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STATISTICAL ANALYSIS OF THE FISHERIES OF DOMINICA (WEST INDIES) 1990-1992

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Introduction

In most Lesser Antilles islands, the fishery sector is an important provider of employment and income for the population, and of fish for the local market. However it is most often poorly known, and detailed descriptions of the fisheries are generally absent or are based on anecdotal information. This is related to the small-scale nature of most fishing operations, which makes it difficult and/or costly to collect and process reliable data Yet this descriptive knowledge of the fishery is absolutely necessary for any further and more detailed analysis of both the fish resource and the economic sector. In the recent years it has become possible to reach at least preliminary conclusions about the state of exploitation of the stocks with assessment methods using only catch structure data (such as length-frequency distributions) ; however a minimal understanding of the structure of the fishing effort and its spatio-temporal distribution will always remain necessary to perform a more reliable analysis of the fishery, and to propose realistic management options.

As in most other islands, the fishery of Dominica is known only in very general terms. Estimates of total catch and proportions of the major species are computed annually from the records of the data collection system, but a detailed description of the fishing activity and landings by landing site, gear type, month, etc., is still lacking. For various reasons related to manpower and computer limitations, such an extensive processing of the data collected at the landing sites had not been possible so far.

An opportunity for this work was offered by a joint research project undertaken by ORSTOM and the Fisheries Division of Dominica, among other partners. The project, entitled "Assessment and management of demersal fisheries of the Lesser Antilles", aims at a better understanding of the fisheries targeting reef fish resources in the Caribbean. These fisheries are considered as very intensive in all islands, and their wise management is a necessity for the future well-being of both the fish resources, the fishermen and the communities who depend on them for their living. Understanding the dynamics of the demersal fishery (and particularly of its fishing effort) cannot be done without consideration of the whole fishery, including pelagics. For this reason, and because of the general importance of a global knowledge of the fishery, ORSTOM and the Fisheries Division undertook jointly the thorough exploitation of the available statistical data which were collected from 1990 to 1992.

1. Methodology

1. Methodology

1.1. General outline of the data collection system

Data were collected in the main Dominican landing sites since 1986 ; the sites where data were collected and processed here are shown in Figure 1. On each site, the stats collector records information daily ; work on week-ends is optional however, some stat collectors choose to work on week ends depending on the level of fishing activity in that particular site, so it may differ among sites. Each day, two kinds of information are recorded : detailed data on as many fishing trips as possible (either by direct observation or through a later interview with fishermen), and data on the fishing activity of the day (total number of boats landed, number of boats which were not sampled). Most of the stats collectors work in one site, but some of them in two sites, even three in some instances ; in these latter cases, there were no explicit rules as to how the collector should share his/her time between the sites and how the information on the actual sampling procedure should be reported.

The data collected so far was used to provide annual statistics of the fish production. Owing to shortage of manpower, and availability constraints of computer and software, the comprehensive computer entry of all the information collected could not be done from the beginning, and only daily summaries could be entered in Lotus 123 worksheets. These summaries are used to create monthly and annual reports of the landings by species and by site. Since the trip-by-trip information are not entered, the reference to fishing gear cannot be used ; as far as the landings are concerned, the main categories of fish species are fairly indicative of the fishing technique used (at least for pelagic species), but no indication of fishing effort can be obtained.

1.2 Processing

1.2.1. Computer entry

In view of the wealth of information collected and of the potential interest of its thorough processing, it was felt worthwhile entering the complete original data on a convenient database format. Raw data of 1990 to 1992 were thus entered into three dBase IV files :

- trip sampling data : all the detailed information pertaining to the trips which were either directly observed, or recorded indirectly through interview with the fisherman : type of boat, gear (up to 2 different gears), areas fished (up to 2 areas), catch (in lbs) by species or species group, crew number, motorization of the boat, time spent at sea.
- activity data : total number of trips having landed in the site for the day, and number of trips not sampled for each of the category defined by the kind of boat and the main fishing type.
- comments : all the hand-written indications found on the field forms, which proved in many instances very useful for the interpretation of the data.

The analysis is based on a considerable amount of data : more than 30000 individual recordings of fishing trips and 7500 daily activity recordings are taken into account for the

sites and years where the data collection was considered as reliable enough to allow some processing.

1.2.2. Exploratory processing

Once stored in the computer, the next phase was to assess the various aspects of the quality of the data, in order to correct possible errors and to determine as precisely as possible to what point the processing could be carried out, for each subset of the data (i.e. site x year or even month). Such screening for potential problems was done on the basis of general knowledge of Caribbean fisheries, and of specific enquiries on the field (discussions with the stats collectors and staff members of the Fisheries Division). Possible problems encountered are listed and detailed in section 1.3.

The exploratory processing included the recoding of gear and species codes, interpretation of patios names, allowing more consistency among sites, and more reliability of the data.

Although the stats collectors were supposed to use a limited number of standardized gear codes, some confusion sometimes arose from their insufficient knowledge of the fishing techniques, from the names used by the fishermen, or from their carelessness to give accurate information about the fishing trip. In addition, the same kind of gear can sometimes be used in quite different ways to catch different target species ; this is particularly the case for lines and for gillnets, for which more confusions occurred than for traps which are easier to define. Therefore six main types of fishing methods (« gears ») were defined as follows :

- offshore pelagic fishing : this category contains all fishing activities which are carried out when migratory pelagic species are seeked far from the land : tunas, dolphins, kingfish, flyingfish, etc. During these trips, gears as different as trolling lines, drifting lines, scoop nets, drifting surface nets, and even surface longlines, can be used, and often more than one are used during a single trip.
- coastal pelagic fishing : this includes the fishing methods used to catch the schooling pelagic species living on the shelf (ballyhoo, mackerels, jacks, sardines, etc.). Beach seine and surface gillnets are the main gears used, but the seines may be used in a more « purse-like » fashion, with the net cast around the school and closed from below.
- bottom gillnets : all sorts of gillnets set on the bottom for a few hours to catch demersal species
- fish pots : this includes mainly the wiremesh or the bamboo traps generally used by the fishermen, but also other possible sizes and shapes of fish traps
- bottom lines : as the data collected did not allow the distinction among the variety of fishing techniques based on hooks and lines to catch demersal species of fish, all were lumped into a single category, from the simple handline to the bottom longline.
- diving : all trips where fishermen dive to spear fishes or collect conch, lobster, or other animals, were considered into this category.

It sometimes happen that two gears are used within the same fishing trip (ex : traps hauled on the way back from offshore pelagic fishing). Then only the main gear was kept to describe the whole trip, and the fish caught by the other gear was considered as a by-catch of the main one.

Species were grouped into 26 categories (Table 1) for two reasons. First, a very large number of species appeared in the original recordings, and it was necessary to reduce it for the processing of catch data. Second, the fish species are numerous and their field identification is often difficult, especially in the working conditions of stats collectors ; this entails a very high likelihood of errors when species names (often vernacular names) are used : grouping species leads to a loss of information, but to a general increase in the reliability of the raw data.

Species or group	Scientific name
Ballyhoo	Hemirhamphidae
Barracuda	Sphyraenidae
Billfish	Istiophoridae
Cetaceans	
Conch	Strombus gigas
Miscellaneous	
Dolphin	Coryphaena hippurus
Eels	Muraenidae
Flyingfish	Exocetidae
Goatfishes	Mullidae
Groupers	Serranidae
Grunts	Haemulidae
Jacks	Carangidae (pro parte)
Kingfish	Acanthocybium solandri
Lobsters	Palinuridae
Mackerel	Decapterus macarellus (Carangidae)
Needlefish	Belonidae
Parrotfishes	Scaridae
Sharks	
Snappers	Lutjanidae
Sprats	Clupeidae
Squirrelfishes	Holocentridae
Surgeonfishes	Acanturidae
Triggerfishes	Balistidae
Tuna	Thunnidae
Turtles	Chelonidae

Table 1. Species groups used for the statistical analysis of the Dominican fishery

1.2.3. Main processing

Once checked, the data were ready for processing, which was done in three steps :

- estimation of total number of trips by site, month, and gear : an average number of trips is first computed from the sampled days (including days noted as having had no fishing activity), and then raised to the whole month according to the total number of days (28, 30, or 31). No particular treatment was made for week-end days (Saturday and Sunday),

because when they were sampled, the sampling rate of these days was often not much lower than that of weekdays (Monday to Friday) : the possible difference in fishing activity was somewhat taken into account by the sampling procedure. In several other cases, Saturdays and Sundays were almost not sampled at all, and no reliable information was available on their level of activity ; the same estimation procedure was used as before (no particular treatment for week-end days), but then it could lead to some over-estimation of the monthly number of trips if there is less fishing activity on week-ends.

- estimation of the average catch/trip : within each stratum (site, month, gear), the average catch is computed from all the sampled trips, including Saturdays and Sundays : the underlying assumption is that the day of the week has no influence on the size or the composition of the catch. The average catch is computed for each species group and for the total.
- estimation of the landings : the total catch landed is obtained very simply by multiplying the estimated number of trips by the estimated average catch/trip in the corresponding stratum, when the data are available.

1.3. Data limitations

The processing could not be always completed in good conditions because the reliability of the raw data could be altered by one or several of a series of flaws. Then assumptions had to be made, which are recalled and discussed in each site-specific section.

1.3.1. Sampling of several sites by a single data collector

When several sites are covered by a single stats collector, it is often not known with precision which sites have been sampled a given day, and whether or not the activity of each of these sites has been recorded entirely or in part only. The first problem is particularly important when one of the sites covered has only a low activity, and thus when the probability of no trips on a given day is far from negligible : then the stats collector may omit to mention explicitly that the site has been checked, and this day may be considered as not sampled instead as sampled with zero trip (which will generate a bias at the estimation stage). The second problem occurs when all sites are quite active, and the complete recording of the activity of a site requires staying there most of the day or collecting indirect data (interviews of fishermen) : when data are recorded for two (or more) sites, the daytime had to be shared among them and it cannot be sure whether the activity data are exhaustive on each site. It has generally been assumed that the data collection had been made exhaustively on each site.

1.3.2. Inconsistency of recorded activities

It occurs in a number of cases that the indications of activity recorded in a given day are not consistent, i.e. the total number of boats landing is not equal to the sum of the numbers of sampled and not sampled boats. Then it is not possible to know at which level an error has been made, and an assumption must be made as to which total should be kept for the estimation. The total number of boats has been retained as the basis for the estimation of monthly activity.

1.3.3. Sampling week-end days

In many sites, Saturdays and/or Sundays were not sampled as often as the other weekdays, and sometimes were not sampled at all. When the fishing activity is totally independent of the day of the week, such sampling bias is not a problem, as all days are equivalent sampling units ; however in most cases there are some particular features of the activity of these days, which may be more active, or less active, or devoted to different fishing methods, than the other days, and the estimation based on the available data lead to biased estimates of the monthly activity by gear. As independent and reliable information was lacking in most sites about the real weekly pattern, it was chosen to estimate activity with the assumption that Saturdays and Sundays have the same landing activity as the ordinary weekdays ; this might have lead to a slight over-estimation of trip numbers, but this was felt to be better than using arbitrary coefficients of activity ; in addition, this may have compensated for under-estimation due to occasional overlooking of boats by the stats collectors.

1.3.4.Fishing gear codes

The recoding of gear into a simplified system of six main types of fishing techniques. Consequences of this are that some recoding errors could have occurred, especially when zero catches were recorded without any gear indication, but also that some precision may have been lost in cases where a reliable and more detailed description was available in the original records.

1.3.5. Species identification and coding

As indicated above, the quality of the catch composition reporting has been improved by species grouping, at the expense of precision ; yet this procedure remained without effect in cases where the raw data were either wrong or (more frequently) missing. This occurs in several instances where the entire catch of pots is described under the category « others » or « mixed demersals », etc.

1.3.6. Double recording of fishing trips

Some of the main landing sites are attractive to boats from neighbouring small villages as they offer better sale opportunities to fishermen : the data collection concerns not only the boats from the main site, but also boats from the other sites, which will just land and sell their catch, or a part of it, and go back to their home port where they may be also covered by a different stats collector. This kind of situation results in an overestimation of the fishing activity in the main site. As the site of origin of the boats is only exceptionally reported, the magnitude of this bias cannot be estimated. This is mainly the case in Portsmouth vs. Bioche, but possibly also in other sites.

1.3.7. Visual estimation of catch weight

It is rarely possible for stats collectors to accurately record the weight of the fish landed ; most often they have to estimate the catch according to the size of the container (bucket, box, etc.) or the number and size of the fish if they are big (large pelagics). A

programme conducted by the fisheries division to test the accuracy of the visual estimation of data collectors indicated that they were 98% accurate on average, except for Scottshead and new employees.. A study conducted in Martinique indicated that, with one exception, data collectors initially trained recorded weights whose average was not significantly different from the true value. This situation also applied to the Dominican stats collectors, except for those whose work has shown obvious signs of unreliability, and whose data were not processed at all.

1.3.8. Coverage of the sampling

The fishing activity in Dominica is widely scattered around the island, and in spite of the large number of stats collectors working with the Fisheries Division, all sites are not covered by the data collection system. There are 16 other primary sites where data is not collected. Landings for those sites can be estimated by using the relative proportion of the landings for a site where the landings are known and which engages in a similar level of fishing activity.

2. Results

2. Results

2.1. General description of the fishery in 1992

An overall picture of the Dominican fishery is available for the year 1992 where estimates of number of trips and of landings could be estimated for all the sampled sites (except for Mahaut, Saint Joseph, and Scottshead/Soufriere for which data for 1990, 1991 and 1993 respectively were used, in all the following sections). For these 13 sites, about 24,000 fishing trips were conducted in 1992 and yielded a production close to 1.6 million lbs of fish (Table 2). Because of the characteristics of the data collection methodology, these overall estimates must be seen as orders of magnitude rather than accurate measurements. Preliminary results obtained in 1995 for sites which were not included in the period covered here (Vieille Case, Fond Colé, Calibishie, Capuchin, Salisbury) lead to a total of about 220,000 lbs, thus suggesting that the scale of the whole Dominican fishery is about 20 % higher than the results obtained here.

Because of the narrowness of the shelf around the island, the Dominican fishery is mainly oriented towards the catch of offshore and coastal pelagic species ; these pelagic components account respectively for more than one-third and one-quarter of the total activity, and for 40 to 43 % of the total catch (Table 2). The demersal components (mainly pots, but also lines and secondarily gillnets) contribute to only 16 % of the catch, but to 35 % of the trips ; this is the consequence of the lower yields of these fishing gears in comparison to the pelagic fisheries which can catch large quantities of fish according to their abundance and availability (Table 3).

Fishery	Activity		Landings	
	trips	%	x 1000 lbs	%
Offshore pelagics	8862	36.9	644.5	40.9
Coastal pelagics	6676	27.8	679.1	43.0
Pots	5273	21.9	191.8	12.1
Bottom lines	2730	11.3	53.4	3.4
Bottom nets	490	2.0	18.5	1.2
Total	24031		1577.5	

Table 2. Overall distribution of the Dominican fishery by gear

Fishery	Average catch/trip (lbs)
Offshore pelagics	78.2
Coastal pelagics	96.2
Pots	36.4
Bottom lines	19.6
Bottom nets	37.8

Table 3. Average yield (lbs/trip) by gear

The distribution of the fishing communities around the coast, the transport possibilities towards the main markets, and the weather and sea conditions, lead to an unequal distribution of the fishery around the island : both in terms of activity and of landings, the contribution of the landing sites located on the East coast is only about one-fifth of the whole fishery (Table 4). Considering that the statistical coverage of the West coast is probably more complete could somewhat moderate this conclusion ; but even if East coast sites such as Castle Bruce, Atkinson, Calibishie or Vieille Case were taken into account, this would not outweigh the number and importance of West coast sites, especially near the major urban centers of Roseau and Portsmouth. The attraction of these two towns is reflected by the importance of the sites of Pottersville and Newtown (in Roseau) and of Portsmouth, which together account for more than 35 % of the whole fishery. The difference between the East and the West coast is not restricted to the magnitude of the fishery : at the scale of the island, coastal pelagic fishing is concentrated only on the Caribbean coast, and the offshore pelagic fishery is equally shared between the two sides ; the relative importance of this latter component is therefore much higher on the East coast, where the three sites are almost exclusively devoted to line fishing (more than 90 % of both activity and landings), mainly for offshore pelagics but also for demersals (fig. 2).

Site	Activity (trips)	Landings (x1000 lbs)
West coast	19022	1223.20
Portsmouth	2621	292.5
Dublanc	1151	43.9
Bioche	2332	70.3
Colihaut	2427	161.4
Saint-Joseph (*)	667	53.8
Layou	1183	127.2
Mahaut (*)	1425	77.5
Pottersville	2483	128.9
Newtown	2712	181
Scottshead/Soufriere (*)	2021	86.7
Others	?	?
East coast	5009	354.30
Fond-Saint-Jean	1681	138.7
Saint-Sauveur	1358	91.8
Marigot	1970	123.8
Others	?	?
Total	24031	1577.5

Table 4. Overall distribution of the Dominican fishery by landing site

One striking feature of the Dominican fishery is the absence of any strong seasonal effect, both on activity and on landings (Fig. 3 and 4), with 1600 to 2100 trips and 100 to 150 thousand lbs/month. The peak of production in May 1992 is the consequence of high offshore pelagic catches in one landing site only (Newtown). The offshore pelagic fishery is more concentrated during the first semester (62 % of the trips, 75 % of the catch), but remains active all year round, and there is no general shift from one fishery to another as the season changes.

Owing to the importance of pelagic fishing in Dominica, the overall catch composition (Fig. 5) is overwhelmingly dominated by a few pelagic species or species groups, either coastal (ballyhoo, and secondarily small schooling carangid : mackerel, Decapterus macarellus and jack or couliwou, Selar crumenophtalmus), or offshore (tuna, flyingfish, dolphinfish). Among the demersal groups, snappers, groupers and triggerfishes are the most important at the scale of the whole island, but many more species have to be lumped together as « others ».

2.2. The offshore pelagic fishery

The offshore pelagic fishery is a major component of the whole Dominican fishery, as it accounts for about 40 % of the total, both in terms of activity and of landings ; it even becomes the dominant activity during the season of maximum abundance of migratory species in the Dominican waters, i.e. from January to June (Fig. 6). However this seasonal increase is about two-fold for the number of trips, but much higher for the landings because the average yield is lower during the second semester, around 50 lbs/trip.

The gears used to catch migratory pelagic species are trolling lines when the boat is sailing and short lines to fish under floating debris, for tuna, dolphin, kingfish, etc ; flyingfish are caught either with drifting gillnets or with scoopnets (kali). The fishery operates all around the island (Table 5), and particularly in the channels between Dominica and Martinique in the South and Guadeloupe in the North, but the main structure appears to differ between the Atlantic and Caribbean sides of the island, where the landings have quite different species composition (Fig. 7a and 7b) : flyingfish accounts for half of the catch on the West coast and for only one-fifth on the East coast, where the catch is more diverse with one-third of dolphins. Tunas are a major component on both sides. In addition, the average catch is much higher on the East side (110 lbs/trip) than on the West side (69 lbs/trip). The monthly distribution of catch by species (Fig. 8) shows that tuna is caught throughout the year in very stable quantities (10 to 20 thousand lbs), whereas the catches of dolphin and flyingfish are much more seasonal and are almost completely absent from the landings from August to November. Within the pelagic season, flyingfish catches are concentrated during a few months, with a very high peak in May.

Landing site	Activity (trips)	Landings (x1000 lbs)	Average yield (lbs/trip)
Newtown	1549	148.6	95.90
Marigot	1467	102.5	69.83
Fond Saint Jean	1327	121.1	91.20
Pottersville	1005	64.1	63.80
Saint Sauveur	990	84	84.87
Mahaut	628	37.9	60.36
Bioche	279	3.1	11.12
Colihaut	258	24.3	94.17
Portsmouth	169	14.6	86.20

Table 5. Characteristics of the offshore pelagic fishery by landing site

2.3. The coastal pelagic fishery

This component ranges second in terms of number of trips (28 %), but provides approximately the same amount as the offshore pelagics, i.e. slightly less than 700 thousand lbs, or 43 % of the total catch. This production is almost totally obtained on the West coast of the island (Table 6), where the fish populations are more abundant and the sea conditions favorable for the detection of the schools and the fishing operations. Although surface gillnets can be used, the main gear is the beach seine, which is used either in a classical way by two groups of people on the beach, or more like a purse seine, with the net cast in deeper waters (off the bottom) and closed from below by the fishermen to prevent the fish from escaping.

