) age data	Not available		NA	NA	

EXAMPLE 1 **SPECIES[1]:** Wahoo and dolphinfish_____	**FISHERY DETAILS[2]**				
	No. markets: ____2 main____ **No. processing plants:** ____5 main___ **No. landing sites:** ___5_primary; 10 secondary; 22 tertiary_____			**No. fleet types:** ___4 major & 2 fleets that harvest as bycatch_____ **No. gear types:** ___2 major gears plus 3 other gears (bycatch)	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(v) sex data	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vi) maturity data – macroscopic exam	1996-1998	Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(vii) ex-vessel price data (EC$ per lb)	1950-1994 (processing plant records); 1995-present (expanded to other sites)	Processing plants, 2 primary, 5 secondary, 5 tertiary	From 1995, 30% coverage at primary sites, and 15% at secondary and tertiary sites	Use ratio of sample size to total landings estimated, taking into account the numbers and types of sampling strata covered.	
(viii) Other (specify) habitat type and depth data (ft), area of occurrence		Visual surveys (conch only)	20% of grounds in annual surveys during 1996-1998	Extrapolate to entire area of likely resource distribution	

SPECIES[1]: ___Queen Conch and Spiny Lobster_____		FISHERY DETAILS[2]			
		No. markets: _____2 (local and export)_____ **No. processing plants:** _____5_____ **No. landing sites:** ___5 major (processing plants), ?? secondary (local)_____		**No. fleet types:** ___2 (trap boats and local conch boats)_____ **No. gear types:** _____2 (traps and free diving)_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
Landings (weight) conch uncleaned (without shell) and lobster (whole)	Conch 1887-present Lobster 1947-present	(a) Processing plants: 5 processing plants (b) Landing sites: 5 primary, ??secondary (c) Fleet types: 2 major fleet types (trapboats, conch boats) (d) Gear types: 2 major gears (traps and freediving)	a) Census at plants during open fishing season	At each plant landing and effort are reported by number of fishers in the boat and total landed catch (lbs.). A boat is fishing for 1 day. Each day is considered a boat-day. Multiple by the number of fishers on the boat and you get the number of man-days.	
effort, indistinguishable for both species (boat-days and man-days)	Conch 1974-present Lobster 1974-present	(a) Processing plants: 5 processing plants (b) Landing sites: 2 primary, 5 secondary, 5 tertiary. (c) Fleet types: 2 major fleet types (d) Gear types: 2 major gears	a) Census at plants during open fishing season	At each plant landing and effort are reported by number of fishers in the boat and total landed catch (lbs.). A boat is fishing for 1 day. Each day is considered a boat-day. Multiple by the number of fishers on the boat and you get the number of man-days.	
size data – shell length (mm) for conch & carapace length (mm) for lobster	Conch 2000-2001 Lobster-1989-1998 Lobster 2005-present	(a) Visual surveys (conch only) (b) (Lobster) Processing plants: 5 Processing plants	(a) 45,900m^2 visual for 2000 hectares fishing grounds =.05% coverage (b) Sample of 30% coverage	N/A	
sex data	Lobster-1989-1998 Lobster 2005-present	(Lobster) Processing plants: 5 Processing plants	Sample of 30% coverage	Use ratio of sample size to total landings	
maturity data	Lobster-1989-1998 Lobster 2005-present	(Lobster) Processing plants: 5 Processing plants	Sample of 30% coverage	Use ratio of sample size to total landings	

ex-vessel price data (EC$ per lb)	2003-2006 (processing plant records	Processing plants	From 2003: 30% at processing plants	Establish a total value of the fishery via processing facility for the entire fishery economic value ($/lbs.)	
Other (specify) habitat type and depth data (ft), area of occurrence	Conch 2004-2005 (EHCLR)	Visual surveys (conch only)	From 2004 :30% of EHCLR Protected Area	Determine the coverage of the various habitats within the known Protected Area and determine the habitat coverage.	
Age data	Not available			N/A	

SPECIES[1]: ____Fin-fish_____		**FISHERY DETAILS[2]**			
		No. markets: ___1 local_____ **No. processing plants:** _5_____ **No. landing sites:** _5 major (processing plants), ?? secondary (local)		**No. fleet types:** __2 (trap boats, local conch boats)_____ **No. gear types:** __2 (traps, line)_____	
Types of data available[3] – give measurement unit	**Time periods for which data are available**	**Extent of data collection activities in relation to fishery details[4]**	**Statistical coverage details[5]**	**Where sample data collected, how are sample data to provide totals for entire industry[6]**	**Comments[7]**
(i) total landings (lbs) for fishery	1990-2002	a) Processing plants: 5 processing plants	a) Census at plants during open fishing season	At each plant landing and effort are reported by number of fishers in the boat and total landed catch (lbs.). A boat is fishing for 1 day. Each day is considered a boat-day. Multiple by the number of fishers on the boat and you get the number of man-days.	
(ii) effort, boat-days and man-days	1990-2002	a) Processing plants: 5 processing plants	a) Census at plants during open fishing season	At each plant landing and effort are reported by number of fishers in the boat and total landed catch (lbs.). A boat is fishing for 1 day. Each day is considered a boat-day. Multiple by the number of fishers on the boat and you get the number of man-days.	
(iii) size data – fork length (cm)	N/A				
(iv) age data	N/A				
(v) sex data	N/A				
(vi) maturity data – macroscopic exam	N/A				
(vii) ex-vessel price data (EC$ per lb)	N/A				

COMPONENTS OF THE SPINY LOBSTER (*Panulirus argus*) FISHERY OPERATIONS IN ST. VINCENT AND THE GRENADINES AND ASSOCIATED SOCIO-ECONOMIC CHARACTERISITICS

Maren Headley[1] and Susan Singh-Renton[2]

[1]Research Graduate, Research and Resource Assessment Programme, CRFM Secretariat, 3rd Floor Corea's Building, Halifax Street, Kingstown, St. Vincent and the Grenadine
marenheadley@vincysurf.com
[2]Programme Manager, Research and Resource Assessment Programme, CRFM Secretariat, 3rd Floor Corea's Building, Halifax Street, Kingstown, St. Vincent and the Grenadines
ssinghrenton@vincysurf.com

Abstract

The spiny lobster fishery is very important to St. Vincent and the Grenadines, and approximately 25 tonnes are exported annually. Habitat degradation and heavy fishing pressure in the near shore areas are believed to have impacted the local spiny lobster population negatively. At present, social and economic considerations, from the level of harvest to the level of supplying external markets, are not incorporated into management decisions for this fishery. Using both formal and informal interviews, this study identified and characterized the component operations of the lobster fishing industry, from harvest to export operations, examined types of social and economic data possible to gather and options for their use in evaluating fishery performance relative to social and economic management objectives. Fishers were the most co-operative interviewees providing information on: material lifestyle; number of dependents; education level; fishing patterns; weekly incomes and expenditures; supply levels to different purchasers. Fishers' most common weekly income range was $500-1000 XCD and most fished full-time (92.5 %), with fishing as the main income for the family. The ex-vessel price range most often quoted was $22.05-55.13 XCD/kg. Stakeholders who benefitted socially and economically at the post harvest level were identified and some preliminary characteristics of their activities determined. Export markets for spiny lobster included: Anguilla, Barbados, Grenada, Martinique, St. Lucia, Trinidad and Tobago, and the USA with marketing routes by sea and air. Additional research is recommended for developing an adequate socio-economic information base to support the formulation of more integrated and balanced strategies for managing the fishery.