Landing site	Activity (trips)	Landings (x 1000 lbs)	Average yield (lbs/trip)
Pottersville	1191	64.1	53.82
Layou	929	118.7	127.75
Colihaut	821	85.2	103.74
Portsmouth	808	195.3	241.43
Dublanc	727	37.2	51.13
Scottshead/Soufriere	605	33.1	54.62
Saint Joseph	524	51.8	98.71
Bioche	515	20.3	39.37
Newtown	360	25.7	71.35
Mahaut	349	33.9	96.95
Fond Saint Jean	31	4	128.37

Table 6. Characteristics of the coastal pelagic fishery by landing site

According to the data available, the year is divided into two periods for this fishery (Fig. 9) : from February to July, the monthly production ranges between 40 and 60 thousand lbs and the activity between 400 and 600 trips, and from August to December there is a rough 50 % increase (60 to 80 thousand lbs and 600 to 700 trips). However this seems to be related only in part to the abundance or availability of fish, since the average catch/trip shows very little variations along the year, around 100 lbs/trip with only a slight increase from August to December.

More than half of the catch is made of ballyhoo (Hemiramphidae), mackerel is the second most important species with (20 %), and the rest is made of several species including jacks, needlefishes, sprats and tuna (bonito). Ballyhoo are not caught steadily over the whole year, but are most abundant in March and September, with the lowest catches from May to July (Fig. 10). The detailed analysis of the data shows that most of the coastal pelagic fishing trips catch one species only, or at least in overwhelming proportions. This is related to the behaviour of these fishes which rarely form important mixed schools, and to the possibility for fishermen to adjust their fishing operations to whatever coastal pelagic species has been detected close to the shore, according to the manifestation of the school at the surface of the sea.

2.4. The pot fishery

Pot fishing is important in Dominica by the number of trips involved (22 % of the total activity) more than the quantities of fish landed (12 %). This fishery is active all around Dominica, but mostly on the West side of the island, and especially in its northern part (Portsmouth, Dublanc, Bioche, Colihaut) where 68% of the trips and 81 % of the catch are concentrated (Table 7).

Landing site	Activity (trips)	Landings (x1000 lbs)	Average catch (lbs/trip)
Portsmouth	1573	78.9	50.15
Bioche	1206	38	31.49
Colihaut	685	35	51.12
Mahaut	448	5.7	12.71
Newtown	406	3.9	9.62
Layou	254	8.5	33.49
Scottshead/Soufriere	217	2.3	10.62
Dublanc	136	3.5	25.79
Marigot	84	9.3	111.02
Saint Joseph	71	1.5	21.09
Saint Sauveur	69	1.5	21.72
Fond Saint Jean	64	2.7	42.31
Pottersville	61	1	16.53

Table 7. Characteristics of the pot fishery by landing site

There is no seasonal effect in pot fishing in Dominica (Fig. 11), which maintains the same level of activity (around 400 trips/month) and of catch (around 15000 lbs/month) throughout the year. The catch/trip seems to decrease slowly from 40 to 30 lbs, with an overall average of 36 lbs ; the fishery is far from homogeneous in this respect, since the yields vary widely among landing sites, from 9 to 50 lbs/trip and up to 111 lbs/trip in Marigot. This much higher yield in Marigot is confirmed by the observations of the other two years (see section 2.7.1.), and probably reflects the low level of fishing effort over the wide insular shelf which extends off this site ; there is no indication of more pots being hauled per trip in Marigot than in the rest of the island.

As exepcted for this kind of gear, many species contribute to the catch (Fig. 12). It should be noted that the snappers and groupers, which are high valued species groups, make up more than one-fourth of the total. In some places like Scottshead and Soufriere, carnivorous species are specifically targeted by the use of small baited traps hauled several times during the fishing trip (« tombé-levé »).

2.5. The bottom line fishery

Different kinds of lines are considered as part of this fishery, from the single-hook handline to the bottom longline with several hundred hooks ; the field data did not allow a reliable distinction between them, so they were lumped together. These gears contribute to a

small proportion of the whole fishing activity (11 % of the trips), and their catch is almost negligible (3 %). The fishery is most important during the second semester of the year (Fig. 13). Most sites have some bottom line fishing, although Colihaut and Marigot together make up 45 % of the landings (Table 8).

Landing site	Activity (trips)	Landings (x1000 lbs)	Average yield (lbs/trip)
Colihaut	578	11.9	20.58
Marigot	418	12.0	28.69
Newtown	371	2.4	6.48
Dublanc	288	3.2	11.13
Saint Sauveur	233	4.9	21.03
Pottersville	224	5.4	24.07
Fond Saint Jean	204	8.5	41.59
Scottshead/Soufriere	154	0.7	4.53
Bioche	137	1.7	12.38
Saint Joseph	73	0.5	6.89
Portsmouth	50	2.2	43.65

Table 8. Characteristics of the bottom line fishery by landing site

Hooks are always baited, so that the catch is mainly made of carnivorous species : snappers and groupers (72 %), but also triggerfishes, squirrelfishes, etc. (Fig. 14). The data available do not allow the identification of any specific component within the fishery, such as a slope fishery targeting deep-water snappers.

2.6. Geographical distribution of the fishing grounds

The Dominican fishery is essentially small-scale in nature ; this related to the size of the boats, the power of the engines, the number of crew members, the duration of fishing trips, the amount of fish caught, etc. However the geographical range exploited by the fishery must be considered differently according to the fishing technique used. In the offshore pelagic fishery, the distance covered during the trips can be quite large, although no data are available to quantify the actual range of prospection of fishermen. The inshore fisheries (demersals and coastal pelagics) are limited to the shelf area, generally a few miles from shore and sometimes farther offshore, on Macuba Bank (SE of Dominica). Data on fishing grounds were collected from the fishermen in the landing sites ; although they should not be interpreted as quantitative and precise distributions of fishing effort, they show that the fishing trips generally take place close to the landing site where the boat is based. However this is not always the case, and some sites such as Newtown (and, to a lesser extent, Mahaut) seem to exploit a much wider range of the caribbean shelf of the island (Fig. 53).

2.7. The fishery of some landing sites

2.7.1. Marigot

Marigot is located on the North-East coast of the island. Although it is a moderately active site at the scale of the whole fishery (Table 9), the landing activity can by quite high on some days with more than 10 boats coming back from fishing. No major problems were encountered with the data collected in this site, so the estimates of activity and landings are fairly reliable ; it is not sure, however, whether the low estimates for 1990 result from an actual low year or from sampling problems.

		1990		1991		1992	
Gear			%		%		%
Offshore pelagic fishery	A	806.9	63.9	1333.4	73.4	1467.9	74.5
	L	*60.7*	*78.5*	*118.5*	*82.4*	*102.5*	*82.8*
	C	(75.5)		(88.9)		(69.8)	
Bottom lines	A	253.6	21.8	370.3	20.4	418.2	21.2
	L	*6.34*	*8.2*	*12.4*	*8.6*	*12.0*	*9.7*
	C	(25.0)		(33.5)		(28.7)	
Pots	A	93.0	8.0	112.9	6.2	83.8	4.2
	L	*10.0*	*12.9*	*12.8*	*8.9*	*9.3*	*7.5*
	C	(107.5)		(113.6)		(111.1)	
Total	A	1164.1		1817.6		1969.9	
	L	*77.3*		*143.8*		*123.8*	

Table 9 . Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Marigot

The main feature of the fishery in Marigot is its dedication to offshore pelagic fishing which accounts for more than 70% of both the activity and the landings in 1991 and 1992. The rest of the fishery is targeting demersal species with bottom lines and, to a much lesser extent, with pots. As a consequence of this, the whole fishery of Marigot is highly seasonal, with 70% of the trips and 78 % of the landings taking place during the first 6 months of the year (Fig.15a and 15b). A very small pelagic fishing activity usually remains during the summer months (particularly between July and October), but then most of the trips are catching demersals.

The main species targeted by the offshore fishery are dolphin and flyingfish whose contribution to the catch is around 70 %, with triggerfish and tuna as secondary species (Fig. 16). The average catch/trip in the main pelagic season ranges most often between 50 and 100 lbs. In February 1991, very high catches of triggerfish were reported ; it is not sure to what extent this reflects the reality of the fishery. In the three years sampled the pelagic season seems to start quite progressively between December and January, and to reach a peak in May, both in activity and in landings, before a very sharp decrease in June and July, when demersal fishing starts.

Fishing with bottom lines and pots is carried out from Marigot mainly from July to November, but it should be noticed that some trips still occur until the middle of the first

semester, during the gradual increase of pelagic fishing. However the demersal activity never compensates for the drop of pelagic activity, and this is even more true for the landings. The yields of bottom lines do not show any seasonality and exceed 50 lbs/trip only in five « off-season months » where 2 trips only were recorded each month ; groupers and triggerfishes seem to make the bulk of the catch (Fig.17). Yields of the pot fishery are frequently higher than 100 lbs/trip, sometimes more than 150 lbs, with no obvious seasonal pattern. The catch is more diversified than that of the lines : in addition to groupers, snappers, squirrelfishes, surgeonfishes and triggerfishes, lobsters make an important part of the catch and are probably, at least in a part of the trips, the targeted fishery. Although the pots have a much higher average yield than the bottom lines (3 or 4 times more in weight, and even more in value, owing to the lobsters), their contribution to the demersal fishery is at most one-fourth, and as low as 16% in 1992. The statistical data do not provide any explanation to this, but it can be hypothesised that constraints related to the working conditions at sea, and to the risks of pot loss, stealing or poaching, are limiting factors to the development of this fishery.

2.7.2. Fond Saint Jean

Fond Saint Jean is a moderately active landing site located on the South-East coast of Dominica. Data were not available for the year 1991, so results are presented for 1990 and 1992 only. No major problem was encountered with the data collection ; yet there is some doubt as to whether all the trips with no catch were sampled. This would lead to some over-estimation of average catch/trip. Comparison with the field knowledge suggests that the diving fishery, which may take rather unconspicuous forms, may also have been underreported.

As in Marigot, the fishery of Fond Saint Jean is dominated by the use of lines, mainly to catch large migratory pelagic species, and secondly to catch demersals (Table 10). A variety of other gears is used in minor proportions namely : pots, gillnets, beach seines, and spearguns

		1990		1992	
Gear			%		%
Offshore pelagic fishery	A	904.8	68.8	1327.9	79.0
	L	*60.2*	*82.1*	*121.1*	*87.3*
	C	(66.5)		(91.2)	
Bottom lines	A	216.1	16.4	204.4	12.1
	L	*6.4*	*8.7*	*8.5*	*6.1*
	C	(29.5)		(41.5)	
Pots	A	110.1	8.4	63.8	3.8
	L	*2.4*	*3.2*	*2.7*	*2.0*
	C	(21.7)		(42.7)	
Bottom gillnets	A	14.9	1.1	54.1	3.2
	L	*0.7*	*1.0*	*2.4*	*1.8*
	C	(49.0)		(45.3)	
Coastal pelagic fishery	A	43.2	3.3	31.2	1.8
	L	*2.6*	*3.6*	*4.0*	*2.9*
	C	(60.8)		(128.6)	
Diving fishery	A	25.2	1.9		
	L	*1.0*	*1.3*		
	C	(39.3)			
Total	A	1314.3		1681.3	
	L	*73.3*		*138.8*	

Table 10. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Fond Saint Jean

Offshore pelagic fishing is of course the main activity during the first quarter of the year and in 1992 remained dominant until August, but it does not seem to stop completely during the summer months (Fig. 18a). Similarly, demersal fishing is carried out mainly from July to November, with a limited activity remaining all year round. Therefore the seasonal pattern does not lead to a complete opposition between the demersal and pelagic time schedules. As expected, the pelagic landings are much more important than the demersal ones, sometimes peaking at 20 thousand lbs or more (Fig. 18b). The catch

composition shows that the highest monthly landings (June 1990, May and December 1992) are related to flyingfish catches and that during the other months, dolphin and tuna made the bulk of the catch (Fig. 19). Average catch/trip is quite variable, with a minimum (about 20 lbs/trip) near the end of the year and values ranging from 40 to 140 lbs/trip during the peak season (January-June).

The bottom line fishery targets mainly groupers and snappers, with average yields most often around 25 lbs/trip (higher values were reported in 1992) (Fig. 21). Owing to the small numbers of recorded trips, only overall catch compositions can be analyzed for the other demersal gears : the groupers (and particularly the coney) appear as major target species for the diving and the pot fisheries, but not for the gillnet fishery where jacks, grunts and snappers are the main groups.

2.7.3. Portsmouth

As the second largest town in Dominica, Portsmouth has an important fishing activity, and landings can take place in three different locations : "Bayfront", which is the most active, located between « Glanvillia » and « Lagoon ». The three sites are within walking distance, but far enough to make it impossible for a single stats collector to cover them simultaneously. In 1991-1992, the sampling was carried out in all sites without any explicit methodology, and the stats collector tried to record as much as possible of the landing activity. « Bayfront » was almost always covered, whereas « Glanvillia » and « Lagoon » were covered from time to time through direct observation or more often through fishermen interviews. A rigorous estimation procedure cannot be followed for the processing of these data because it was not recorded whether a site was sampled or not on a given day. Therefore it was necessary to make assumptions to allow for the study of the fishing activity in Portsmouth, but this also restricted the reliability of the results, especially as far as quantitative estimates of activity and landings were concerned. The main assumption was that the activity had been recorded exhaustively in the three sites on every sampled day. This is almost certain for Bayfront where most of the landing activity takes place. In Glanvillia and Lagoon, this is more doubtful, but the much smaller scale of the activity reduces the impact of a violation of the assumption. However some under-estimation of the number of trips should be expected. In addition to this particular problem, many cases of inconsistency in the recordings of activity (cf. § 2.3.) were found in the data set, and there is some uncertainty about the extent of landings from neighbouring sites (Bioche/Dublanc, but also Capuchin) ; therefore the results have to be considered with caution. In what follows, the three landing sites are considered together as « Portsmouth ».

		1991		1992	
Gear			%		%
Pots	A	2086.3	60.1	1573.3	60.0
	L	*113.1*	*37.8*	*78.9*	*27.0*
	C	(54.2)		(50.1)	
Coastal pelagic fishery	A	945.1	27.2	808.9	30.8
	L	*156.9*	*52.5*	*195.3*	*66.8*
	C	(166.0)		(241.5)	
Bottom lines	A	245.0	7.1	50.4	19.2
	L	*5.9*	*2.0*	*2.2*	*0.8*
	C	(24.1)		(44.6)	
Offshore pelagic fishery	A	154.3	4.4	169.4	6.5
	L	*21.3*	*7.1*	*14.6*	*0.8*
	C	(138.1)		(86.1)	
Bottom gillnets	A	41.9	1.2	19.2	0.7
	L	*1.8*	*0.6*	*1.5*	*0.5*
	C	(43.7)		(79.2)	
Total	A	3472.5		2621.2	
	L	*299.0*		*292.6*	

Table 11. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Portsmouth

As expected from the size of the town, Portsmouth is one of the major landing sites of the country. The fishing activity is dominated by the use of pots (60% of the trips), but the landings of coastal pelagic species are higher, about the two-thirds of the total in 1992 (Table 11). It should be noted that the offshore pelagic fishery is almost absent from Portsmouth.

Fishing is carried out from Portsmouth almost continuously all year round, with 250 to 350 trips/month in 1991, but only 150 to 250 in 1992 (Fig. 22a). There is no clear interpretation for the steady decline in number of trips observed during the whole period : such a continuous deterioration of the quality of the data collection, and such a fast decrease of fishing activity are both equally unlikely. However, the general lack of reliability of the results precludes any further analysis of this observation. Owing to higher 1992 yields in the coastal pelagic fishery, the time-series of landings does not show the same decreasing trend, and the monthly production generally ranges between 15 and 10 thousand lbs, with no apparent seasonality (Fig. 22b).

The coastal pelagic fishery targets two main species, ballyhoo and jacks (« couliwo ») which account for 60 to 65% of the catch, but also lands a variety of other species : mackerel, needlefishes, sprats, etc. (Fig. 23). Although there could have been some under-reporting of zero catches, the average catch/trip was quite high (usually between 100 and 200 lbs), and particularly so from August to December 1992 where it was around or above 300 lbs, thus entailing a significant increase in yearly averages (166 to 241 lbs/trip). The opposite observation can be made with the yields of the pot fishery, which usually ranged from 30 to 60 lbs/trip with unexplained higher values in early 1991 followed by a minimum in August to October (Fig 24). The catch composition appears to be stable ; many reef fish species were caught and landed in analogous proportions throughout the year.

2.7.4. Dublanc

Located south of Portsmouth, Dublanc is a village where the fishing activity appears not to be very important, about 1000 to 1200 trips/year. The same stats collector works in Dublanc and in Bioche, but there does not seem to entail any major problem in the quality of data collected. Fishermen from Dublanc sometimes land their catch in Portsmouth where the sale opportunities are better ; this was not taken into account in the data collection, and it is not known to what extent this affects the results.

Pelagic fishing account for 60-70% of the activity in Dublanc (Table 12) ; a majority of the trips are targeting small schooling species (mackerels, ballyhoo, etc.) with seines and can be clearly identified as belonging to a coastal pelagic fishery. However the rest of the trips use trolling lines, but cannot be considered as part of an offshore pelagic fishery ; they most often operate at a very small scale and with non-motorized canoes, yielding very low catches (if not zero) of a variety of species ranging from coastal fishes such as needlefishes to large species such as dolphins. Therefore a reliable distinction between a « coastal pelagic » and an « offshore pelagic » fishery cannot be made clearly at the scale of the landing site, and the whole pelagic fishery of Dublanc has been categorized as coastal owing to its geographical scale of operation. This fishery is operating all year round without any apparent seasonal pattern (Fig. 25a and 25b), and lands more than 75% of the total production ; its catch is mainly made of ballyhoo, except around May of each year where it is outweighed by the other species : needlefish, jacks, mackerels, tunas, etc., caught with seine nets or with trolling lines (Fig. 26). Average yields are widely fluctuating, at the scales of both months (10 to 110 lbs/trip) and years (46 to 78 lbs/trip).

		1990		1991		1992	
Gear			%		%		%
Coastal pelagic	A	685.4	69.5	712.4	60.9	727.6	63.2
fishery	L	*53.3*	*87.2*	*32.9*	*77.1*	*37.2*	*84.7*
	C	(77.8)		(46.2)		(51.1)	
Bottom lines	A	154.0	15.6	249.5	21.3	287.6	24.9
	L	*1.6*	*2.6*	*1.8*	*4.3*	*3.2*	*7.3*
	C	(10.4)		(7.3)		(11.1)	
Pots	A	146.1	14.8	207.1	17.7	135.7	11.8
	L	*6.2*	*10.1*	*7.9*	*18.7*	*3.5*	*8.0*
	C	(42.3)		(38.2)		(25.8)	
Total	A	985.5		1169.1		1150.9	
	L	*61.1*		*42.7*		*43.9*	

Table 12. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Dublanc

Demersal fishing with pots and lines accounts for about one-third of the trips, but much less of the landings. It is carried out all year round with variable activity ; there is no obvious seasonal pattern, but March to May seem to be months of lower relative activity. The two gears target different ranges of species : whereas snappers make up most of the line catch (72% for the whole period), pots land a highly multispecies catch made of reef fish species (Fig. 27).

2.7.5. Bioche

As mentioned earlier, Bioche is sampled by the same stats collector than Dublanc. Although the two villages are located close to each other, their fishing activity is very different, both quantitatively (Bioche has about twice as many trips) and qualitatively (half of these trips are using fish pots, and there is a small but clearly defined offshore pelagic fishery) (Table 13).

		1990		1991		1992	
Gear			%		%		%
Pots	A	1102	45.9	1135	51.6	1206	51.7
	L	*29.8*	*40.0*	*35.4*	*52.0*	*38.0*	*54.0*
	C	(27.1)		(31.2)		(31.5)	
Coastal pelagic fishery	A	808	33.6	561	25.5	515	22.1
	L	*32.5*	*43.5*	*20.8*	*30.5*	*20.3*	*28.8*
	C	(40.2)		(37.1)		(39.3)	
Offshore pelagic fishery	A	255	10.6	272	12.6	279	11.9
	L	*8.4*	*11.3*	*7.3*	*10.7*	*3.1*	*4.4*
	C	(32.9)		(26.8)		(11.0)	
Bottom gillnets	A	79	3.3	123	5.6	194	8.3
	L	*2.1*	*2.9*	*3.5*	*5.2*	*7.2*	*10.3*
	C	(27.4)		(28.7)		(37.4)	
Bottom lines	A	143	6.0	109	5.0	137	5.9
	L	*1.6*	*2.1*	*1.0*	*1.5*	*1.7*	*2.5*
	C	(11.0)		(9.2)		(12.7)	
Diving fishery	A	13	0.6			1	
	L	*0.1*	*0.2*				
	C	(11.5)		()		(12.7)	
Total	A	2400		2200		2332	
	L	74.6		68.0		70.4	

Table 13. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Bioche

The overall activity in Bioche does not show any seasonality nor trend over the three-year period, and all gears are used in roughly stable proportions all year round (Fig. 28a). This is also true for the landings (summing up to about 5000 lbs/month), with the exception of the offshore pelagic fishery which can occasionally land significant quantities of fish (Fig. 28b).

Pot fishing is active very often with 80 to 100 trips/month ; on the average, it accounts for half of the total activity and hardly less of the total catch. The catch/trip varies between 20 and 35 lbs, and the catch composition is very diverse with high-valued species (snappers and groupers) accounting for about one-third of the catch (Fig. 29). As expected, the bottom line fishery is mainly targeting snappers (Fig. 30), but sharks and jacks are also caught in significant proportions, whereas bottom gillnets catch a wide array of species, including mackerels (which are caught farther off the bottom) and turtles. Theses two fisheries are only of minor importance in Bioche (less than 15 %).

Both types of pelagic fishing are performed, but landings of the offshore pelagic fishery are negligible except when flyingfish is abundant, i.e. in May and June 1990 and in January 1991 ; the activity and catch/trip time-series suggest that these high catches are the result of an opportunistic, rather than directed, flyingfish fishing. The coastal pelagic fishery is always important in Bioche, and is mainly targeting two species, which are caught along a clear seasonal cycle : ballyhoo from December to April, and mackerel from May to August (Fig. 31). The remaining period (September to November) is a low activity period for this fishery with a minimum in October for all three years.

2.7.6. Colihaut

Colihaut is located south of Bioche on the West coast of Dominica. Data were not available for the first three months of 1990 and for the whole year 1991 ; therefore there is only one full year of results (Table 14). One major methodological problem is that the zero catches have almost never been reported : their proportion in the data set is much too low to be likely in any fishery. This means that the number of trips is all the more under-estimated and the average catch/trip is all the more over-estimated that the probability of a zero catch is high. It should be emphasized that the total landings are not affected by this problem. In respect to other criteria, the quality of the data seems satisfactory.

		1992	
Gear			%
Coastal pelagic fishery	A	821	33.8
	L	*85.2*	52.7
	C	(103.7)	
Pots	A	685	28.2
	L	*35.0*	21.7
	C	(51.1)	
Offshore pelagic fishery	A	258	10.6
	L	24.3	15.1
	C	(94.3)	
Bottom lines	A	578	23.8
	L	*11.9*	7.4
	C	(20.7)	
Bottom gillnets	A	85	3.5
	L	*5.0*	3.1
	C	(58.7)	
Total	A	2427	
	L	161.5	

Table 14. Yearly activity, landings, and catch/trip for Colihaut

The fishing activity does not show any clear seasonal fluctuations in Colihaut (Fig. 32a and 32b) ; coastal pelagic fishing accounts for about half of the trips (probably more, as unsuccessful trips were not recorded), but pots and bottom lines are also important secondary gears. However, 75% of the total landings are made of pelagic species, most of the demersal production being caught by the pots. The pelagic catch composition is strongly seasonal, both for coastal and offshore species : mackerel is landed from April to September, but mainly in June and July (Fig. 33), and flyingfish (which makes almost all the offshore pelagic catch) in January and June with a high variability. The monthly landings are quite stable around 10-15 thousand lbs, but peaked to 50000 lbs in June 1990 ; from June to August of this year, total landings were almost exclusively made of mackerel and flyingfish. Pots provided one-fifth of the 1992 production, with a highly multispecific catch composition where snappers accounted for a very small proportion, whereas they constitute half of the catch from bottom lines (Fig. 34).

2.7.7. Saint Joseph

Saint Joseph is sampled by the same stats collector as Layou ; for undetermined reasons, various problems were encountered in the data recorded in Saint-Joseph. First, the time series is far from complete : in 1990 the first six months had to be discarded because of obvious differences of activity sampling and two of the remaining months were not sampled ; in addition, the last three months of 1992 were lacking. Another problem is that, in 1992, days sampled but without fishing activity were recorded as such but not in 1990-1991 the reason being that this bias was corrected by the stats supervisor in 1992 : the estimated activity was therefore overestimated in the first two years. A correction had to be applied, based on the 1992 proportion of days with no trips. There still remains a declining trend which cannot be imputed without doubt to either the data collection or the fishery itself. Finally, the gear description for the demersal fishery did not seem very reliable, and it is not completely sure whether pots or bottom lines are most used in Saint-Joseph. Therefore the available results must be considered as orders of magnitude only.

These reservations do not invalidate the conclusion that most of the activity in Saint Joseph is devoted to coastal pelagic fishing, which provides almost all the fish landed at that site (Table 15). Fishing is carried out very regularly without any seasonal pattern (Fig. 35a) ; the apparent declining trend of activity does not seem to occur in the landings (Fig. 35b). Data limitations preclude any conclusion about the reality of this trend. Ballyhoo is the main target species and is caught all year round, but mackerel can also be important in the landings (Fig. 36).

		1990	
Gear			%
Coastal pelagic fishery	A L C	524 *51.8* (98.7)	78.5 *96.2*
Pots	A L C	71 *1.5* (21.7)	10.7 *2.8*
Bottom lines	A L C	72 *0.5* (6.9)	10.8 *1.0*
Total	A L	667 53.8	

Table 15. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Saint-Joseph

2.7.8. Layou-Tarou

Layou and Tarou are two landing sites located north and south of the mouth of Layou River respectively and south of Saint-Joseph. Data collection is done simultaneously on both sites, but potential problems related to sampling in two different sites (cf. 2.3.) are minimized in this case because of the very small scale of the fishing activity in Tarou, where there are only a few canoes : collecting indirect data is made easier, and potential bias is very small. The same kind of problems as in Saint Joseph were encountered : the first quarter of 1990 had to be discarded because of very low sampling rates and likely flaws in the data, and a correction factor based on 1992 data had to be applied to 1990 and 1991 because of non-reporting of days with no activity.

In Layou/Tarou also, coastal pelagic fishing is by far the main activity (Table 16) ; the remaining trips are devoted to pot fishing in proportions almost constant through time, and no seasonality of activity was observed (Fig. 37a). However, monthly landings are highly variable, ranging from 5 to 17 thousand lbs (Fig. 37b). Ballyhoo is the main species caught in the coastal pelagic fishery, with jacks and other species being of secondary importance only (Fig. 38). As far as pots are concerned, no pattern appears for the average yield nor for the species composition of the catch (Fig. 39)

		1991		1992	
Gear			%		%
Coastal pelagic fishery	A	890.2	72.6	929	78.5
	L	*103.0*	*89.6*	*118.7*	*93.3*
	C	(105.1)		(127.8)	
Pots	A	370	27.4	254	21.5
	L	*12.0*	*10.4*	*8.5*	*6.7*
	C	(32.4)		(33.7)	
Total	A	1260.2		1183	
	L	*115.0*		*127.2*	

Table 16. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Layou/Tarou

2.7.9. Mahaut

The data available for Mahaut were of intermediate quality : as opposed to some other sites, Sundays and zero catches were sampled, but several observations also suggest that the collection of data was not always fully rigorous, at least as far as activity is concerned (frequency of seemingly indirect data recording, of inconsistencies among activity totals, etc.). The quality of catch data looks better, in spite of some unsolved questions (cf. below). Therefore, although no obvious flaws lead one to fully question the reliability of the results, some caution is necessary in their interpretation.

		1991	
Gear			%
Coastal pelagic fishery	A	349	24.5
	L	*33.9*	*43.7*
	C	(97.1)	
Offshore pelagic fishery	A	628	44.0
	L	*37.9*	*48.9*
	C	(60.4)	
Pots	A	448	31.4
	L	*5.7*	*7.3*
	C	(12.7)	
Total	A	1425	
	L	*77.5*	

Table 17. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Mahaut

There is some month-to-month variability in the activity (Fig. 40a), without any apparent seasonal pattern ; it is not known whether the low levels of activity observed early 1991 were due to sampling or real fluctuations of the fishery. Monthly landings range most often between 5 and 10 thousand lbs, and peak to more than 25000 lbs in May 1992 because of the offshore pelagic fishery catches (Fig. 40b). This latter fishery targets mainly tuna, which can at times be caught in large quantities in seine nets, but also some dolphins and occasionally flyingfish. The pot fishery is characterized by a very low average catch/trip, which was not found in the other sampled landing sites. This could be the result of some data collection problem or a reflection of the reef fishery resources in that area, but the reality of a very low level of performance of the pot fishery cannot be excluded ; it would be the case if only a few pots were hauled during each trip, either by part-time or retired fishermen, or as part of a polyactivity strategy.

2.7.10. Saint Sauveur

This site is located on the East coast of Dominica, half way between Fond Saint-Jean and Marigot. On the whole, the data collected were found to be quite reliable, although the wide year-to-year variations of pots and bottom lines activity may reflect some uncertainty in the demersal gear identification by the stats collector (which seems very unlikely) or the effect of the introduction of improved bottom longline technique by the fisheries division.

The offshore pelagic fishery is by far the most important in Saint-Sauveur, where the fishing grounds of the Atlantic Ocean are easily accessible ; the shelf is too narrow and the difficult working conditions experienced hinders the development of a demersal fishery, but pots, lines and nets are still used in non-negligible proportions (Table. 18).

		1990		1991		1992	
Gear			%		%		%
Offshore pelagic fishery	A	633	58.2	811	63.7	990	72.9
	L	*43.1*	*81.7*	*59.4*	*80.8*	*84.0*	*91.5*
	C	(68.1)		(73.2)		(84.8)	
Pots	A	273	25.1	85	6.7	69	5.1
	L	*5.5*	*10.5*	*2.0*	*2.7*	*1.5*	*1.6*
	C	(20.3)		(23.6)		(21.0)	
Bottom gillnets	A	41	3.8	39	3.1	66	4.9
	L	*0.9*	*1.8*	*2.3*	*3.1*	*1.4*	*1.5*
	C	(23.3)		(57.6)		(20.8)	
Bottom lines	A	140	12.9	336	26.4	233	17.1
	L	*3.2*	*6.0*	*9.8*	*13.3*	*4.9*	*5.3*
	C	(22.7)		(29.2)		(21.0)	
Total	A	1087		1271		1358	
	L	*52.7*		*73.5*		*91.8*	

Table 18. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Saint Sauveur

The whole yearly activity is characterized by the alternance of pelagic and demersal fishing, although none of them completely stops for more than one or two months (Fig. 41a). The 1991-1992 pelagic season was exceptionally long, with intermediate levels of activity before and after the peak months of January to May, and reached higher values than the previous ones ; this explains the increase in yearly number of trips from 1990 to 1992. As the average yields of demersal fishing are much lower, the monthly landing pattern is dominated by the pelagic fishery and its seasonality (Fig. 41b). Monthly landings range from 2 to 5 thousand lbs during the season, and rise to about 10000 lbs in 1990 and 1991, and 20000 lbs in 1992. The offshore pelagic fishery mainly targets dolphin, which accounts for about half of the catch (46 to 58%), the rest being made of a variety of other species : tuna, kingfish, flyingfish, triggerfish, etc. (Fig. 42). During the peak season, the average yields are varying around 75 lbs/trip, but can reach much higher values, as was the case early 1992.

Demersal fishing is performed with pots, lines, and nets ; the variations of yearly activity and the similarities between average catch/trip (Table 18) and species composition (Fig. 43) leads one to suspect some confusion between pots and bottom lines at the data collection level or that both types of gear are almost equally effective at catching snappers. It appears that snappers are the main target of this fishery, which regularly lands about 20 lbs/trip.

2.7.11. Pottersville

Pottersville as Newtown is sampled by the same stats collector and is one of the main landing sites of Roseau. Three years of data are available. Data for 1990 is incomplete, but a major problem strongly limits the reliability of the results. In parts of 1991 and 1992 two different sites (Pottersville and Fond-Colé) was covered in such a way that it is not possible rigorously to separately process each data set, nor to consider them together as a single site. Yet this latter solution has been retained in order to at least obtain rough estimates of fishing activity and production : the results cannot be considered as being anything else than orders of magnitude for the fishery operating from the northern part of Roseau, on the right bank of Roseau River.

		1991		1992	
Gear			%		%
Coastal pelagic fishery	A	1104	45.2	1191	47.9
	L	*72.1*	*42.0*	*58.4*	*45.3*
	C	(65.3)		(49.0)	
Offshore pelagic fishery	A	1076	44.1	1005	40.5
	L	*89.5*	*55.2*	*64.1*	*49.7*
	C	(83.1)		(63.8)	
Bottom lines	A	258	10.6	224	9.0
	L	*9.9*	*5.8*	*5.4*	*4.2*
	C	(38.3)		(24.2)	
Pots	A			61	2.4
	L			*1.0*	*0.8*
	C			(16.1)	
Total	A	2438		2483	
	L	*171.5*		*128.9*	

Table 12 . Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Pottersville

Both in terms of activity and of landings, the fishery of Pottersville can be qualified as almost entirely pelagic, with similar shares for the coastal and offshore components (Table 19). The numbers of trips steadily decreased from mid-1990 to mid-1992 and then suddenly rose to higher levels (Fig. 44a). As data collection effects cannot be ruled out as cause of these trends, it will be concluded only that there is no seasonality in the fishery. Monthly landings are quite variable (Fig. 44b), which is not unexpected in this kind of fishery ; in particular, the peaks of production observed in January 1991 and May 1992 are due to periods of high abundance of flyingfish within the range of the offshore pelagic fishery. Among the other species, tuna makes most of the catch of the fishery. The coastal pelagic catch is more diversified, with three important groups of species : ballyhoo, jacks and mackerel, and a few others (sprats, tunas) whose landings can be more than negligible at times (Fig. 45). Bottom lines are used all year round and target mainly snappers and groupers (Fig.46).

2.7.12. Newtown

Only one year and a half of data are useable for Newtown : a change of data collector in July 1991 revealed that almost the whole demersal activity, and possibly a part of the pelagic activity, had been overlooked until that date. No major problem was found in the remaining time period. In order to show the complete time-series of pelagic data (which seems to have been correctly sampled during the first 18 months), the whole data set has been included in the figures, but only 1992 data were used for total activity and catch estimation (Table 20).

		1992	
Gear			%
Offshore pelagic fishery	A	1550	57.1
	L	*148.6*	*82.1*
	C	(95.9)	
Coastal pelagic fishery	A	360	13.3
	L	*25.7*	*14.2*
	C	(71.4)	
Pots	A	406	15.0
	L	*3.9*	*2.2*
	C	(9.7)	
Bottom lines	A	371	13.7
	L	*2.4*	*1.3*
	C	(6.5)	
Bottom gillnets	A	25	0.9
	L	*0.4*	*0.2*
	C	(15.2)	
Total	A	2712	
	L	181.0	

Table 20. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Newtown

As far as activity is concerned, half of the trips are devoted to the offshore pelagic fishery, and the other half is equally split among pots, bottom lines and beach seine. There is no explanation for the complete stop of these three components in April 1992 (Fig. 47a) ; this could be due to a sampling problem rather than a real feature of the fishery. Demersal species represent only a negligible part of the fish production. Offshore pelagic fishing accounts for 82% of the landings, and coastal pelagic fishing for most of the rest (Fig. 47b). Monthly landings are usually around 10000 lbs, but peaked to 50000 lbs in May 1992 because of high catches of flyingfish. The data for 1990 to mid-1991 (which are less biased for the offshore pelagic fishery) confirm this stability of monthly pelagic production. The most important pelagic species in the landings are flyingfish and tuna for the offshore fishery (Fig. 48), and ballyhoo and jacks for the coastal fishery (Fig. 49). Pots and bottom lines, which make the bulk of the demersal activity of Newtown, have very low yields (less than 10 lbs/trip), and thus are negligible in the total landings ; snappers and groupers are the main species groups caught.

2.7.13. Scottshead/Soufriere

These two villages are located at the southern tip of Dominica, around the wide Soufrier Bay where a marine reserve (SSMR) has recently been established with the purpose of managing the coastal environment and the various human activities conducted within it (fishing, snorkeling, scuba diving, sailing, etc). Reliable statistical data covering the whole fishing activity of these two villages are not available, but the activity taking place within the boundaries of the marine reserve is fairly well known through a specific data collection system which has been operating for 18 months (October 1992 to March 1994) and for which no particular methodological problem needs to be pointed out. Therefore it should be emphasized that the description presented here does not reflect the entire fishing activity of the two villages, but only the part which takes place within the Marine Reserve area, thus excluding the coastal fishing activity realized outside its limits (from Soufriere northwards and from Scottshead Point eastwards) and the offshore fishing activity for migratory pelagics. By analogy with the neighbouring sites on the southern Caribbean coast of Dominica, it can be hypothsized that about half of the fishing trips are conducted offshore. A very rough estimate of this component would therefore be of about 1000 trips, for a production ranging from 50 000 to 100 000 lbs, according to the average catch/trip (from 50 to 100 lbs in the neighbouring sites).

		1992	
Gear			%
Coastal pelagic fishery	A	605.9	57.4
	L	*33.1*	*89.0*
	C	(56.6)	
Pots	A	216.6	20.5
	L	*2.3*	*6.4*
	C	(11.0)	
Bottom lines	A	154.5	14.6
	L	*0.7*	*2.0*
	C	(4.8)	
Bottom gillnets	A	46.6	4.4
	L	*0.6*	*1.5*
	C	(12.3)	
Unknown	A	30.6	2.9
	L	*0.3*	*1.0*
	C	(12.6)	
Total	A	1054.3	
	L	*37.2*	

Table 21. Yearly activity (A, trips), landings (L, thousand lbs), and catch/trip (C, lbs/trip) for Scottshead/Soufriere in SSMR area

Most of the coastal fishing activity is devoted to pelagic schooling species (mackerel, ballyhoo, jacks, sprats,...), which account for about 9/10 of the catch (Table 21). Among demersal gears, pots and bottom lines are the most important, whereas gillnets, diving, and possibly other gears are almost negligible. On the whole, the coastal fishing activity seems to be quite stable over the year, with little seasonal effect on numbers of trips (Fig. 50a)

and on landings (Fig. 50b). From January to December 1993, the proportions of the gears do not vary much, but significant differences appear between the last 3 months of 1992 and the first 3 months of 1994 ; no interpretation can be proposed for this.

Four species make up almost 80 % of the coastal pelagic catch, with mackerel being the most important one (Fig. 51), but most trips catch only one species. Although some trolling trips can be done within the bay, the main gear is the seine, which can be used either in the classical way, hauled from the beach, or to encircle a school of fish in deeper waters before being closed from below by the fishermen and then brought to shore. Detailed examination of the data shows that the two types of pots are use in the SSMR area : the traditional, non-baited caribbean pot which catches a wide variety of reef fish species, and the smaller « tombé-levé » pot, baited and hauled after a short soak time, which catches mainly predatory species such as groupers, morays, and squirrelfishes (Fig. 52). This catch composition is also similar to that of the bottom line fishery, whereas gillnets mainly catch grunts, jacks, and occasionnaly sharks.