KEYWORDS: Caribbean, spiny lobster, socio-economic data

INTRODUCTION

St. Vincent and the Grenadines is located in the Eastern Caribbean, at the southern end of the Windward Islands chain (Figure 1). The fishing industry in St. Vincent and the Grenadines includes a small scale and artisanal component which utilizes traditional gear, methods and vessels (Jardine and Straker 2003). There are approximately 2500 full and part-time fishers, while fish vendors, traders, and processors make up an additional 500 persons (FAO 2002a). The fishing sector in St. Vincent and the Grenadines contributed an average of $9.91 million Eastern Caribbean dollars (XCD) to the Gross Domestic Product (GDP) during 2003-2007 (St. Vincent and the Grenadines Statistical Office, unpublished data). However, this amount does not account for other aspects of industry operations, such as the sale of fish in restaurants, and investments in fisheries.

In the region, the Caribbean spiny lobster (*Panulirus argus*) is believed to be fully or overexploited (FAO 2007). Additional factors that are negatively impacting fish stocks include habitat loss due to coastal development, and the unregulated and illegal fishing from local and foreign vessels (Jardine and Straker 2003, FAO 2007). In terms of export revenue generated, the spiny lobster fishery is one of the most valuable fisheries in St Vincent and the Grenadines. Approximately 25 tonnes are exported annually and an estimated 10–20% of the lobster catch is consumed locally (FAO 2002b).

The majority of spiny lobster is caught and landed in the Grenadine islands of St. Vincent. However, due to the small and dispersed nature of these islands, comprehensive routine monitoring of lobster fishing activities is difficult, and also limited by the current administrative infrastructure. Present regulations specify a closed season for lobster from May 1st to August 31st in each year and prohibit the harvest of berried females, as well as moulting and undersized individuals (Kirby-Straker 2003). Hand loop and fish traps (also called 'pots') are the only legal methods by which lobster can be captured (Kirby-Straker 2003). However, there are limited available resources for enforcement of current management regulations. In St. Vincent and the Grenadines, the specific management objectives of the spiny lobster fishery are: i) to stabilize the net income per fisher at a level above the national minimum desired income; and ii) to maintain stocks at the level of Maximum Sustainable Yield (MSY) (Anon. 2003).

Despite the obvious need to analyze fishery performance from the standpoint of contributions to the social and economic well-being of the stakeholders, national fishery data collection systems in many of the Eastern Caribbean islands do not routinely collect the types of data necessary to facilitate such an analysis. Though this problem has been recognized for several years, only recently have efforts shifted from qualitative to more quantitative appraisals *e.g.* (Baldwin *et al.* 2006, Gill *et al.* 2007, Staskiewicz and Mahon 2007). Additionally and very importantly, there have been efforts within the sub-region in the past two years to develop data analysis methodology that not only attempts to incorporate social and economic data into fishery assessments, but also seeks to identify and quantify all the social and economic relationships that underpin the fishing industry (CRFM 2007, CRFM 2008).

In an effort to improve the available data and information necessary to apply the methods advocated by CRFM (2007, 2008) to the spiny lobster fishery of St. Vincent and the Grenadines, this study identified and characterized the various component operations comprising the local industry, based on social and economic data gathered during stakeholder interviews, and examined options for utilization of these data on a routine basis to evaluate social and economic performance of the fishery and so inform the development of more integrated management strategies. We also conducted a preliminary evaluation of the fishery's performance with regard to the socio-economic management objective listed above at (i).

METHOD

Interviews were conducted during the period April-September 2008. The fishing communities surveyed included: Paget Farm and Friendship Bay in Bequia; Mustique Fishing Camp in Mustique; Saline Bay in Mayreau; Grand Bay in Canouan, and; Clifton in Union Island (Figure 1). Given the

absence of a complete national register of lobster fishers, a list of fishers and other lobster fishery stakeholders was developed based on data and information provided by staff of the national fisheries administration, and other key informants including lobster fishers. The data collection methods included formal interviews using questionnaires and informal interviews with key informants and stakeholders.

Formal Interviews

Formal interviews were conducted using prepared questionnaires, and four stakeholder groups were targeted: lobster fishers (sample size = 40); purchasing company and processing plant operators and the single trading vessel's captain (sample size = 4); employees at landing sites, markets, and processing plants (sample size = 3); the general public, including yacht visitors (sample size = 20). The completion of questionnaires depended on the willingness of individuals to participate and their level of interest. In addition, a fifth questionnaire form was prepared for restaurateurs and hoteliers, to determine their purchase and sale patterns of lobster. A memorandum was distributed to restaurateurs and hoteliers in St. Vincent and the Grenadines informing them of the study aims and they were also contacted by phone. However, the restaurateurs and hoteliers were unwilling to share this information and the questionnaires were not completed.

A questionnaire was administered to the lobster fishers in order to collect demographic information on the fisher, boat and gear characteristics, spatial and temporal information on fishing practices, markets, and fishing costs. The questionnaire took an estimated 30-45 minutes to complete, depending on the detail given by the respondent.

Operators of the purchasing companies and the processing plant, and the trading vessel captain were interviewed to collect demographic information, and to determine lobster purchase patterns, markets and market routes. The questionnaire took an estimated 15-20 minutes to complete, depending on the detail given by the respondent.

Interviews were conducted with other individuals involved in the fishing industry e.g. processing plant employees and fish vendors using a questionnaire to collect demographic information. The questionnaire took an estimated 10-15 minutes to complete, depending on the detail given by the respondent.

A questionnaire was administered to the general public including yacht visitors in order to collect demographic information, and to determine patterns of lobster consumption and purchase. The questionnaire took an estimated 10-12 minutes to complete, depending on the detail given by the respondent.

Informal Interviews

Where formal interviews failed due to the reluctance of interviewees in providing responses to specific questions, informal interviews were conducted as an alternative. Informal discussions were held with restaurateurs in Mayreau (sample size =2), and St. Vincent (sample size =1), and individuals who operated hotels with onsite restaurants in Bequia (sample size =2), St. Vincent (sample size =1), and Union Island (sample size =2). These hotel-restaurants were chosen due to their popularity and high patronage levels as lobster meals were typically expensive. In addition, the importance of the water taxi operators within the sales and distribution chain was only identified after the study had commenced. Consequently, informal discussions were held with selected water taxi operators (sample size = 5) to determine their purchase and sale patterns of lobsters.

Other sources of information

The GDP of the fishery sector was supplied by the St. Vincent and the Grenadines Statistical Office (St. Vincent and the Grenadines Statistical Office, unpublished data), while the data on lobster landings and values were obtained from the Fisheries Division of St. Vincent and the Grenadines (St. Vincent and the Grenadines Fisheries Division, unpublished data). The Labour Department in St. Vincent and the

Grenadines provided the minimum wage for unsheltered agricultural workers as there was no specific minimum wage quoted for fishers (St. Vincent and the Grenadines Statutory Rules and Orders No. 30 2008). Data on yacht and tourist arrivals were obtained from The Ministry of Tourism, Youth and Sports (Ministry of Tourism, Youth and Sports 2007).

On completion of the individual interviews, key informants were again consulted to facilitate validation of the information for general accuracy and consistency.

RESULTS

The key component operations of the lobster fishery were made up of: a harvest component, which involved the fishers and their fishing operations; a sales and distribution component which involved fishers, vendors, traders and processors engaged in local and/or external sales and distribution of spiny lobster and its products; and a consumption component which was made up of consumers from the local population, on-site tourists and consumers in importing countries (Table 1).

Harvest Component

General technical and technological characteristics

In addition to lobster, the most frequently targeted resources included conch and reef and slope fish (Figure 2a). Large pelagic and small coastal pelagic fish were captured less frequently. Large pelagic fish were only captured by the Bequia fishers whereas small coastal pelagic fish were captured by both Bequia and Mustique fishers. The most frequent average weight range of lobsters captured by fish pots was 18-27 kg (Figure 2b) while the most frequent average weight range captured by SCUBA was 27-36 kg (Figure 2c). Battowia, Pillores, Savan, Mustique and Balliceaux were identified as the five areas most frequently fished for spiny lobster (Figure 2 d). Bequia fishers fished in all the islands and hence all fishing areas, while the Mustique fishers fished in all identified areas except Isle de Quatre, Canouan, Petit Canouan, Petit Nevis and Union Island. The Canouan fishers only fished in the Canouan, Petit Canouan and Mayreau fishing areas. The Union Island fishers fished in the areas identified as Canouan, Petit Canouan, Mayreau and Union Island (Figure 2d).

Social and social-related characteristics of lobster fishing operations

The majority of fishers spent between 10 to 30 years in the fishing industry (Figure 3a). Fishers had 0-7 dependents within their households, with the most common number quoted being three (Figure 3b). Identified dependents were categorised as, children under the age of 16 (40%), employed adults (36%) and unemployed adults (24%) (Figure 3c). The employed adults were: waitresses (4%), clerks (5%), shopkeepers (3%), general workers (19%), masons (1%), cooks (2%), taxi drivers (1%) and divers (1%). There was a high dependence of households on the lobster fishery, with 87.5% of the fishers being the main provider at home and 12.5% being the second/third provider. The majority of fishers (97.5%) depended on the lobster fishery for 75-100% of their income, while only 2.5% depended on it for 50-75% of their income. Most fishers were educated up to primary level (95%), with only 5% having completed a secondary level of education. A little over half of the fishers were married (52.5%), 42.5% were single, and 5% lived as common law spouses. In terms of capital, 70% of the fishers owned land, while 30% did not. Fishers most frequently lived in houses made of a combination of concrete and wood (52.5%), while 45% lived in houses constructed completely of concrete and only 2.5% lived in wooden houses. All fishers lived in houses which had running water and electricity. These percentages are illustrated in Figure 3c.

Economic and economic-related characteristics of the lobster fishing operations

The most frequent average income range for the fishers in all islands was $500-1000 XCD per week (Figure 4a). Other economic-related characteristics are illustrated in Figure 4b. For instance, crew sizes

were most frequently made up of 1-3 individuals (72.5%). The other crew sizes given were 4-6 individuals (7.5%) and >6 individuals (20%). The duration of all fishing trips was 4-6 hours. This time included search time and represented the length of time between fishers leaving the shore and returning. The majority of fishers (95%) made 4-6 fishing trips per week, while 2.5 % made 1-3 trips per week and 2.5% made 7-9 trips per week. With regard to the number of days fished, most fishers fished 4-6 days per week (92.5%), 5% fished 7 days and only 2.5% fished 1-3 days per week (Figure 4 b).

Fishing costs associated with the lobster fishery

Flat transom boats, also known as bow and stern boats or dories, were the most commonly used vessels. The boats were powered by one or two outboard gasoline engines with 40-85 horsepower. Of the 40 fishers interviewed, 25 were vessel owners. In terms of fixed costs, the average costs of a vessel and engine given were $20,600 XCD and $10,340 XCD respectively (Table 2). The average cost given for a fish pot was $121.79 XCD. Information from key informants suggested that fishers usually owned 1-30 pots, with an average of 20 pots per fisher. Fishers were generally unwilling to indicate the number of pots they owned during the interviews. The average cost for a BCD (buoyancy control device) and regulator was $1390 XCD. In terms of running costs, SCUBA tanks were rented at a cost of $10 XCD/day and fishers usually used three tanks per fishing trip. The average cost of fuel per fishing trip was $134 XCD, while the average cost of food was $14.75 XCD per trip. Overall maintenance costs per year for vessels, engines and gear are also shown in Table 2.

The operational cost was estimated by adding the running costs per year to the value range most frequently given by fishers for the maintenance costs for vessel, engine and gear (see Table 2), and based on a range of 4-6 fishing days per week. The most common operational cost range was $24,380-26,380 XCD per year assuming 4 fishing days per week while it was $35,820-37,820 assuming 6 fishing days per week.

Economic Value of the Harvest

The average landed weight and value of spiny lobster for the fishing year 2005-2006 were 29,042 kg and $346,866.50 XCD respectively (St. Vincent and the Grenadines Fisheries Division, unpublished data). The ex-vessel price of lobster given by the fishers ranged from $22.05-55.13 XCD per kg. A preliminary estimate of a spiny lobster fisher's weekly earnings using values provided by the fishers was calculated based on a crew size of 3 persons and a mean lobster price of $36.11 XCD per kg. Assuming a minimum number of four fishing days and a minimum average catch weight per fishing day of 18 kg, the potential minimum weekly earning of a fisher was estimated to be $575.84 XCD. Assuming a maximum number of six fishing days and a maximum average catch weight per fishing day of 27 kg, the potential maximum weekly earning was estimated to be $4035.70 XCD

Sales and Distribution Component

The sales and distribution component was divided into two operations: sales and distribution at sea; and sales and distribution after the catch was landed (Figure 5). Fishers sold and distributed their catch to various buyers including yacht visitors, a trading vessel, vendors, water taxi operators, locals, restaurants, hotels with restaurants, purchasing companies and a processing plant. Based on the percentage of fishers who indicated that they sold their catch to these stakeholders, an estimated weight of spiny lobster supplied to each buyer group was calculated using the average landed weight of spiny lobster (29,042 kg) for the fishing year 2005-2006.

Sales and Distribution at Sea

Yachts-Visitors on yachts purchased lobsters directly from fishers at sea. Based on interviews with both fishers and visitors, it appeared that the average number of lobsters purchased per yacht was 4. Yacht visitors usually bought lobster once or twice per week. There was a preference for lobsters which weighed between 0.7 to 0.9 kg since these could be consumed during one meal. The price range paid by yacht

visitors ranged from $22.05 XCD/kg to as high as $117.75 XCD/kg. The average annual number of yacht visitors to St. Vincent and the Grenadines during the period of 1998-2006 was 128,364, with the average number of yachts being 32,091 based on four people onboard (ECLAC 2002, Ministry of Tourism, Youth and Sports 2007). Key informants and fishers estimated that approximately one out of every twenty yachts purchased lobsters. Therefore based on an estimate of 21,287 yachts potentially being present during any given lobster open season (34.5 weeks), and 1064 yachts purchasing lobster once or twice a week, it can be estimated that fishers supplied these yachts with 4256-8512 lobsters. Therefore the estimated weight of lobster supplied to these yachts in a year would range from 2979-7661 kg. Assuming a mean price of $69.90 XCD/kg, fishers could earn between $208,232 - 535,504 XCD per year. The estimated weight of lobster, which fishers indicated that they supplied to the yachts annually, i.e. based on an estimated percentage, fell within this range as it was 5082 kg (Figure 5).