Conclusion

Conclusion

The findings of the analysis presented in this document provides a very good understanding of the characteristics of the Dominican fishery. In spite of some small limitations posed by data collection methodology from three sites, the estimated landings for 1992 was 1.6 million pounds of fish from 2400 fishing trips. This figure is slightly underestimated owing to the absence of data from non sampled sites. Improvements made in recent years by the Fisheries Division to include four more landing sites (namely Salisbury, Vielle Case, Capuchin and Calibishie) in the data collection system indicates that catches from those areas are not negligible.

The offshore migratory pelagic and coastal pelagic components of the fishery yielded 40% and 43% of the annual catch respectively, and thus together contributed 83% of the total landings. The almost equal levels of performance observed is a rather interesting feature as it was generally thought that the offshore pelagic fishery produced a significantly higher proportion of the total landings of the Dominican fishery. The demersal reef and deep slope fishery contributed only 16% of the total landings but expended as much as 35% of the total fishing effort ; as this is related to the difference of productivity (catch/trip) between the pelagic and demersal fisheries, the large magnitude of effort versus catch observed for the demersal fisheries cannot be explained in strictly biological terms. However, the demersal fishery is more accessible to fishermen and does not involve travelling long distances, gear used are more readily available and less expensive than seines ; therefore there exists the tendency for this high degree of effort in this fishery to continue into the future. Although no conclusion on stock status can be drawn without more biological information, the wide differences in yield observed within the pot fishery suggest that the demersal resources of the Dominican shelf are probably experiencing a high fishing pressure in some areas.

Most of the fishing activity is concentrated on the West coast of the island. Fishing for coastal pelagics occurs almost exclusively on this side, the Caribbean sea affording favourable working conditions for fishermen for almost all of the year. The landing sites of Portsmouth, Pottersville and Newtown account for about 1/3 of the whole fishery, bearing in mind that landings for Portsmouth could be slightly inflated due to fish from Bioche and Capuchin being landed there because of the better marketing facilities in that town. The Fond St. Jean, Saint Sauveur and Marigot landing sites on the East coast land the largest proportion of the offshore pelagics and correspondingly expend more fishing effort in this fishery by comparison with sites on the West coast of the island.

The apparent absence of any distinct seasonal effect on the fishing activity nor on the landings is a very interesting feature of the Dominican fishery. All of the three fishery categories identified remain active all year round with an increase in offshore pelagic activity at the peak of the season, but not at the expense of the demersal and coastal pelagic fisheries. This observation cannot be explained strictly from the data available, there may be other factors (such as socio-economic considerations) that influence this dynamics rather than just fishing.

Although the collection of statistical data unavoidably requires some simplification of the information, the results presented here provide a fairly accurate account of the

Dominican fishery, which could be described at the level of gear, species, average catch, seasons, at the scale of the landing sites and of the whole island. It provides valuable information which can be used by planners and decision makers on the allocation of resources within the industry and for future development projects within the fisheries sector. This work has already been beneficial through a critical analysis of the Dominica fisheries data collection system and the improvements which have been recognised. The difficult task of setting up, running and constantly upgrading a fishery data collection system and maintaining a research component within any fisheries department is of significant importance. It enables sound judgements to be made based on strong scientific evidence and minimises the trial and error approach. Collation and processing of the data is a very time consuming and tedious exercise the results of which can be very rewarding as is evident in this report.

Figures

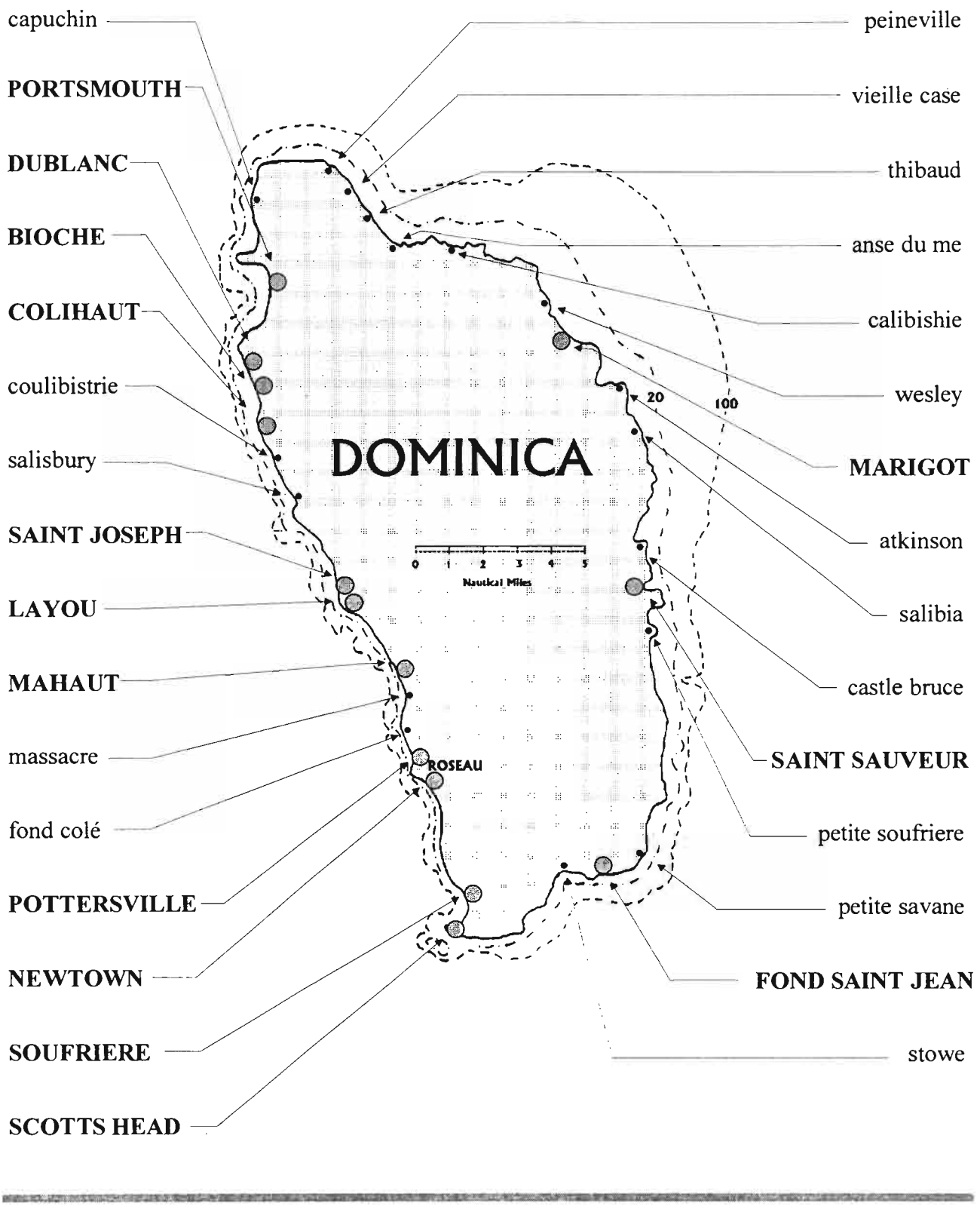


Figure 1. Map of Dominica with the landing sites (sites where data were collected and analyzed are shown in capital letters)

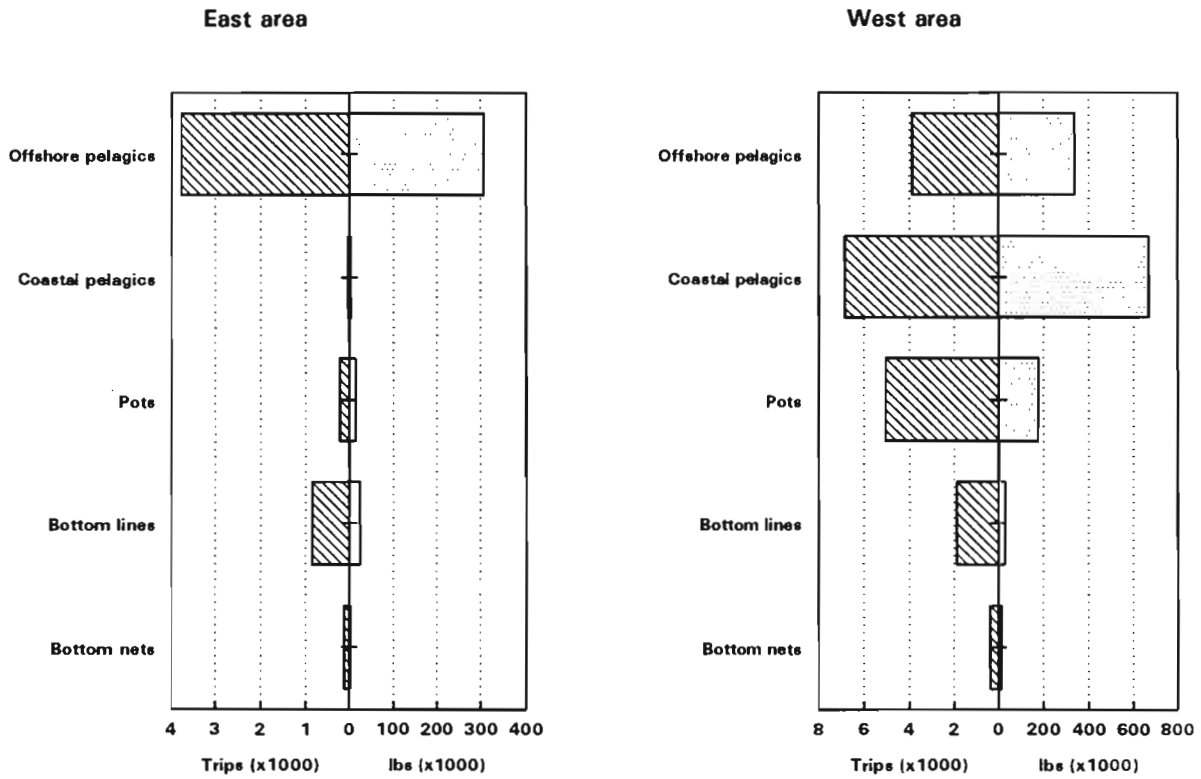
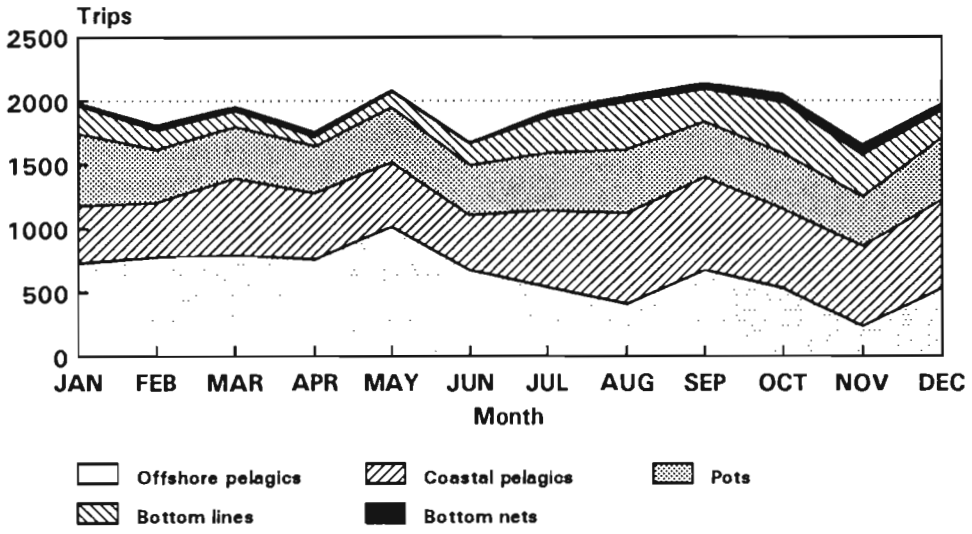


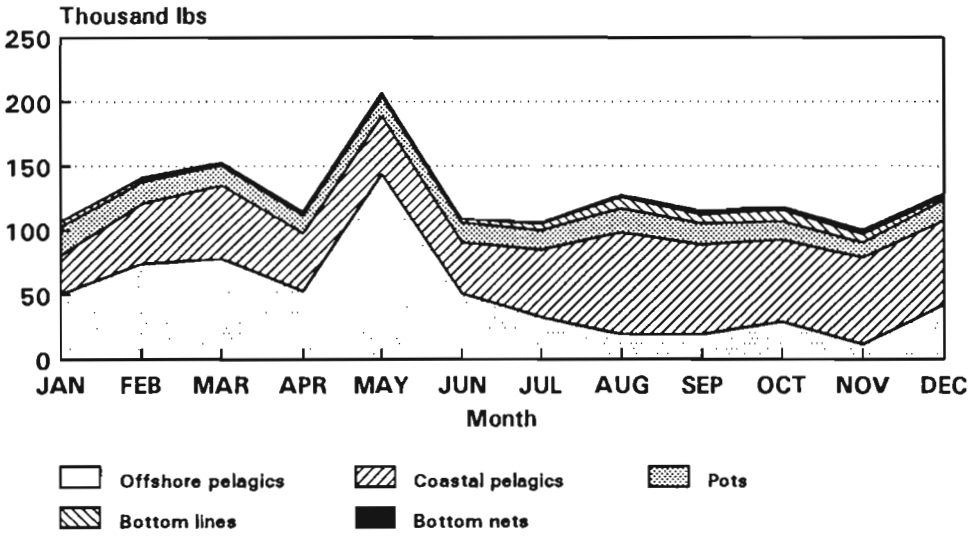
Figure 2. Activity and catch profiles of the fishery on the East and the West coasts of Dominica

Figure 3
Overall monthly activity in the Dominican fishery



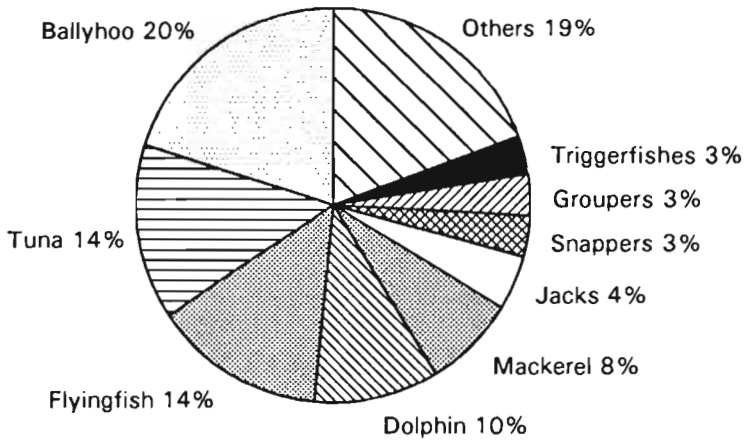
(N.B. Offshore pelagic activity was not included for Scottshead-Soufriere)

Figure 4
Overall monthly landings of the Dominican fishery



(N.B. Offshore pelagic landings were not included for Scottshead/Soufriere)

Figure 5
Overall catch composition of the Dominican fishery



(Catches of Scottshead/Soufriere were not included)

Figure 6
Monthly activity, landings and average yield for the offshore pelagic fishery

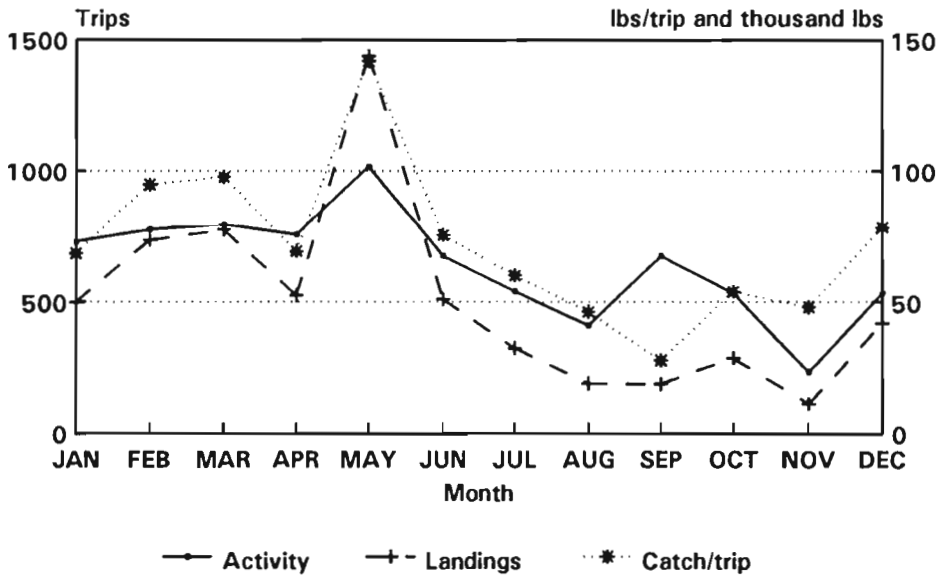


Figure 7a
Average composition of the offshore pelagic catch (East coast)

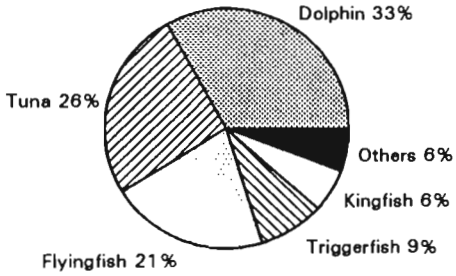


Figure 7b
Average composition of the offshore pelagic catch (West coast)

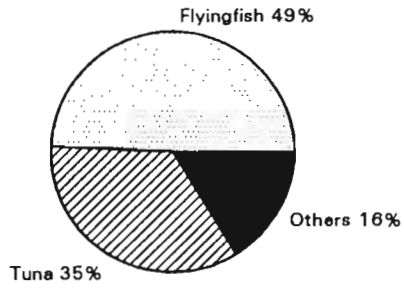


Figure 8
Monthly landings of the offshore pelagic fishery

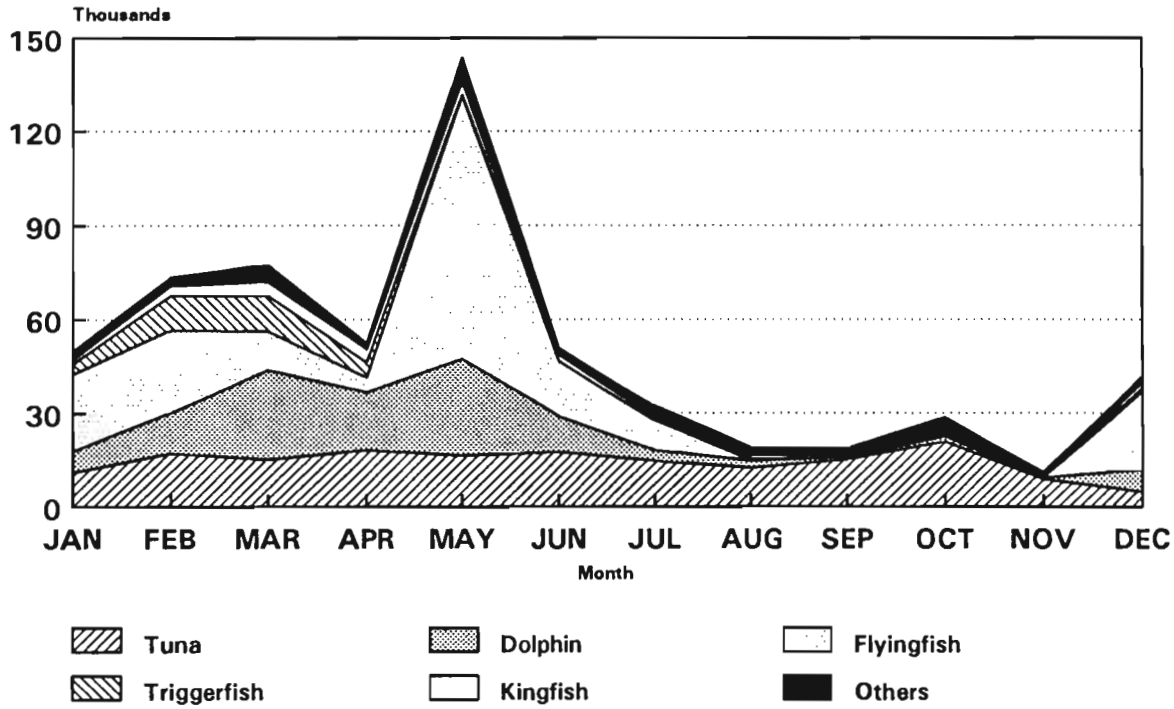


Figure 9
Monthly activity, landings and average yield for the coastal pelagic fishery