Trading Vessel- At the time of the study, one trading vessel operated out of Friendship Bay, Bequia. The vessel was licenced in Grenada and operated according to HACCP standards. Reef and slope fish species were purchased by the trading vessel which supplied markets in Grenada and Martinique. It appeared that lobster was not routinely bought and its purchase depended on special orders. The captain of the vessel indicated that it was not profitable to sell lobster in Grenada and Martinique unless there was an order since the selling price was usually too high for customers to purchase on a regular basis. The estimated amount of lobster supplied to the trading vessel by fishers on an annual basis was 2904 kg (Figure 5).

Sales and Distribution on Land

Vendors - It was rare to find lobster in the local markets due to its high export demand. Vendors indicated that they did not typically purchase lobsters unless they received a special order. The estimated annual amount of lobster supplied to vendors by fishers, as indicated by fishers, was 726 kg (Figure 5).

Water Taxi Operators- Water taxi operators based in Union Island and Mayreau purchased lobsters to host weekly barbecues in the Tobago Cays. Five water taxi operators had an informal business arrangement with the captains of charter yachts which visited the Cays. The charge for a lobster meal ranged from $126.16-162.20 XCD per person and the number of guests at the barbecues typically ranged from 5 to 25 people per week. Based on a mean price of $144.17 XCD, it was estimated that water taxi operators could earn from $720.85-3604.25 XCD per week from these lobster barbecues. The estimated annual weight of lobster supplied to the water taxi operators by fishers, as indicated by fishers, was 2904 kg (Figure 5).

Locals- It appeared that lobster was not considered a traditional meal and therefore was not purchased by Vincentians on a regular basis. In addition to this, the price of lobster was considered to be restrictive to the interviewees who had a mean income of $2400 XCD per month. The estimated annual weight of lobster supplied to the locals by the fishers, as indicated by fishers, was 2904 kg (Figure 5).

Restaurants and Hotels- The prices at which lobsters were purchased by restaurants and hotels ranged from $26-55 XCD/kg and the average lobster meal started at $95 XCD. Restaurateurs indicated that due to the high demand of the lobster export market, very little lobster was available for local purchase. The restaurateurs/hoteliers also expressed concern about the declining amount of lobster and the competitive prices at which it was being sold. The estimated annual supply of lobster to the restaurants and hotels by fishers, as indicated by fishers, was 15,247 kg (Figure 5).

Processing plant-There was only one processing plant in Bequia, for which the operator leased the Fisheries Complex located in Paget Farm at a cost of approximately $10,000 XCD per month including utilities. Processing of the lobsters involved the removal of the tail from the head, packaging and freezing of the tails. However, the majority of lobsters were kept live rather than processed. In addition to processing the lobster, the processing plant also supplied lobster to both the local and export markets. No data on the weights and values of lobster processed and sold were available as the operator was unwilling to share this information. The price range at which lobsters were purchased from the fishers was $22.05-33.08 XCD/kg. The estimated annual supply of lobster by fishers to the processing plant, as indicated by fishers, was 9439 kg (Figure 5).

Purchasing companies - There were two purchasing companies: one located in Bequia and the other in Mustique. The company in Bequia supplied lobster mainly to the export market and all the lobsters were sold live. No data were available on the weights and values of lobster sold as the operator in Bequia was unwilling to share this information. The permanent fishing camp and Fish Market located in Britannia Bay, Mustique, was operated by The Mustique Company. The fishing camp was made up of individual sleeping quarters, gear storage lockers, a common kitchen and bathroom facilities. The majority of fishers within the camp sold their lobster catches to the Fish Market which then supplied the hotels, restaurants and guests on Mustique. The operator of the Fish Market indicated that the weights of lobster purchased weekly ranged from 23-91 kg, and it was noted that this was influenced by supply and demand. A purchase price range of $22.05-33.08 XCD/kg was given by both purchasing company operators. It was estimated that fishers supplied the purchasing companies with approximately 24,686 kg of lobster on an annual basis (Figure 5).

The total weight of lobster sold to the various buyers based on estimates provided by the fishers was 63,892 kg. This figure is significantly larger than the average landed weight of 29,042 kg which the national fisheries administration had recorded for the 2005-2006 fishing season.

Consumption Component

The initial markets identified were the local and export markets. Within the local market, buyers consisted of yacht visitors, vendors, water taxi operators, locals, restaurants, a processing plant and purchasing companies. The consumers within the local markets consisted of on-site tourists and locals. The export markets included: Anguilla, Barbados, Grenada, St. Lucia, Trinidad and Tobago, Martinique and the USA, with marketing routes by sea and air. Exporters and local suppliers were unwilling to share their export and sale records, therefore there were some data gaps with regard to the weights and values of lobster which were sold and distributed both locally and externally.

DISCUSSION

This study identified and characterised the components of the spiny lobster fishing industry in St. Vincent and the Grenadines along the production chain from harvest, to sales and distribution, and finally to consumption by using an integrated framework in which the interactions among economic and social systems are considered together (CRFM 2007, CRFM 2008). The main stakeholders within the spiny lobster fishery were the fishers, who made up the harvest component; the fishers, yacht visitors, the trading vessel captain, vendors, water taxi operators, locals, restaurateurs, operators of purchasing companies and a processing plant operator, who were active within the sales and distribution component; and consumers within the local and export markets, who comprised the consumption component.

Examination of the technological characteristics of fishing industry operations allows an increased appreciation of the nature, extent, and purpose of various strategies adopted by the operators concerned, especially as these relate to choices and opportunities for economic development. Within the harvest component, we were able to gain an overall understanding of several technological aspects of the harvest operations. The top five fishing areas identified were all in close proximity to Bequia and Mustique. This may be due to the fact that the largest sample sizes of fishers were from these two islands. However, although the sample size of fishers was small throughout the islands, it is believed that the present study sample was representative of those who depend mainly on spiny lobster as a source of income.

The spiny lobster generates a considerably high return as a result of its ex-vessel price when compared to other fisheries species utilizing the same gears and methods. Although spiny lobster was targeted most frequently because of its high value, other species such as reef and slope fish and conch were also regularly harvested in this fishery. The reef and slope fish were also caught in the fish pots and the average ex-vessel price of these species was given as $14.82 XCD/kg. Fishers using SCUBA gear to capture lobster also harvested conch when encountered, probably because conch also has a relatively high

average ex-vessel price of $19.85 XCD/kg. Large pelagic species such as tuna and wahoo were caught using a tow/troll line, which the fishers set en route to and from the fishing grounds. Tuna and wahoo attract a relatively high value with an ex-vessel price of $19.85 XCD/kg. However fishers usually had to troll for long distances to catch these species and this method would require a lot of fuel. The average ex-vessel price of small coastal pelagic fish such as carangids and clupeids caught using seine nets, was noted to be approximately $8.82 XCD/kg. The notable differences in fishing strategies required to target large and small pelagic fish species, and the low ex-vessel price of small coastal pelagic fish probably made it less convenient and less desirable for the lobster fishers to target these species.

Due to the small sample size of fishers, no statistical tests were conducted to compare the weights of lobsters caught by fish pot and SCUBA gear. However the results indicated that SCUBA divers caught more lobster per trip than fishers using fish pots. This may be due to the fact that divers are able to select their lobsters by sight, and therefore may be expected to select the largest ones, whenever sufficient lobsters are available. Fish pots are non-selective, and restrictions prohibit the landing of berried and undersized lobsters, therefore, when these individuals are encountered in fish pots, presumably they are returned.

The spiny lobster fishery is a social and economic activity which provides employment and income for the fishers involved in addition to a range of other benefits to their standards of living. The fishing sector is rapidly evolving as a result of changes in ecosystems, fishing technologies and market environments. It is therefore important to assess the social and economic well-being of fishers who are dependent on fishing activities for their livelihoods. This information could then be used to guide decision making and strategic planning at both the national and regional levels. In this study we were able gather data on some social and economic aspects associated with the spiny lobster fishery at the harvest component level.

The spiny lobster fishers had dedicated a significant amount of years to their occupation, which implies that it has made and continues to make a successful contribution to their livelihood. The number of years spent fishing is also an indicator of vulnerability with regard to fishers' capacities to pursue alternative livelihoods, because as the fishers age, we argue that it becomes harder for them to learn new skills. The total number of dependents within the fishers' households was three times more than the number of fishers (n=40) interviewed, with the majority being children (n=49) who were under 16. In the cases where the dependents were employed, the majority of jobs were low income with minimum wages of $450 XCD per month (St. Vincent and the Grenadines Statutory Rules and Orders No. 30 2008). Arguably, these indicators reflect day-to-day financial support dependence on the lobster fishery within the harvest component only. Similar data for the other components could be gathered to provide the total proportion of the local population relying on the fishery as a direct source of daily financial support.

Education level provides a measure of the level of formal education attained by the fishers and can reflect their capacity for adaptability as well. The majority of the fishers only received up to primary level education and spent a substantial amount of years fishing which suggests that they may find it difficult to easily change occupations. Managers and decision makers would therefore have to take this information into account in establishing training and education programmes and communication strategies that would be suitable for fishers. Some data appear to provide measures of both social and economic well-being. For instance, ownership of assets and marital status reflect states of social well being, but arguably also provide a measure of fishery performance in terms of its contribution to economic well-being and profitability. Most fishers were married and owned land, which indicates that the lobster fishery was economically viable to them as individual operators.

In terms of the lobster fishers' economic well-being, it was found that the majority earned between $500-1000 XCD per week and were dependent on the lobster fishery for most of their income. Considerable investments within this fishery have been made by the fishers with regard to the purchase and maintenance of vessels, engines and gears; and fishing costs. These investments indicate that the lobster fishery is economically viable and provides the fishers with the capital required to make such investments. Other studies have shown that fishers of demersals *e.g.* snappers earn an average of $500 per week (Gill *et al.* 2007) and given the high ex-vessel price of lobster, it is likely that the lobster fishers earn

more than these fishers. In addressing the socio-economic objective of the lobster fishery, the data provided by the fishers and the preliminary estimates suggest that the lobster fishers are earning above the minimum wage of $30 XCD/day for unsheltered agriculture workers (St. Vincent and the Grenadines Statutory Rules and Orders No. 30 2008). The estimated daily wage for fishers based on a weekly earnings range of $500-1000 XCD and the most frequently quoted fishing days per week range of 4-6 days, would be $83-250 XCD/day. Fishers devote a substantial amount of time to lobster fishing, and economic related variables such as hours of day at sea, number of fishing trips per week and number of fishing days per week all provide measures of this. The price of lobster, together with catch and effort data, also provides an indicator of the fishery's economic performance.

The present study focused on understanding the quantities and sales of lobster being transferred through the various components of the spiny lobster fishery. At the post-harvest level, there are many stakeholders who benefit both socially and economically from the lobster fishery; however socio-economic data such as number of family dependents, age, education, and income levels were not collected for these stakeholders. It appears that local fish vendors do not have a large role in the lobster fishing industry; however, based on the estimated weight of lobster supplied to them by fishers and the high sale price of lobster, they would still obtain some economic benefits. Our data indicated that the estimated annual earnings of the water taxi operators from the sale of the lobster barbecues were quite substantial. The estimated weight of lobster purchased by locals for household consumption was the same amount as that purchased by the water taxi operators; however, based on a population estimate of 119, 000 people and a per capita fish consumption of 14.7 kg per year (FAO 2008), it can be concluded that the spiny lobster does not contribute markedly to food security in St. Vincent and the Grenadines. This is due to the fact that Vincentians do not consider lobster as a traditional meal and the high sale price is also restrictive. The restaurants represent a huge purchasing and sale sector which generates foreign exchange since it is mainly supported by tourists. The processing plant and purchasing companies represent the largest purchasing and sales sector, and it also generates foreign exchange from international trade of the spiny lobster. This highlights the importance of determining the levels of earning and profits made by these businesses and their contributions to the livelihoods of people employed within these sectors.

At present the majority of landings data for spiny lobster are recorded from the export shipments, since these must be accompanied by corresponding export licences. Landings data for spiny lobster sold on the local market are not fully captured due to direct sales by fishers to: the yacht visitors, trading vessel, vendors, water taxi operators, locals, restaurants, processing plant and purchasing companies. The potential extent of this problem became clear when we considered that the total weight of lobster supplied to the stakeholders using the fishers' estimates was twice that which the national fisheries administration had recorded.

This study identified the key stages and operators of the spiny lobster fishery of St. Vincent and the Grenadines and provides a preliminary evaluation of social and economic performance, particularly for the harvest component. The average value of fish exports from 2005-2006 for St. Vincent and the Grenadines was $907,720 XCD (St. Vincent and the Grenadines Statistical Office, unpublished data), while for lobster the average landed value for 2005-2006 was $346,866.50 XCD (St. Vincent and the Grenadines Fisheries Division, unpublished data). This shows that the export of spiny lobster accounts for approximately two fifths of the total value of fish export products. It may be possible that the value is higher, based on data gathered during this study.

All components of the fishing industry should be monitored for social and economic performance, as well as technological performance. Hence, in addition to the improvement of catch and effort, and biological data collection, implementation of a routine data collection programme for social and economic data may not prove to be too onerous and should therefore also be considered by the national fisheries administration in order to facilitate the evaluation of the spiny lobster fishery's social and economic performance. Routine collection of data on the number of dependents within all stakeholder households, their ages and employment status would allow dependency trends to be developed over time and would also enable analysis of the contribution of the lobster fishery to the fishing communities and the country as a whole. Routine data collection of social-related variables such as the total number of people employed in

the fishery, and the number of livelihoods associated with the fishery would indicate the levels of social and financial dependence. Routine data collection of income and investment indicators would provide a measure of social and economic security and viability of the fishery. This information, together with data and information on technological aspects of operations, could also be useful in determining the adaptability of the fishery in response to natural and anthropogenic disturbances *e.g.* hurricanes, a bad fishing season, increase in oil prices or a decrease in demand. Routine monitoring and data collection is also necessary to confirm the estimates of lobster weights, values and earnings, which have been made in this study.

In order to ensure that all the landings of the spiny lobster are captured, the national fisheries administration will have to: i) increase monitoring, control and surveillance of all landings and sales at sea; ii) increase monitoring, control and surveillance of export activities; and iii) develop closer linkages with other government departments *e.g.* the Ministry of Trade which collect these types of data and information. The results of the present study can be used to guide improvements in statistical monitoring that would guarantee adequate coverage of the key players and operations concerned.

The export markets were only generally identified in the consumption component. Within these markets, additional research to improve understanding of the specific players and the nature and extent of their potential operations would provide valuable insight into the strengths and weaknesses of these markets, and the linkage of this to the sustainability of the local industry. Such additional research could be done through collaboration among the relevant government departments in St. Vincent and the Grenadines and the lobster importing countries.