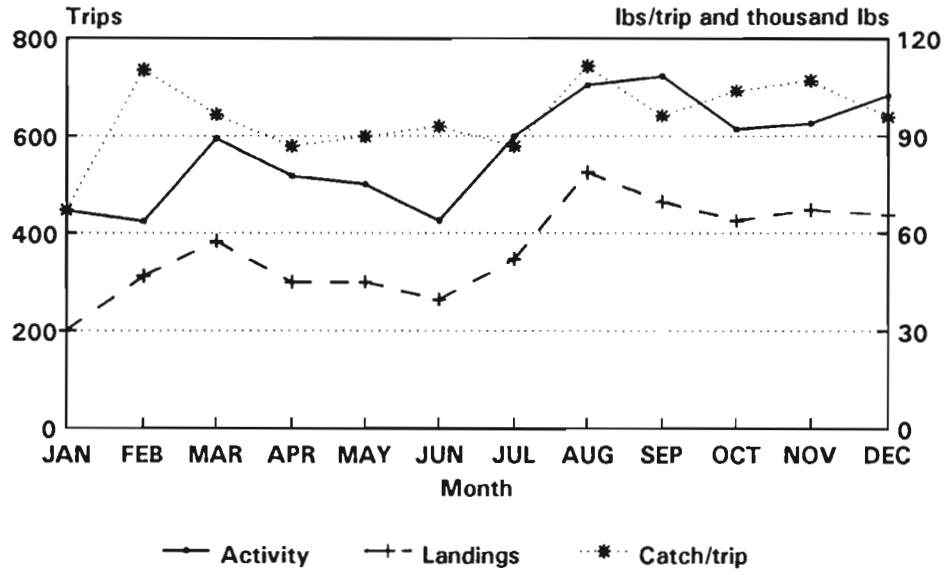


Figure 10
Monthly landings of the coastal pelagic fishery

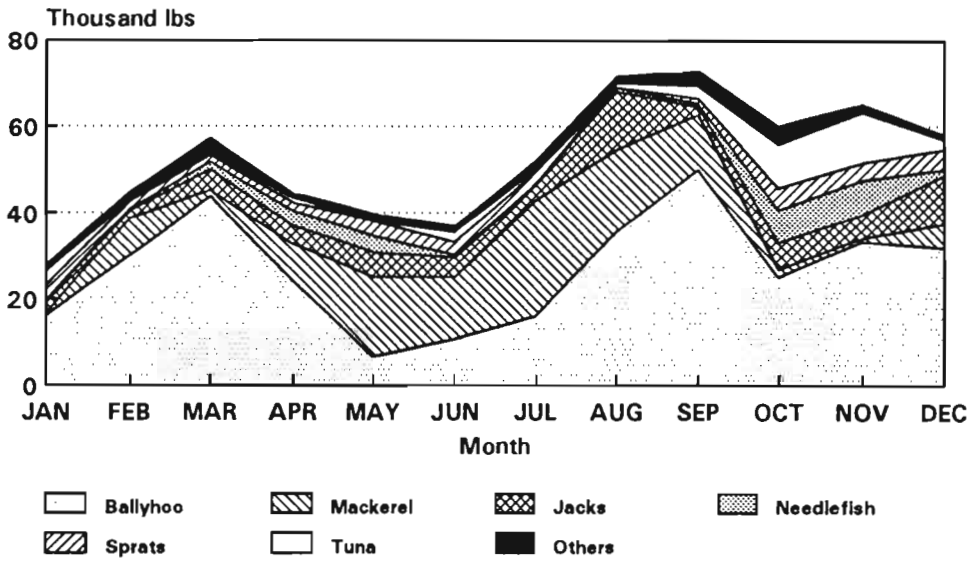


Figure 11
Monthly activity, landings and average yields in the pot fishery

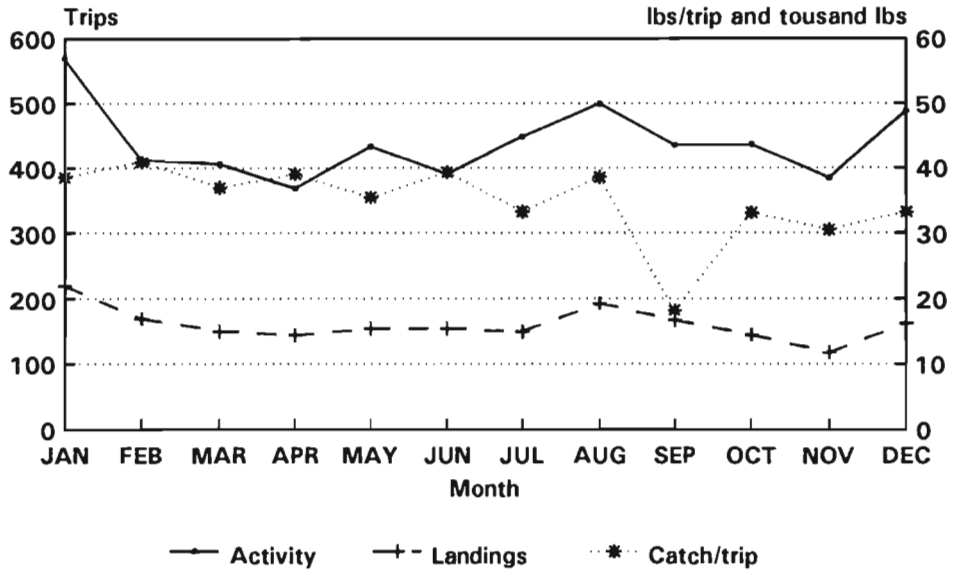


Figure 12
Average catch composition of the pot fishery

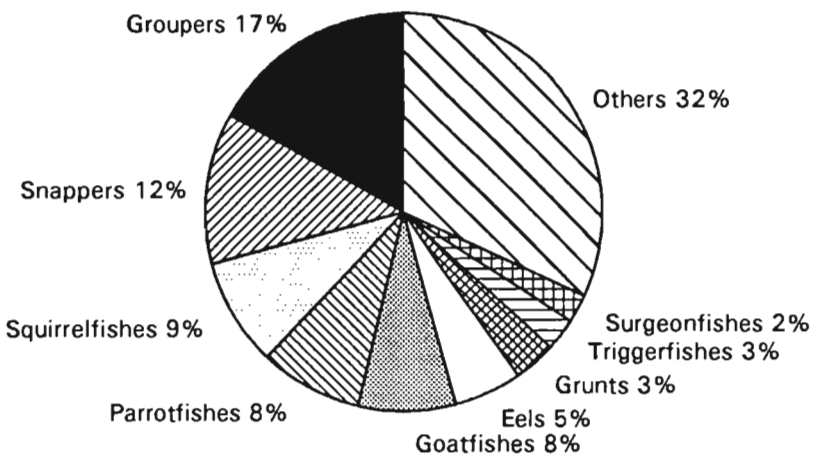


Figure 13
Monthly activity, landings and average yield of the bottom line fishery

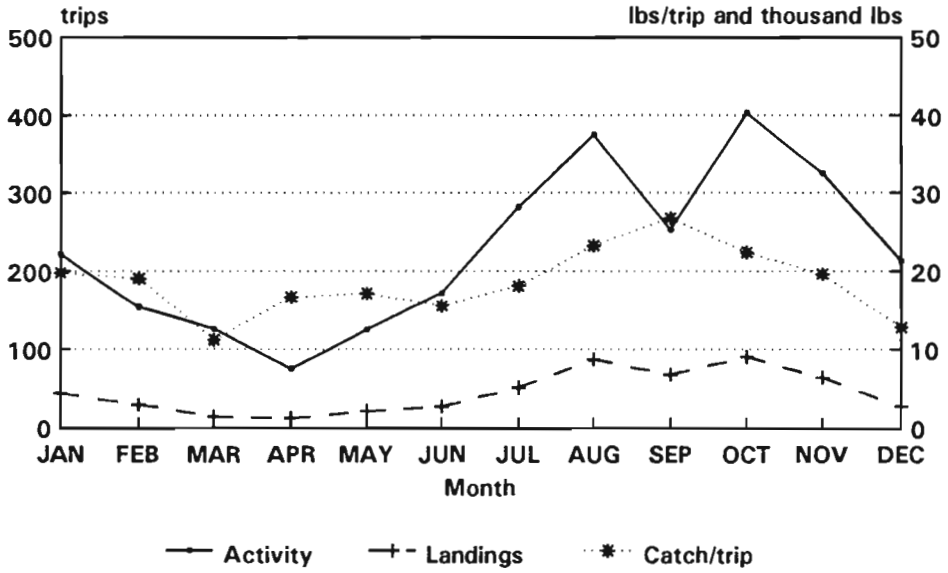


Figure 14
Average catch composition of the bottom line fishery

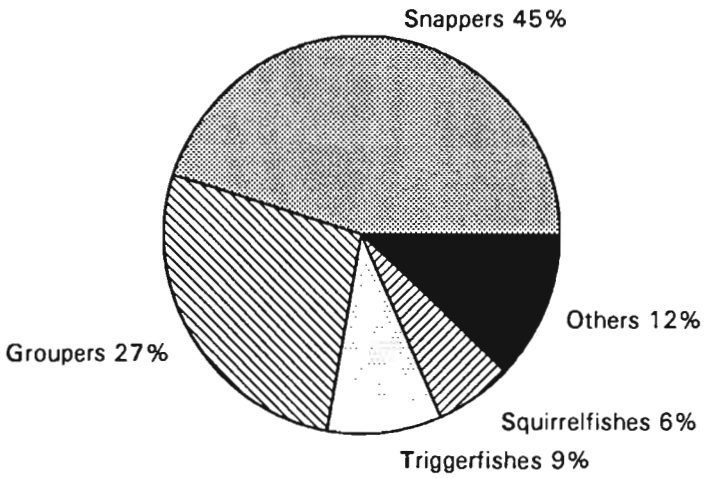


Figure 15a
Monthly activity in Marigot 1990-1992

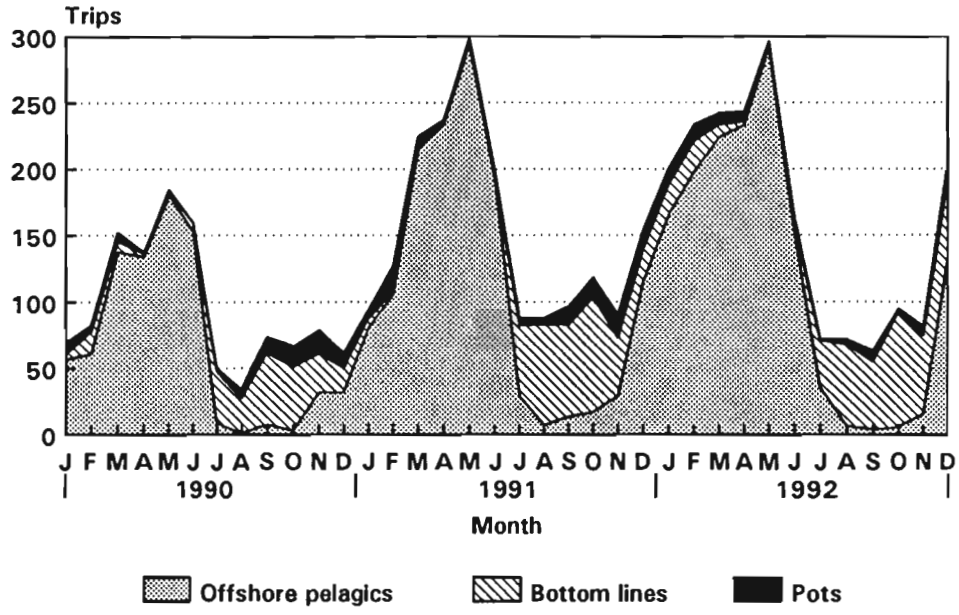


Figure 15b
Monthly landings in Marigot 1990-1992

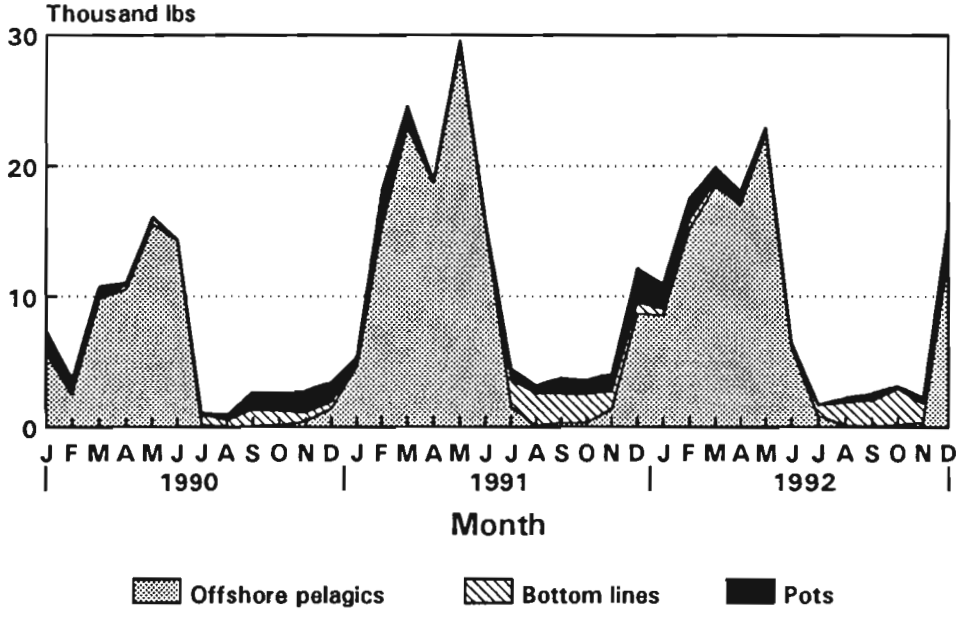


Figure 16
Monthly catch/trip in the offshore pelagic fishery of Marigot 1990-1992