At present, the current biological status of the spiny lobster stock of St. Vincent and the Grenadines is unknown. Knowledge of this is necessary, together with consideration of social and economic indicators of fishery performance, in order to facilitate the development of integrated, sustainable management strategies.

ACKNOWLEDGEMENTS

We thank the fishers, and other stakeholders for participating in this study. We are grateful to the staff of the Fisheries Division of St. Vincent and the Grenadines and other government Ministries for identifying stakeholders, for providing information, and the necessary support to facilitate our field work.

REFERENCES

Anonymous (2003). Draft Fisheries Management Plan of St. Vincent and the Grenadines.36 pp.

Baldwin, K., Gill, D., Cooke, A., Staskiewicz, T., Lizama, D., Mahon, R., McConney, P. and Oxenford, H. A. (2006). A Socio-economic and Space-use Profile of Grenadines Marine Resource Users. *CERMES Technical Report*. University of the West Indies, Cave Hill Campus, Barbados. 116 pp.

CRFM (2008). Report of the Fourth Annual Scientific Meeting-Kingstown, St. Vincent and the Grenadines, 10-20 June 2008. *CRFM Fishery Report*-2008, Volume 1. 227 pp.

CRFM (2007). Report of the Third Annual Scientific Meeting - St. Vincent and the Grenadines, 17-26 July 2007. *CRFM Fishery Report* -2007. Volume 1. 183 pp.

ECLAC (2002). St. Vincent and the Grenadines The Yachting Sector Economic Commission for Latin America and the Caribbean (ECLAC) Technical Report LC/CAR/G.707. Internet-http://www.eclac.org/publicaciones/xml/2/12372/lcarg707.pdf

Gill, D., McConney, P. and Mahon, R. (2007). A Socio-economic Profile of Fishers in the Grenadine Islands. *CERMES Technical Report* No. 11. 69pp.

FAO (2002a). Fishery Country Profile: St. Vincent and the Grenadines. Internet-http://www.fao.org/fi/fcp/en/ VCT/profile.htm

FAO (2002b). Information on Fisheries Management in St. Vincent and the Grenadines. Internet-http://www.fao.org/fi/oldsite/FCP/en/VCT/body.htm

FAO (2007). Report of the fifth Regional Workshop on the Assessment and Management of the Caribbean Spiny Lobster. Mérida,Yucatán, Mexico, 19–29 September 2006. *FAO Fisheries Report* No. 826. Rome FAO. 2007. 99p.

FAO (2008). Status and Trends of Fisheries and Aquaculture in the WECAFC Region. WECAFC Thirteenth Session, WECAFC Lesser Antilles Fisheries Committee Tenth Session. Cartagena, Colombia 21-24 October 2008. Internet-ftp://ftp.fao.org/docrep/fao/meeting/014/ai763e.pdf

Jardine, C. and Straker, L. (2003). Fisheries Data Information Document St. Vincent and the Grenadines. Fisheries Division Data Unit Ministry of Agriculture and Fisheries.62 pp.

Kirby-Straker, R. (2003). Fisheries Resources & Regulations in St. Vincent and the Grenadines. Fisheries Division, Ministry of Agriculture and Fisheries, St. Vincent and the Grenadines.25 pp.

Mahon, R. (1990). Fisheries Management Options for Lesser Antilles Countries. *FAO Fisheries Technical Paper*, No. 313, FAO, Rome.126 pp.

Ministry of Tourism, Youth and Sports (2007). St. Vincent and the Grenadines Tourism Statistical Reports.

Staskiewicz, T. and Mahon, R. (2007). A livelihoods analyses of fishers in the Grenadine Islands. *CERMES Technical Report* No. 12. 71pp.

St. Vincent and the Grenadines Statistical Office (2008). St. Vincent and the Grenadines Gross Domestic Product by Economic Activity at Basic Prices, in Current Prices.

St. Vincent and the Grenadines Fisheries Division. (2008). Lobster Landings and Export Data.

St. Vincent and the Grenadines Statutory Rules and Orders No. 30. 2008. Wages and Regulations for Agricultural Workers.

Tables

Table 1: A summary of the lobster fishing industry operations in St. Vincent and the Grenadines.

Harvest	**Sales and Distribution**			**Consumption**
Fishers	Local distribution	Fishers, local vendors and food retail businesses Processor and purchasing company	Local markets	Consumers
	External distribution	Fishers, Processor and purchasing company	Export markets	

Table 2: Fishing costs associated with the lobster fishery given in XCD.

Fixed Costs	**Range - ($ Min- Max)**	**Mean ± Standard Deviation**
Vessel	$9000-35,000	$20,600 ± 5748.04
Engine	$5000-15,000	$10,340 ± 2105.80
Gear Cost (Fish pot)	$100-300	$ 121.79 ± 47.61
BCD (Buoyancy Control Device) and Regulator	$1000-2500	$1390 ± 160.17

Running Costs/Day	**Average XCD Value**
(Fuel + SCUBA gear + Food Costs)	$ 178.75
Maintenance Costs/Year	**Percentage of responses**
Vessel	
$ 0- 500	12
$ 500 - 1000	32
$ 1000 - 2000	28
> $ 2000	28
Engine	
$ 0- 500	4
$ 500 - 1000	36
$ 1000 - 2000	48
> $ 2000	12
Gear (Fish pot)	
$ 0- 500	85
$ 500 - 1000	15
Operational Costs/Year	**Range - ($ Min- Max)**
Running costs/yr + Maintenance costs/yr of vessel + engine + gear based on 4 fishing days per week	$24,380 – 26,380
Running costs/yr + Maintenance costs/yr of vessel + engine + gear based on 6 fishing days per week	$35,820 – 37,820

List of figure captions

Figure 1: A map of St. Vincent and the Grenadines. The line indicates the boundary between St. Vincent and Grenada.

Figure 2: General technical and technological characteristics of lobster fishing operations in St. Vincent and the Grenadines: (a) The percentage of lobster fishers by island targeting various fishery resources; (b) Frequency of the average lobster catch weight per fish pot trip indicated by fishers from each Grenadine island; (c) Frequency of the average lobster catch weight per SCUBA trip indicated by fishers from each Grenadine island; (d) Fishing areas of each Grenadine island frequented by lobster fishers.

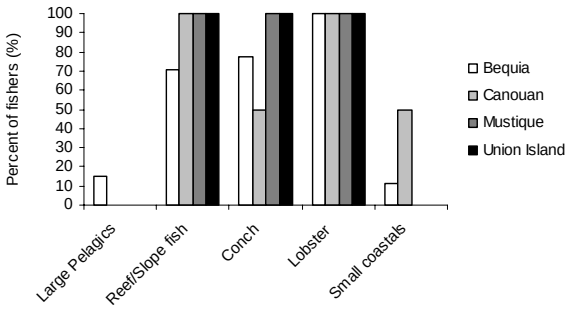
Figure 3: Social and social-related characteristics of lobster fishing operations in St. Vincent and the Grenadines: (a) Frequency of fishers with various years of experience in lobster fishing; (b) Frequency of number of dependents per fisher and hence household size; (c) Frequencies, indicated by percentage responses, of other conditions related to human and social well being.

Figure 4: (a) Frequency of average ranges of earned weekly income indicated by fishers interviewed in each island, and all islands combined (n indicates sample size in each case); (b) Frequencies, indicated by percentage responses, of other conditions that impact the economic aspects of fishing operations.