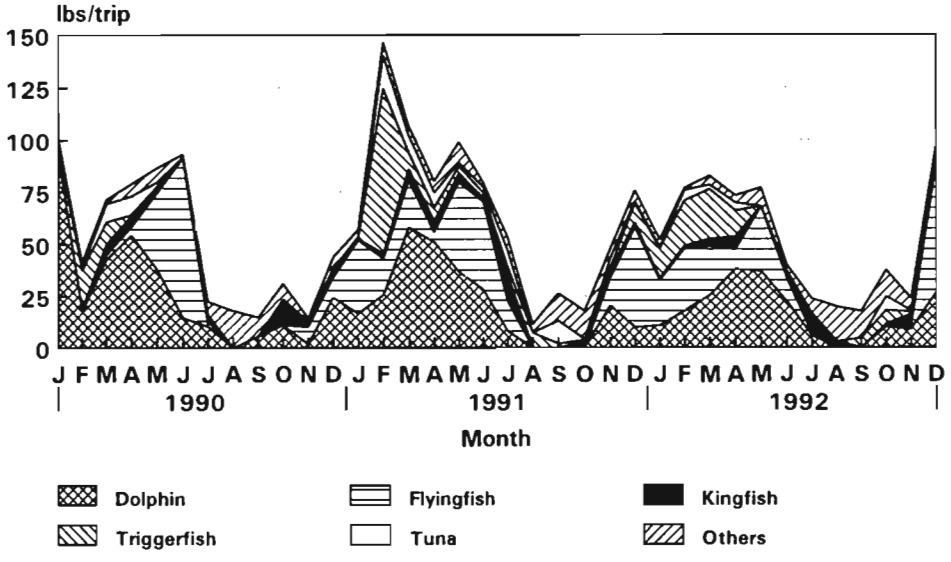


Figure 17
Monthly catch/trip in the bottom line fishery of Marigot 1990-1992

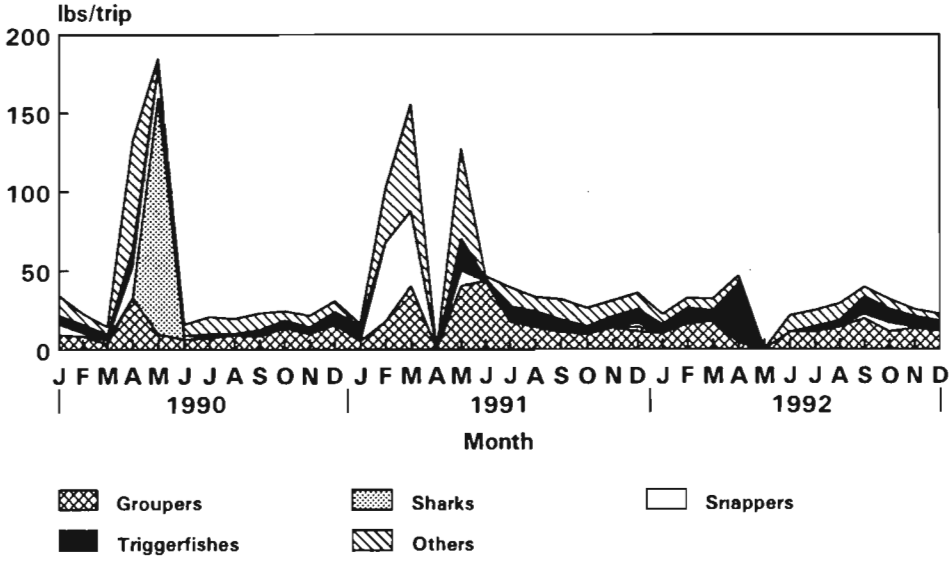


Figure 18a
Monthly activity in Fond-Saint-Jean
1990-1992

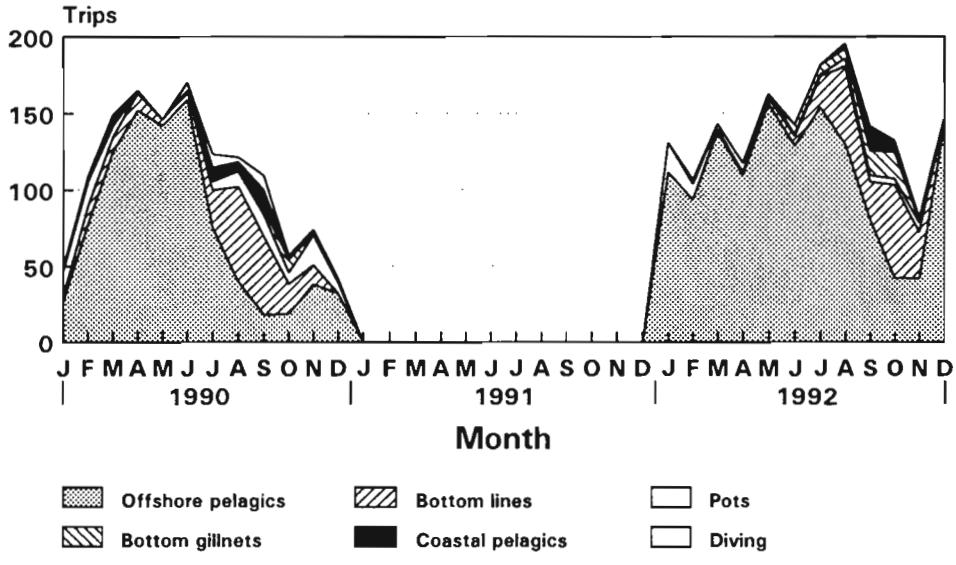


Figure 18b
Monthly landings in Fond-Saint-Jean
1990-1992

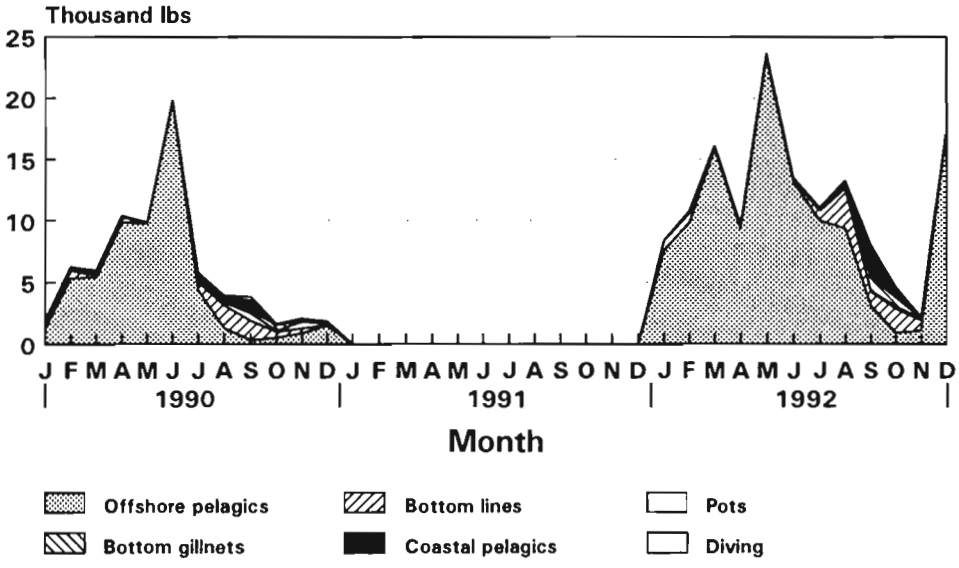


Figure 19
Monthly catch/trip of the offshore pelagic fishery of Fond Saint Jean

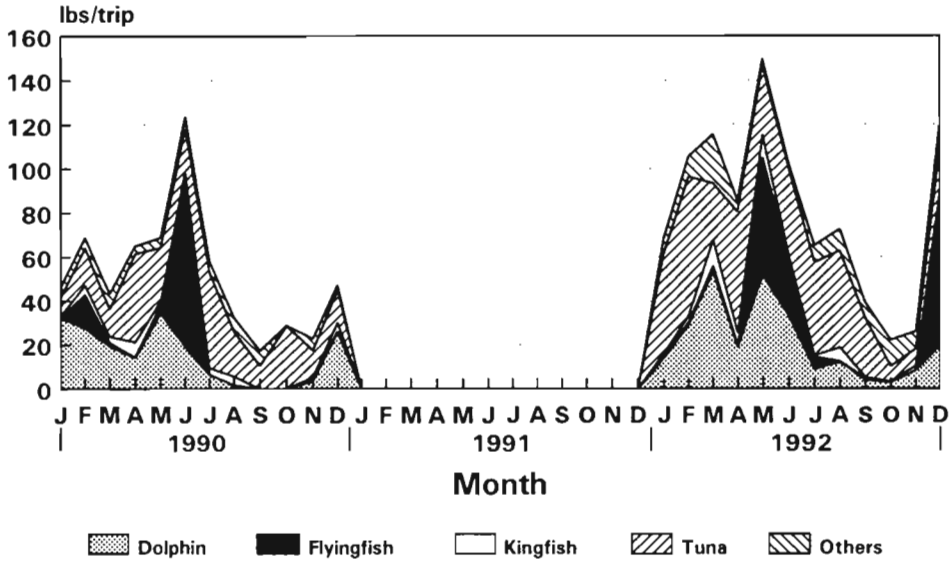


Figure 20
Monthly catch/trip of the bottom line fishery in Fond Saint Jean

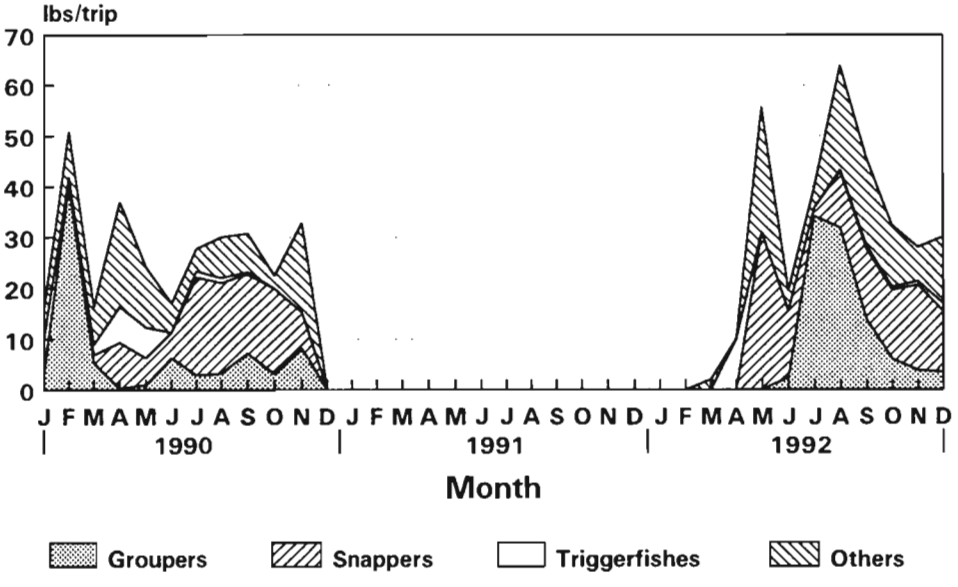


Figure 21a
Catch composition of the bottom gillnet fishery of Fond Saint Jean 1990-1992

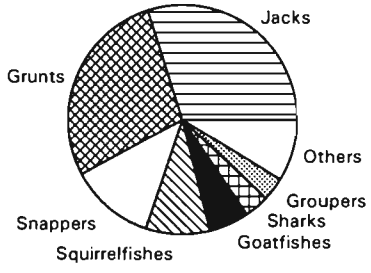


Figure 21b
Catch composition of the pot fishery of Fond Saint Jean 1990-1992

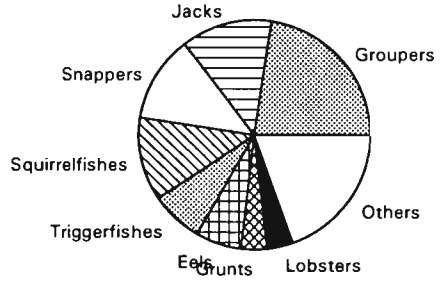


Figure 21c
Catch composition of the bottom line fishery of Fond Saint Jean 1990

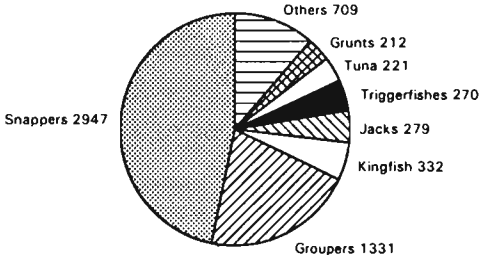


Figure 21d
Catch composition of the dive fishery in Fond Saint Jean 1990-1992

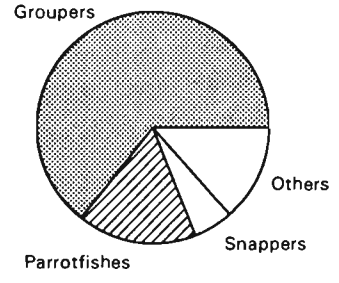


Figure 22a
Monthly activity in Portsmouth
1991-1992

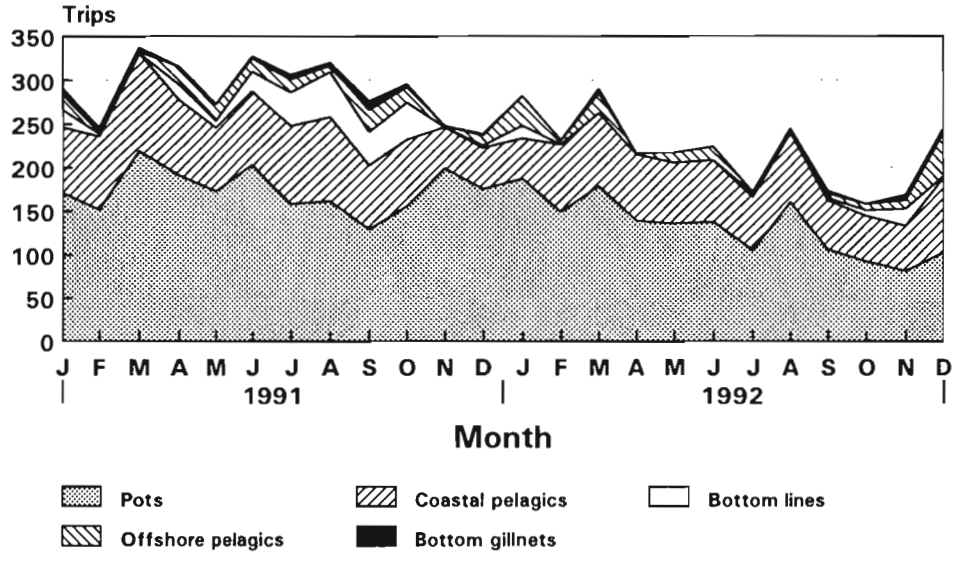


Figure 22b
Monthly landings in Portsmouth
1991-1992

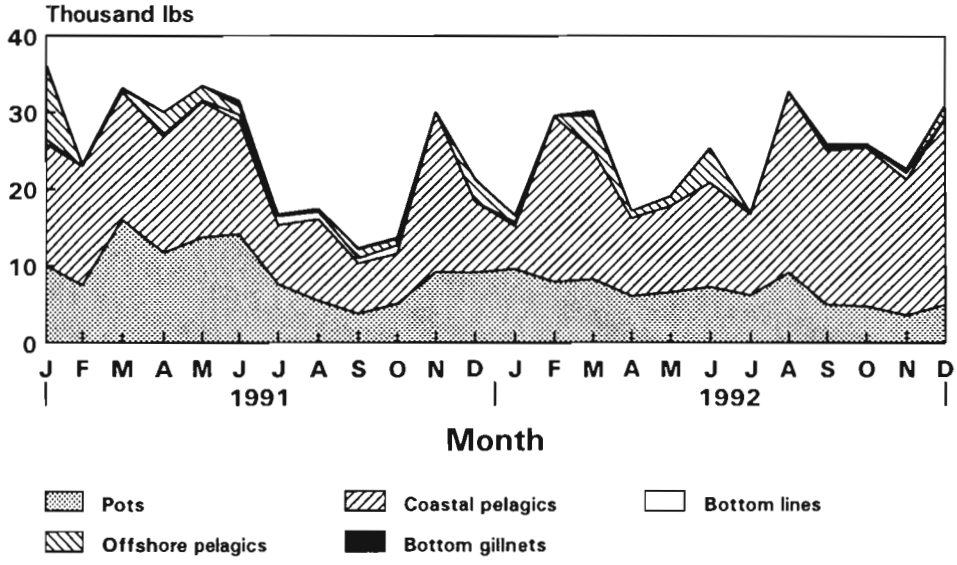


Figure 23
Monthly catch/trip of the coastal pelagic fishery of Portsmouth 1991-1992

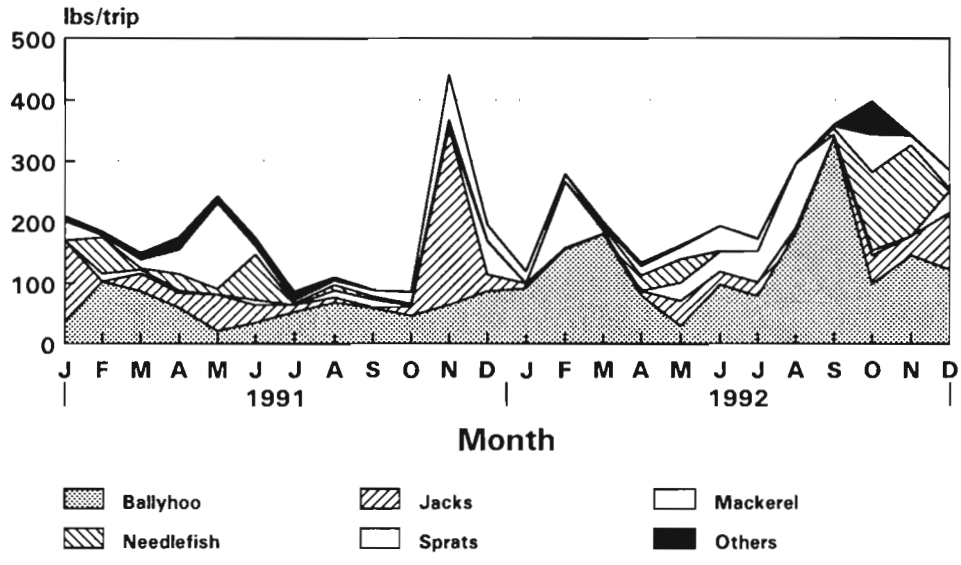


Figure 24
Monthly catch/trip of the pots fishery of Portsmouth 1991-1992

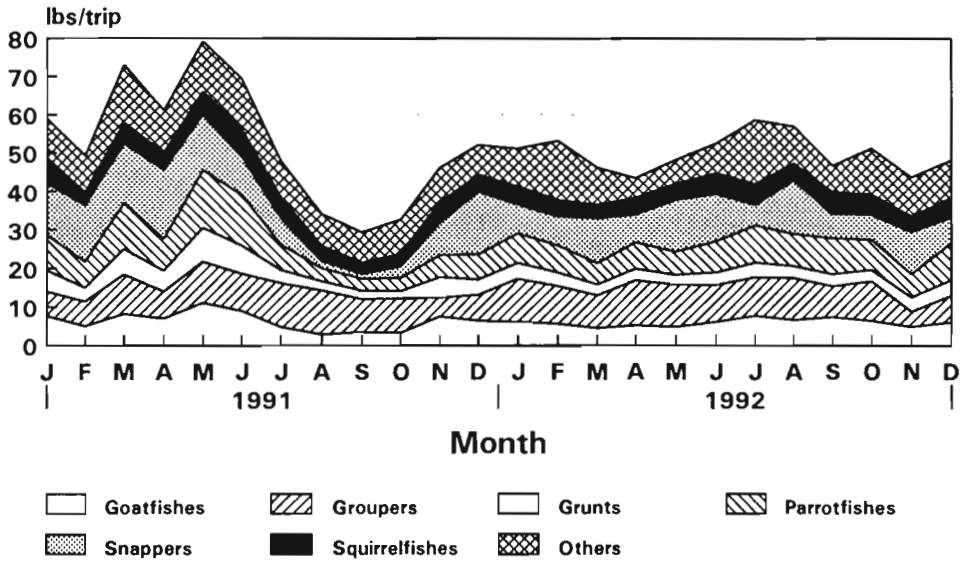


Figure 25a
Monthly activity in Dublanc 1990-1992

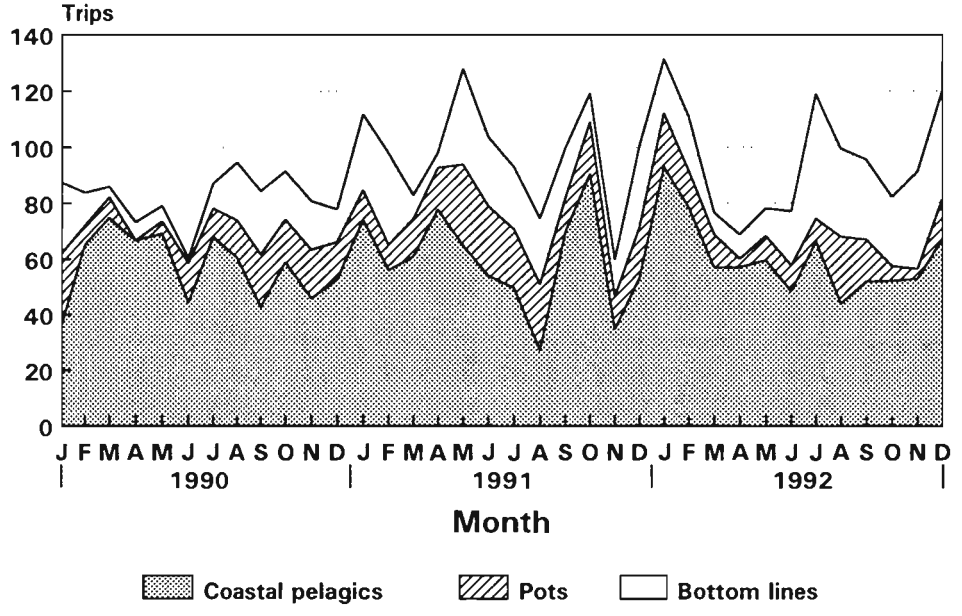


Figure 25b
Monthly landings in Dublanc 1990-1992

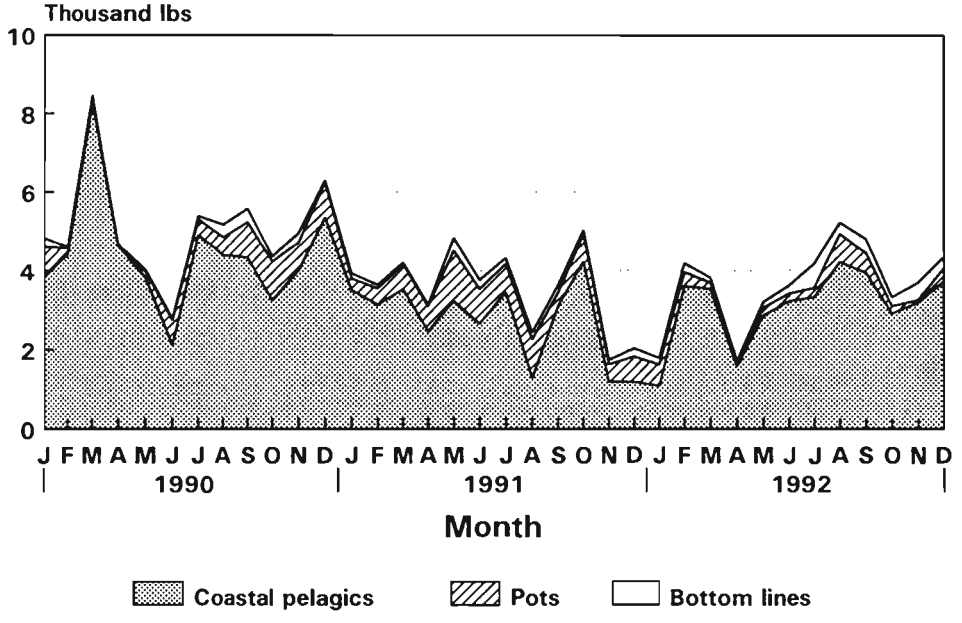


Figure 26
Monthly catch/trip of the coastal pelagic fishery in Dublanc 1990-1992

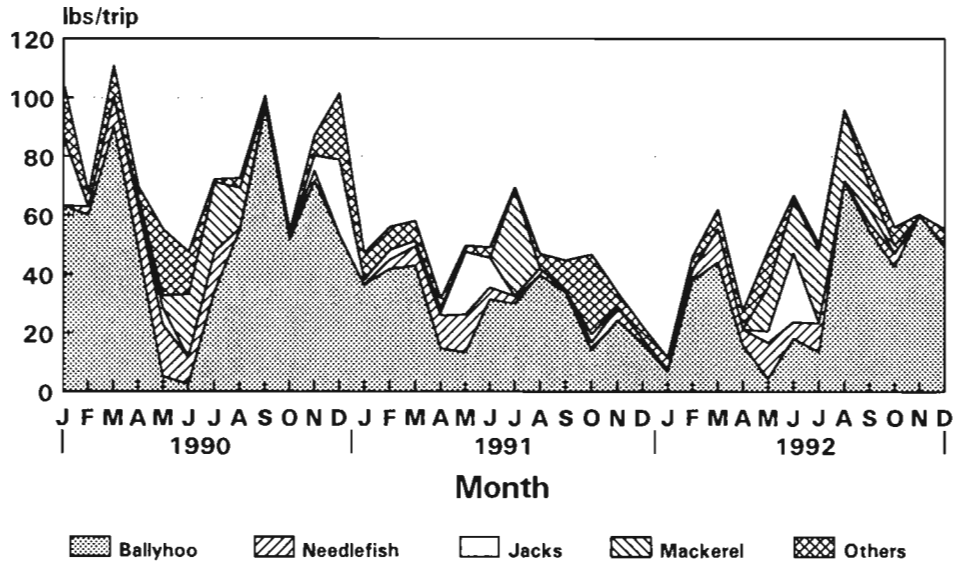


Figure 27
Average catch composition of the demersal fisheries in Dublanc

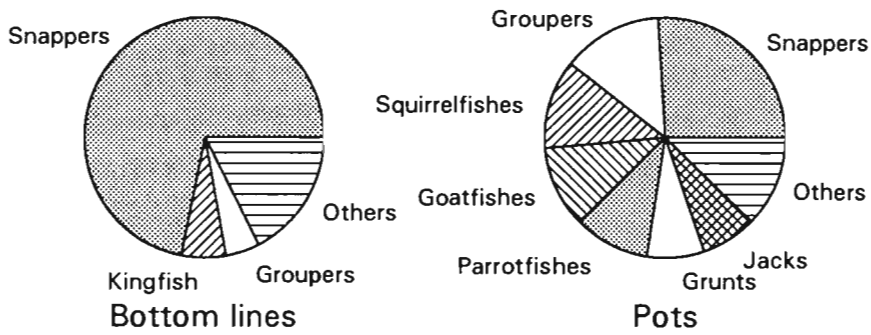


Figure 28a
Monthly activity in Bioche 1990-1992

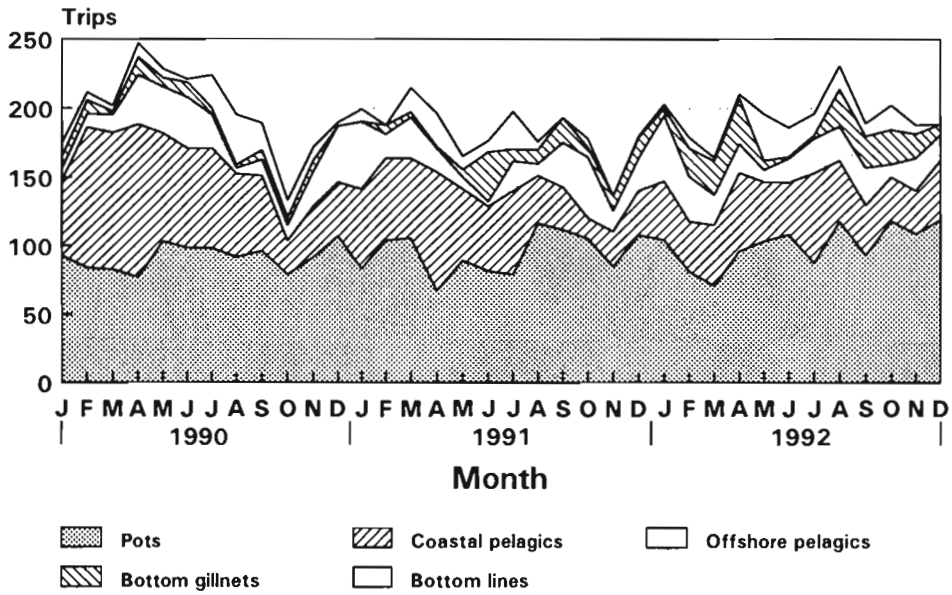


Figure 28b
Monthly landings in Bioche 1990-1992

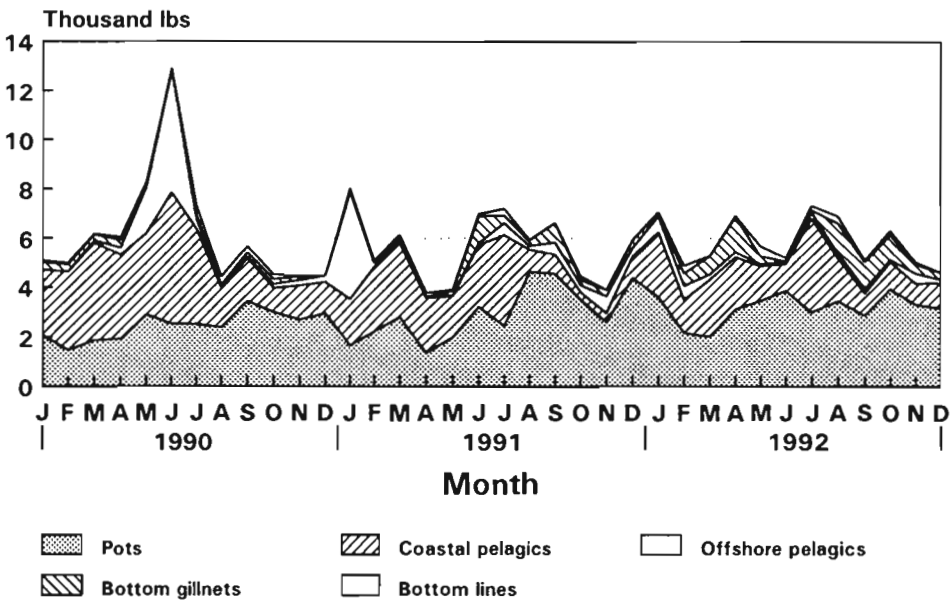


Figure 29
Species composition of the pot catch
of Bioche in 1990

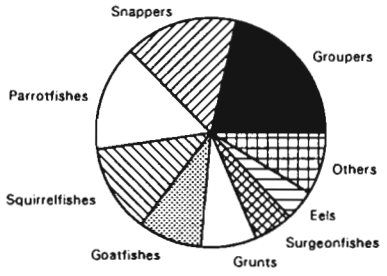


Figure 30
Species composition of the bottom line
fishery of Bioche in 1990

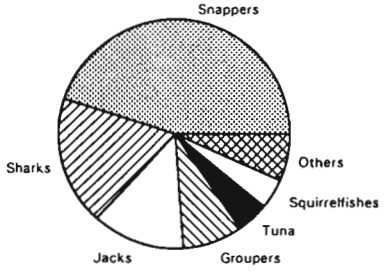


Figure 31
Monthly catch/trip of the coastal
pelagic fishery of Bioche 1990-1992

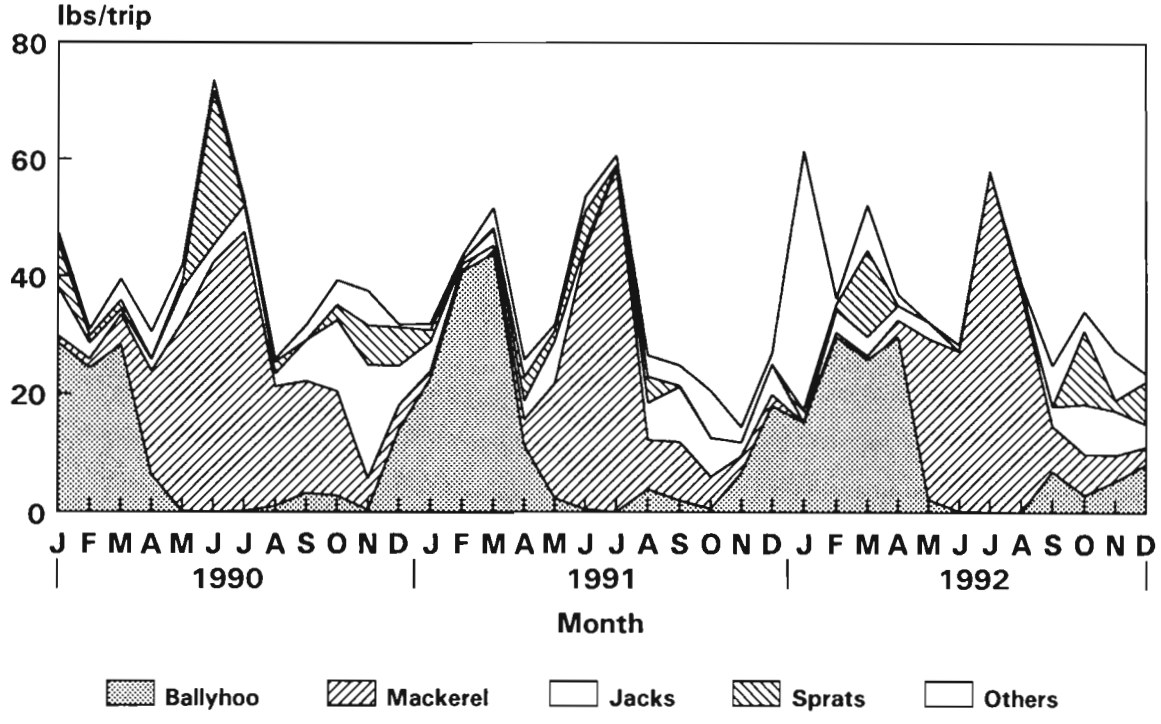


Figure 32a
Monthly activity in Colihaut
1990 and 1992

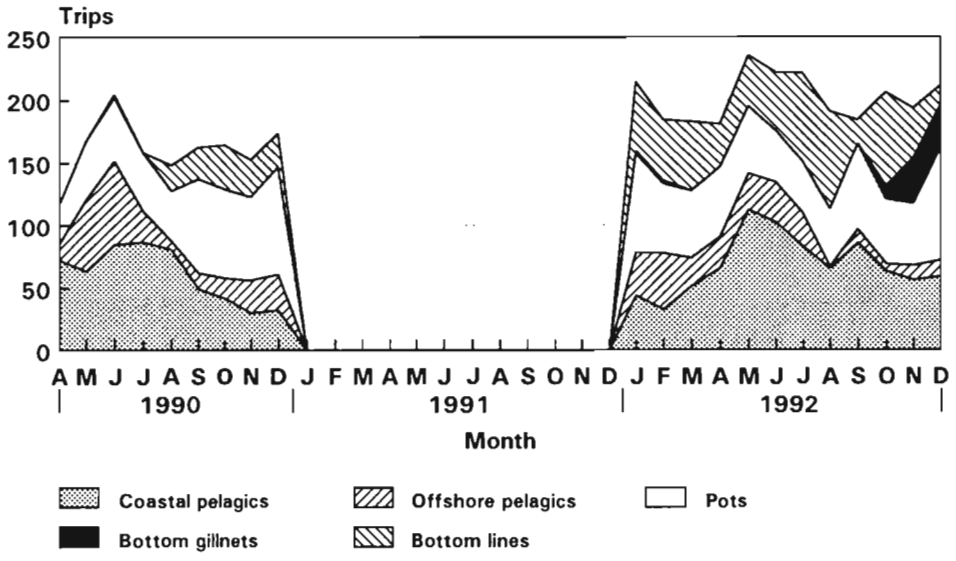


Figure 32b
Monthly landings in Colihaut
1990 and 1992

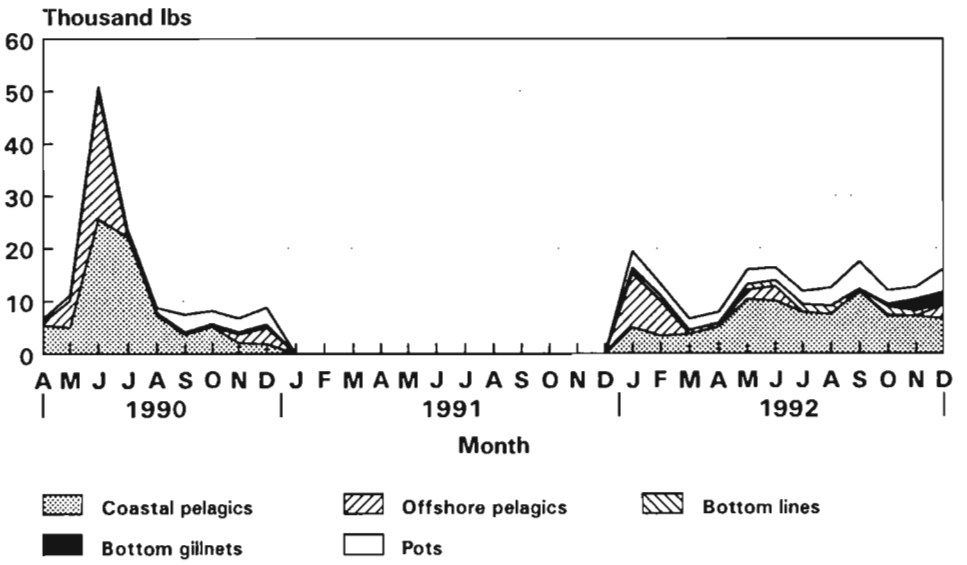


Figure 33
Monthly catch/trip of the coastal pelagic fishery of Colihaut 1990 + 1992

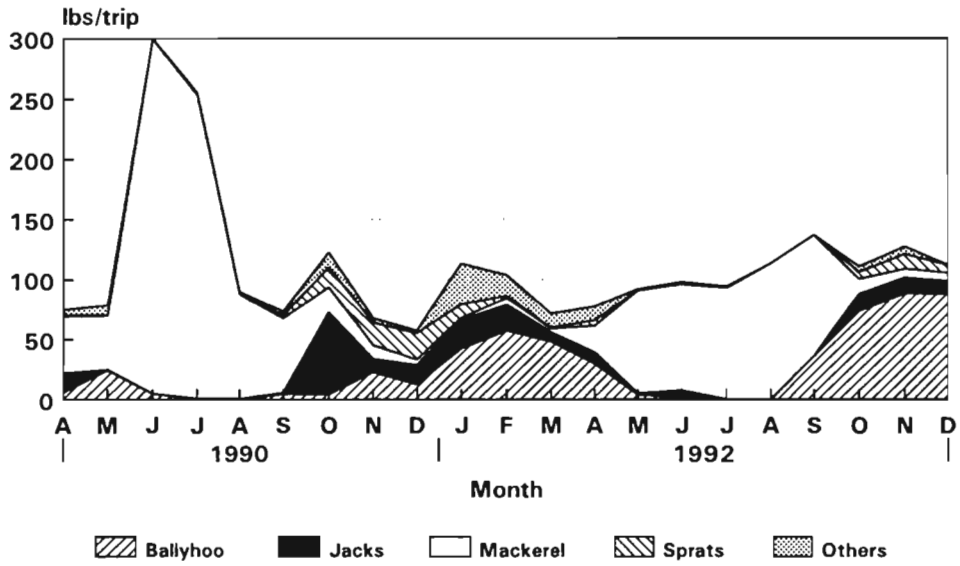


Figure 34
Average catch composition of the demersal fisheries in Colihaut 1992

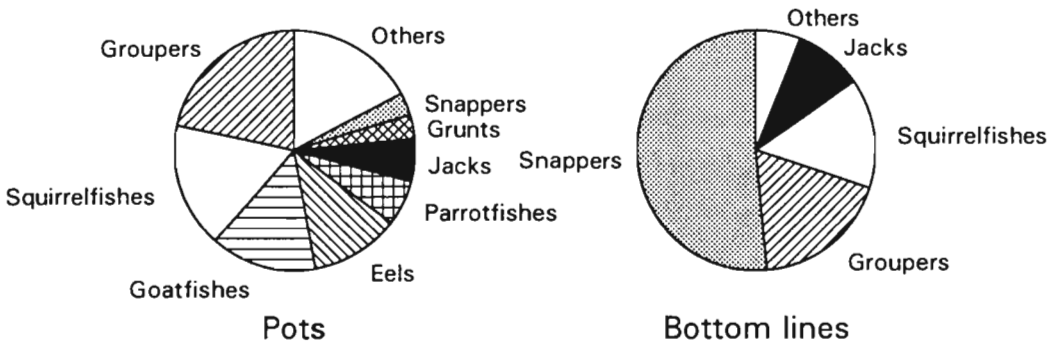


Figure 34
Average catch composition of the demersal fisheries in Colihaut 1992

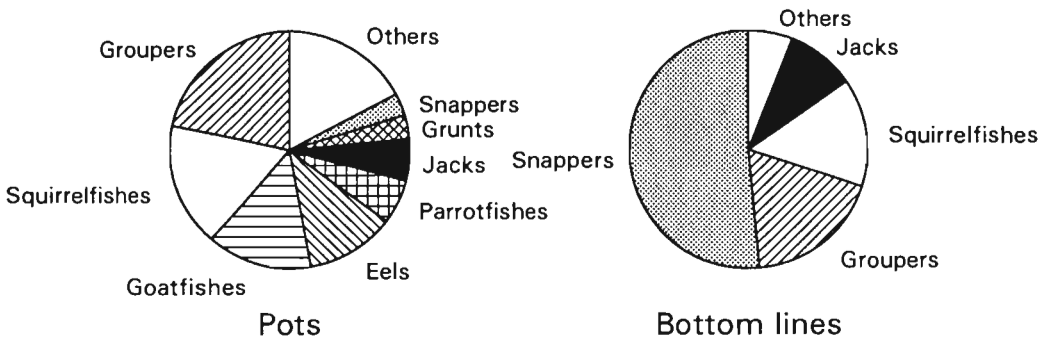


Figure 35a
Monthly activity in Saint Joseph
1990-1992

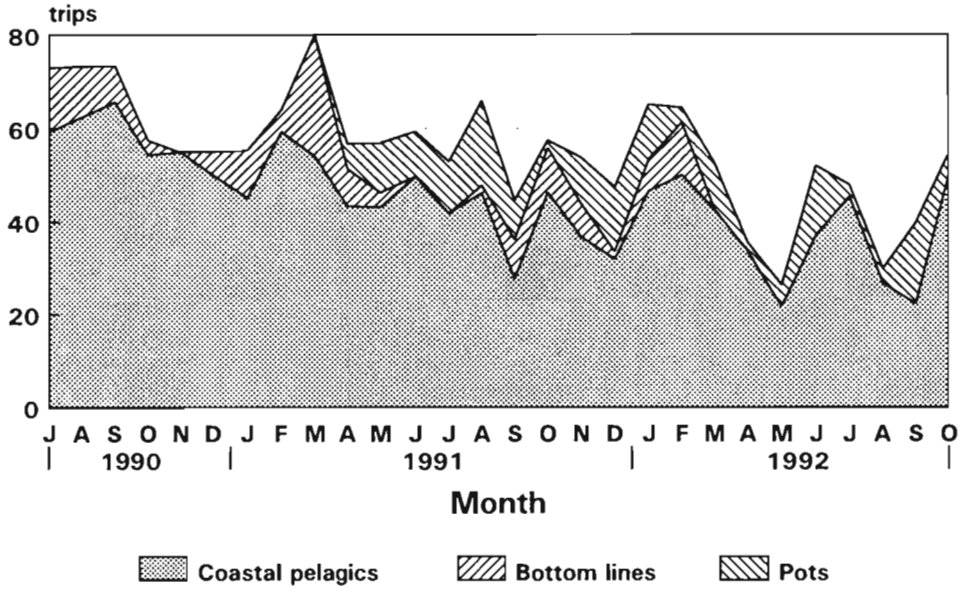


Figure 35b
Monthly landings in Saint Joseph
1990-1992

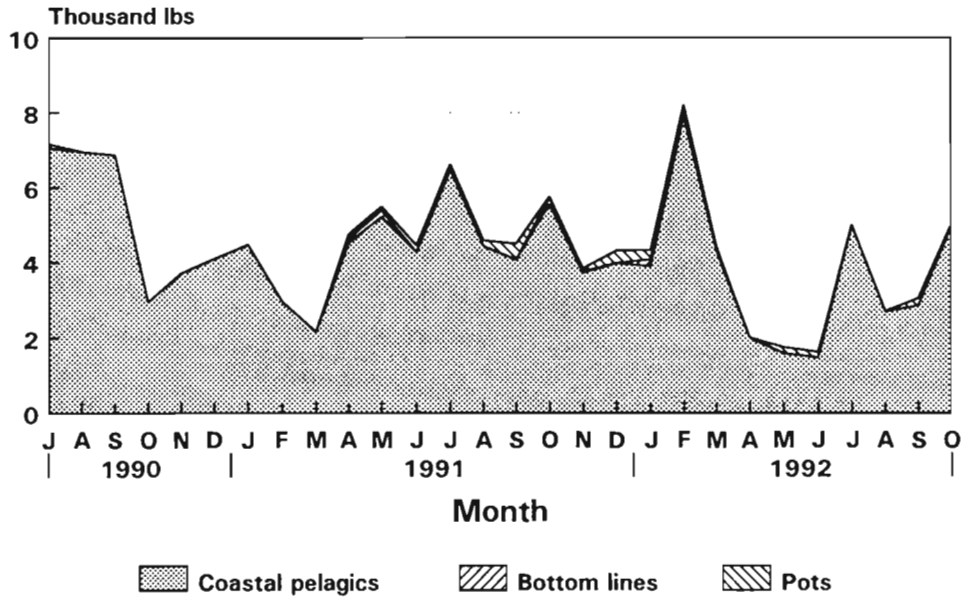


Figure 36
Monthly catch/trip of the coastal pelagic fishery of Saint Joseph 1990-92