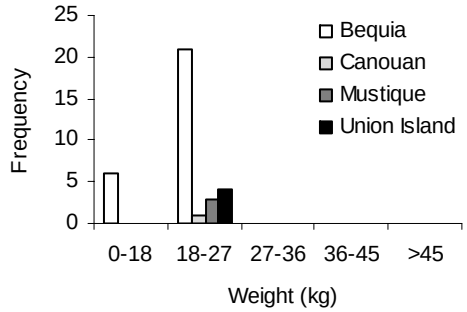
Figure 5: The spiny lobster fishing industry framework for St. Vincent and the Grenadines: where data were provided, quantities and estimated percentages are indicated. Dashed arrow for the export markets indicates that the weights and values concerned remain unknown.


St. Vincent and the Grenadines
N
St. Vincent
Bequia
Bettowia
Balliceaux
Mustique
Petit Mustique
Savan
Petit Canouan
Canouan
Mayreau
Union
Prune Island
Petit St. Vincent
Petit Martinique
Carriacou
Grenada
Grenada
0 5 10 20 Kilometers
Saint Lucia
Saint Vincent and the Grenadines
Grenada
Trinidad and Tobago
Venezuela
Kilometers
0 55 110 220

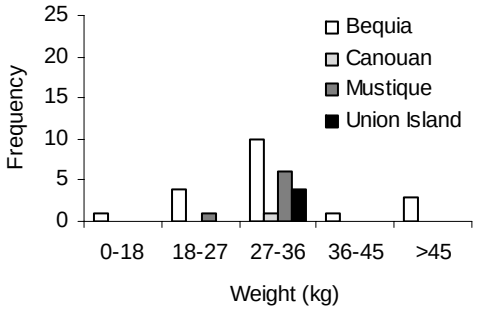
Figure 1


Percent of fishers (%)
100
90
80
70
60
50
40
30
20
10
0
Large Pelagics
Reef/Slope fish
Conch
Lobster
Small coastals
Bequia
Canouan
Mustique
Union Island

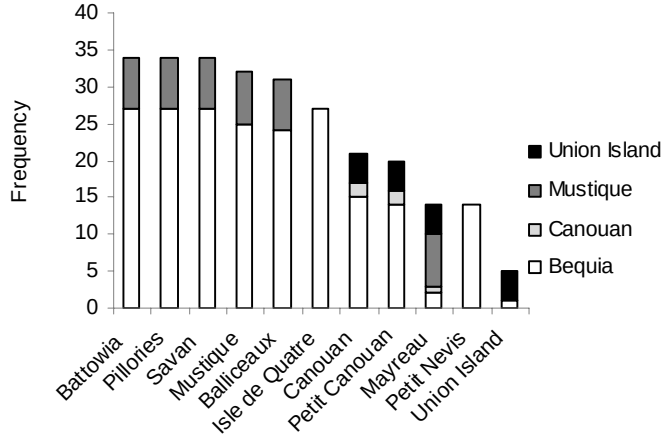
(a)


Frequency
25
20
15
10
5
0
0-18
18-27
27-36
36-45
>45
Weight (kg)
Bequia
Canouan
Mustique
Union Island

(b)

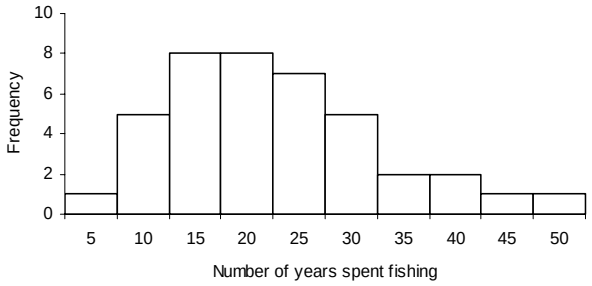

Frequency
25
20
15
10
5
0
0-18
18-27
27-36
36-45
>45
Weight (kg)
Bequia
Canouan
Mustique
Union Island

(c)

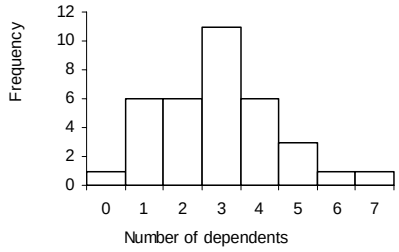

40
35
30
25
20
15
10
5
0
Frequency
Union Island
Mustique
Canouan
Bequia
Battowia
Pillories
Savan
Mustique
Balliceaux
Isle de Quatre
Canouan
Petit Canouan
Mayreau
Petit Nevis
Union Island

(d)

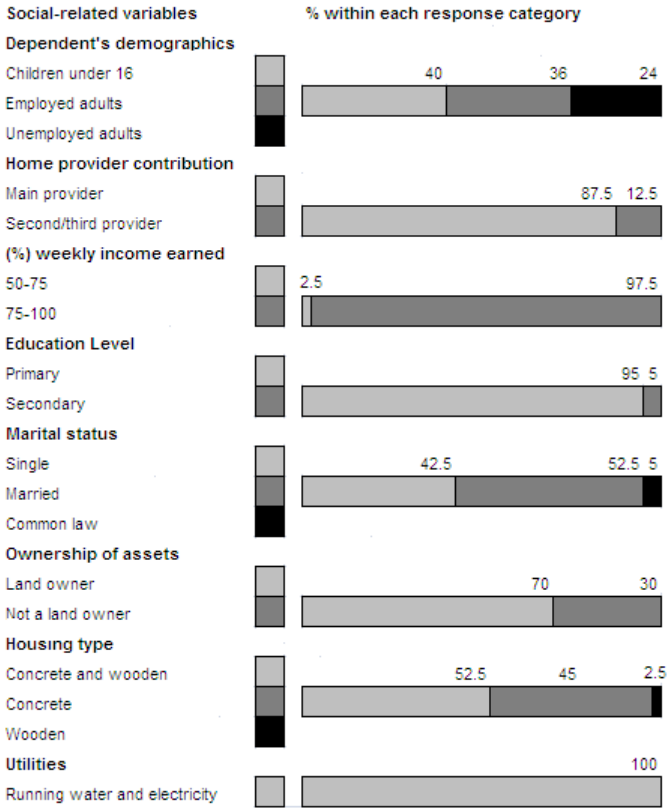
Figure 2


10
8
6
4
2
0
Frequency
5
10
15
20
25
30
35
40
45
50
Number of years spent fishing

(a)

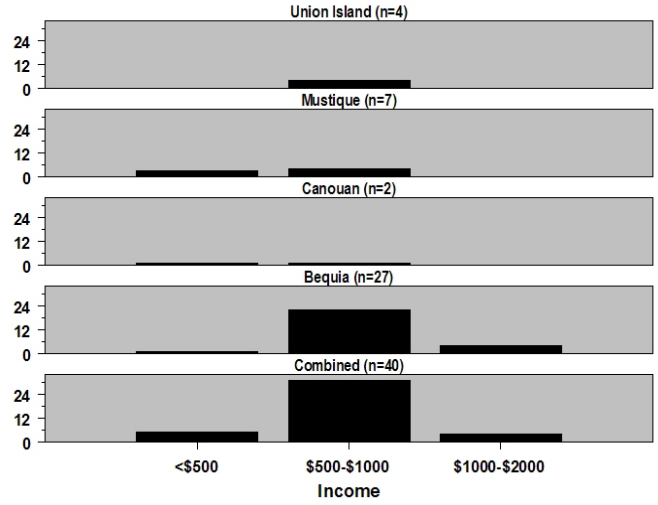

12
10
8
6
4
2
0
Frequency
0
1
2
3
4
5
6
7
Number of dependents

(b)

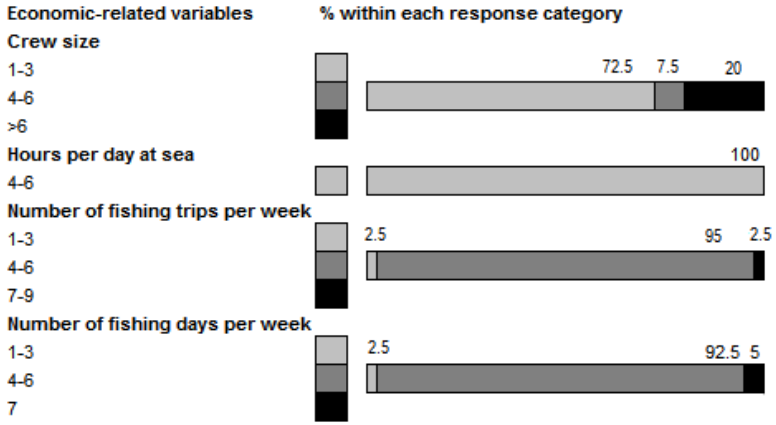

Social-related variables
% within each response category
Dependent's demographics
Children under 16
Employed adults
Unemployed adults
40
36
24
Home provider contribution
Main provider
Second/third provider
87.5
12.5
(%) weekly income earned
50-75
75-100
2.5
97.5
Education Level
Primary
Secondary
95
5
Marital status
Single
Married
Common law
42.5
52.5
5
Ownership of assets
Land owner
Not a land owner
70
30
Housing type
Concrete and wooden
Concrete
Wooden
52.5
45
2.5
Utilities
Running water and electricity
100

(c)

Figure 3


Union Island (n=4)
Mustique (n=7)
Canouan (n=2)
Bequia (n=27)
Combined (n=40)
24
12
0
<$500
$500-$1000
$1000-$2000
Income

(a)


Economic-related variables
% within each response category
Crew size
1-3
4-6
>6
72.5
7.5
20
Hours per day at sea
4-6
100
Number of fishing trips per week
1-3
4-6
7-9
2.5
95
2.5
Number of fishing days per week
1-3
4-6
7
2.5
92.5
5

(b)

Figure 4

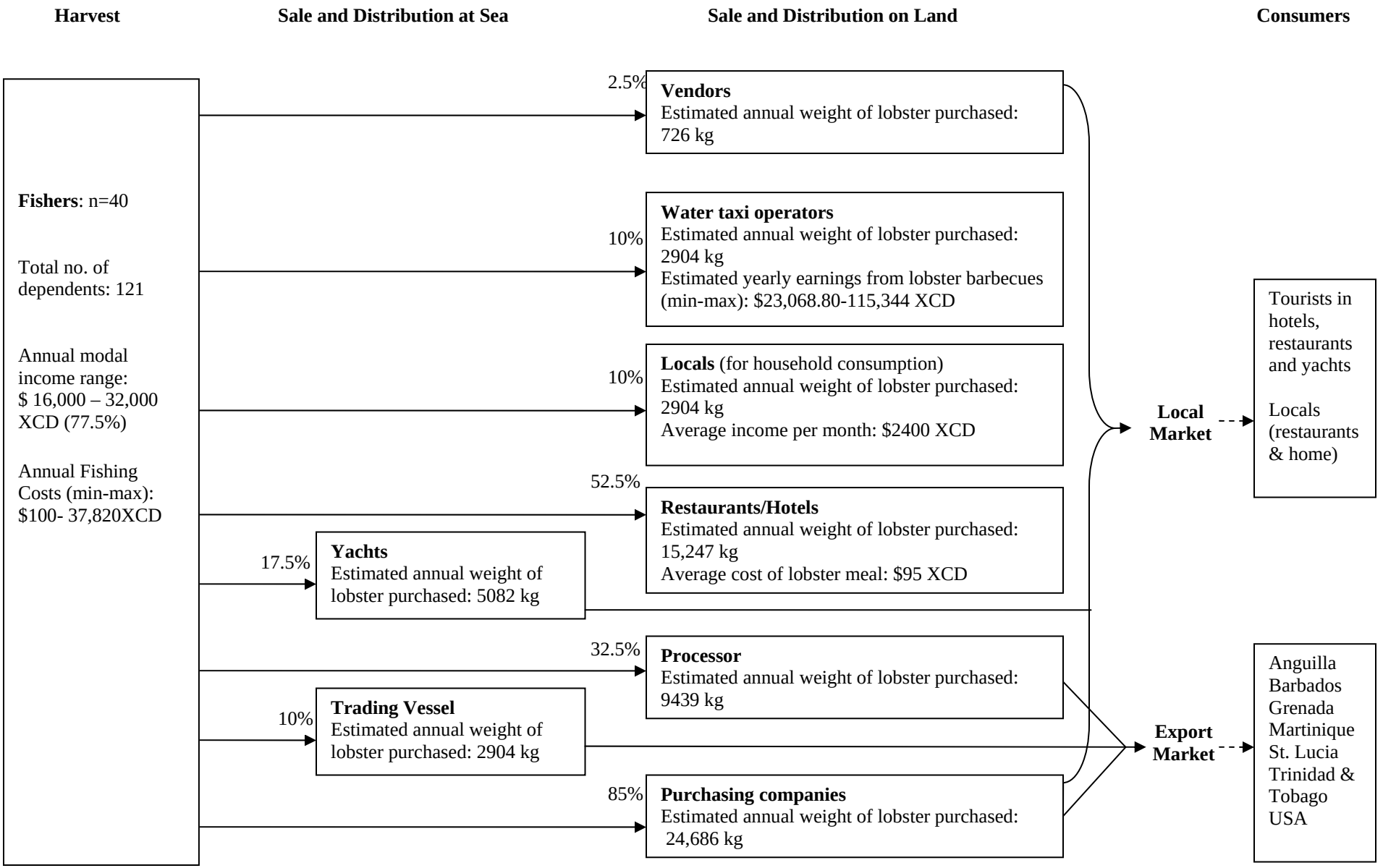

Harvest
Sale and Distribution at Sea
Sale and Distribution on Land
Consumers
Fishers: n=40
Total no. of dependents: 121
Annual modal income range: $ 16,000 – 32,000 XCD (77.5%)
Annual Fishing Costs (min-max): $100- 37,820XCD
2.5%
Vendors
Estimated annual weight of lobster purchased: 726 kg
10%
Water taxi operators
Estimated annual weight of lobster purchased: 2904 kg
Estimated yearly earnings from lobster barbecues (min-max): $23,068.80-115,344 XCD
10%
Locals (for household consumption)
Estimated annual weight of lobster purchased: 2904 kg
Average income per month: $2400 XCD
52.5%
Restaurants/Hotels
Estimated annual weight of lobster purchased: 15,247 kg
Average cost of lobster meal: $95 XCD
17.5%
Yachts
Estimated annual weight of lobster purchased: 5082 kg
32.5%
Processor
Estimated annual weight of lobster purchased: 9439 kg
10%
Trading Vessel
Estimated annual weight of lobster purchased: 2904 kg
85%
Purchasing companies
Estimated annual weight of lobster purchased: 24,686 kg
Local Market
Tourists in hotels, restaurants and yachts
Locals (restaurants & home)
Export Market
Anguilla
Barbados
Grenada
Martinique
St. Lucia
Trinidad & Tobago
USA

Figure 5