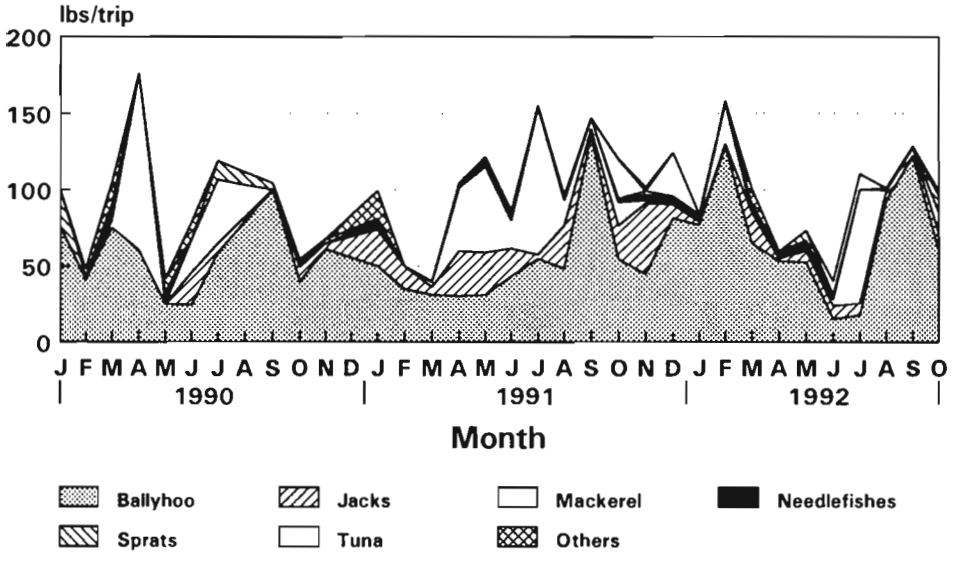


Figure 37a
Monthly activity in Layou/Tarou
1990-1992

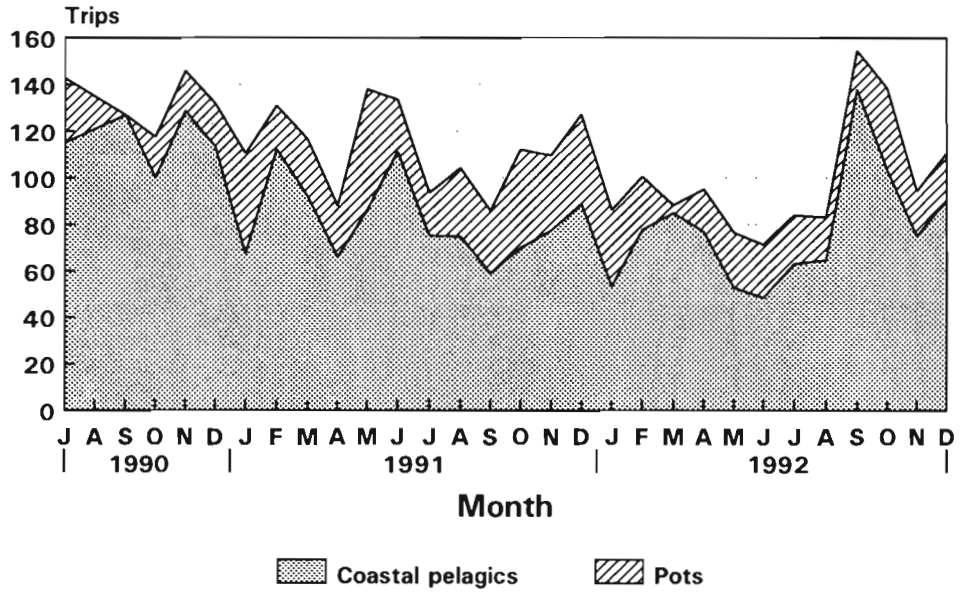


Figure 37b
Monthly landings in Layou/Tarou
1990-1992

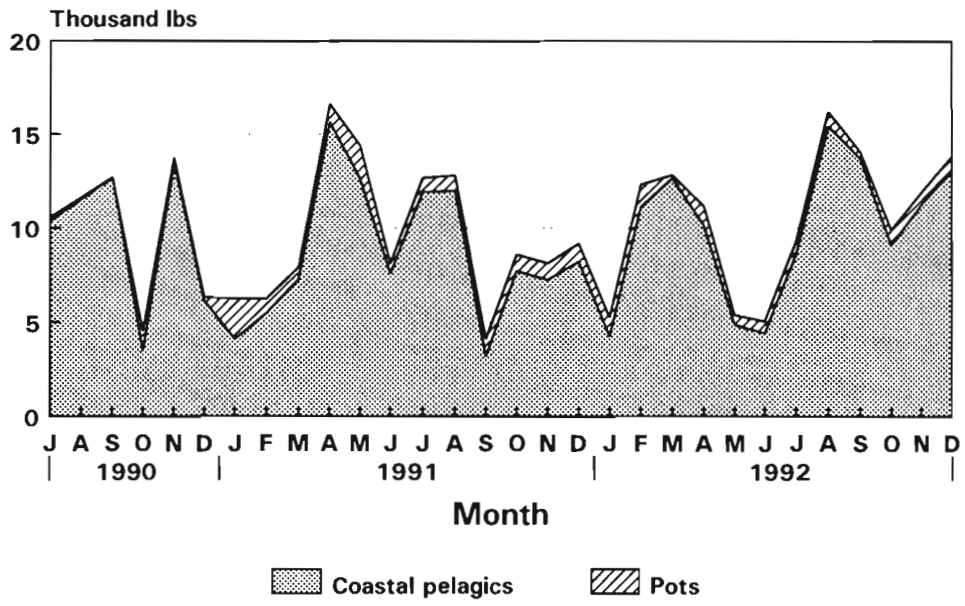


Figure 38
Monthly catch/trip of the coastal pelagic fishery of Layou/Tarou 1990-1992

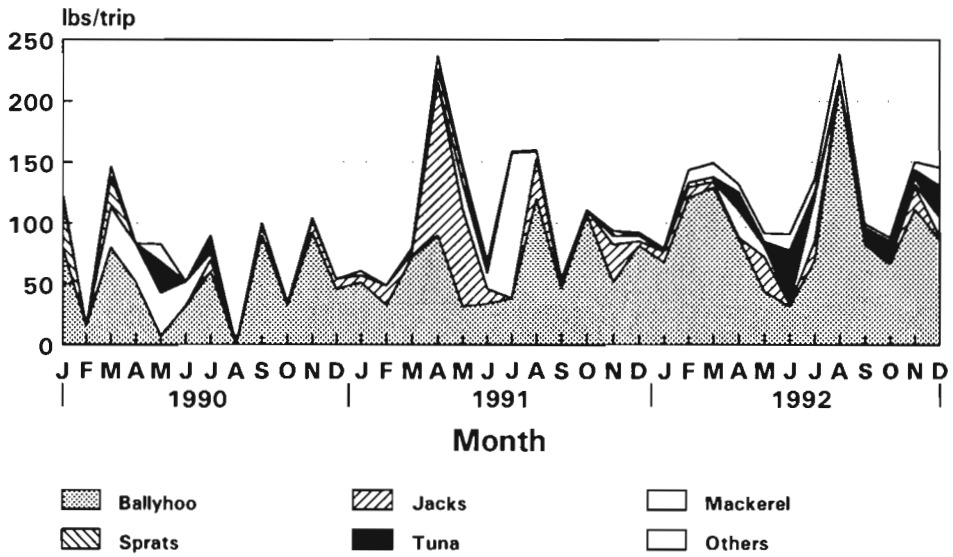


Figure 39
Monthly catch/trip of the pot fishery of Layou/Tarou 1990-1992

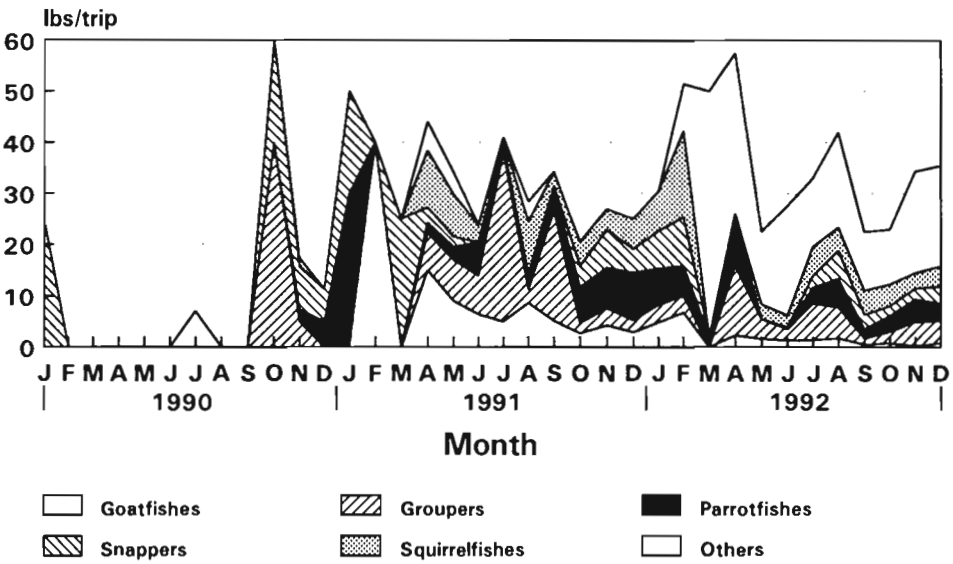


Figure 40a
Monthly activity in Mahaut 1990-1992

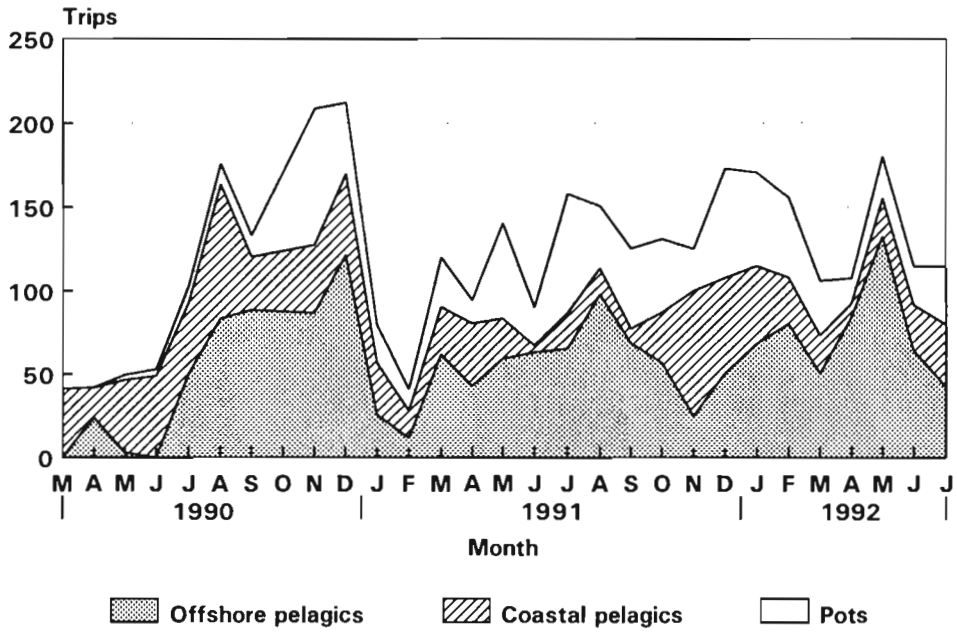


Figure 40b
Monthly landings in Mahaut 1990-1992

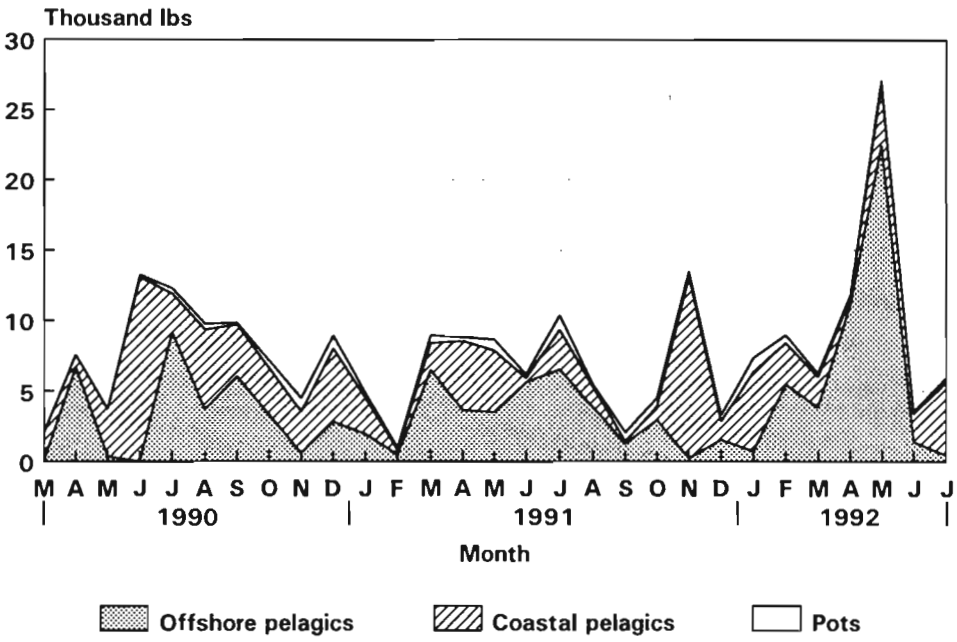


Figure 41a
Monthly activity in Saint Sauveur
1990-1992

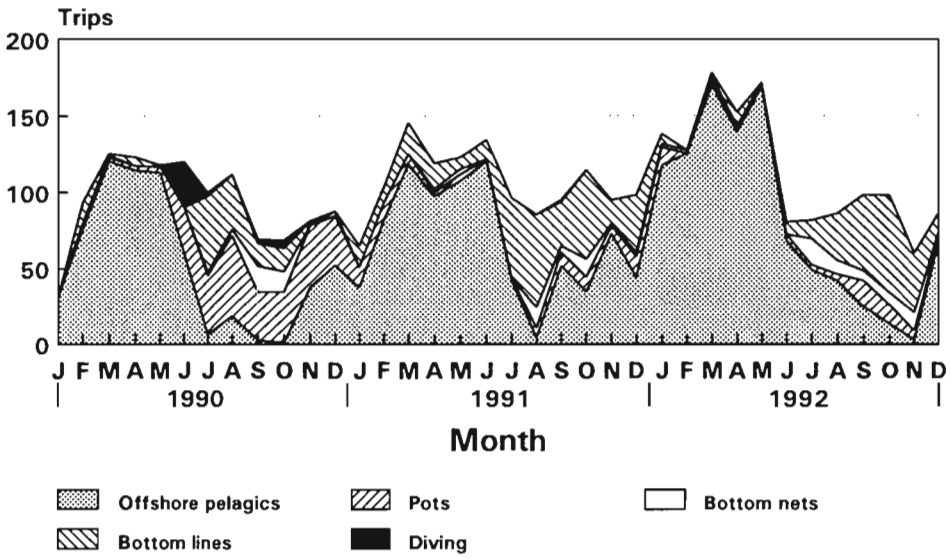


Figure 41b
Monthly landings in Saint Sauveur
1990-1992

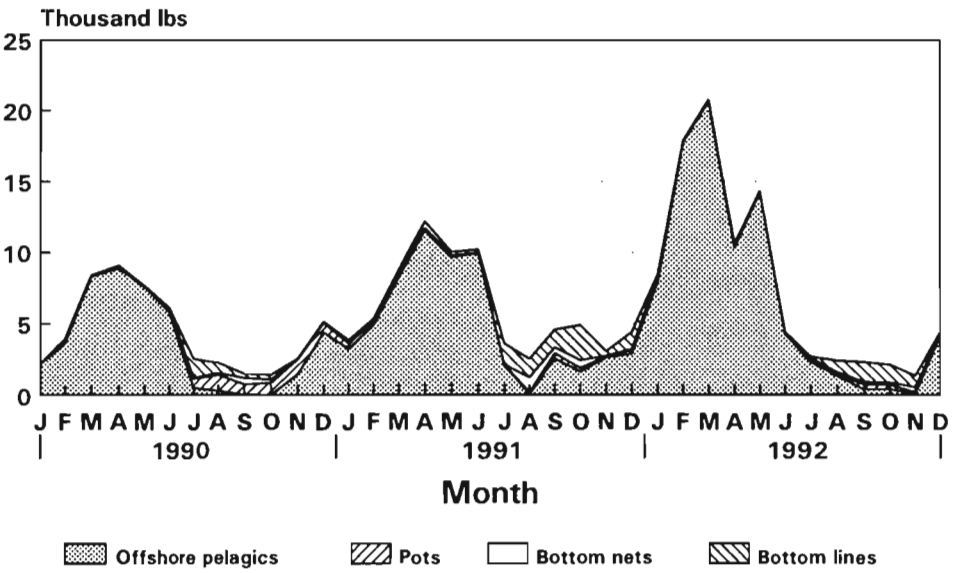


Figure 42
Monthly catch/trip of the offshore pelagic fishery in Saint Sauveur 1990-92

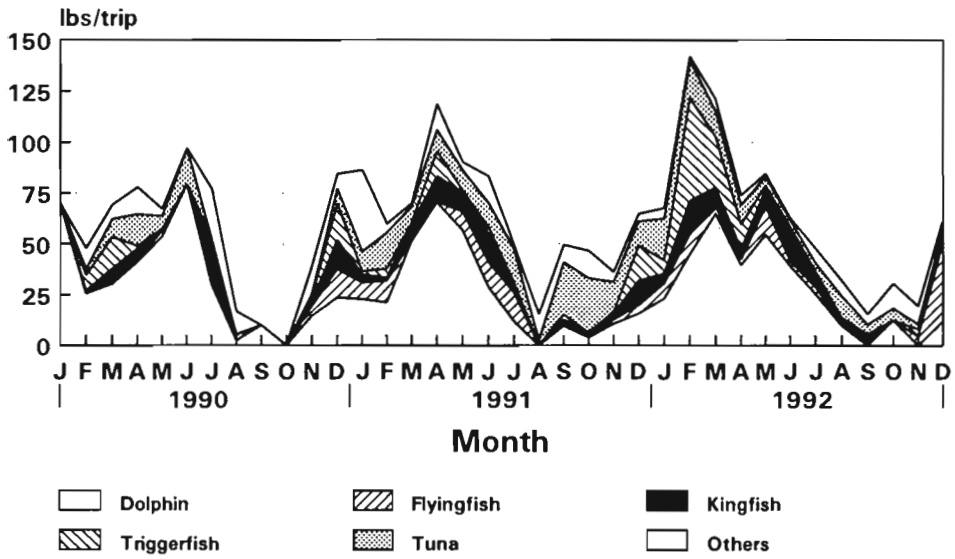


Figure 43
Species composition of the pots and line landings of Saint-Sauveur 1990-1992

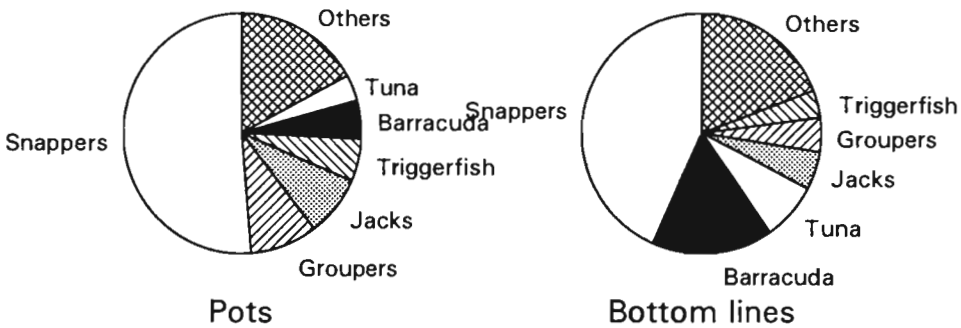


Figure 44a
Monthly activity in Pottersville
1990-1992

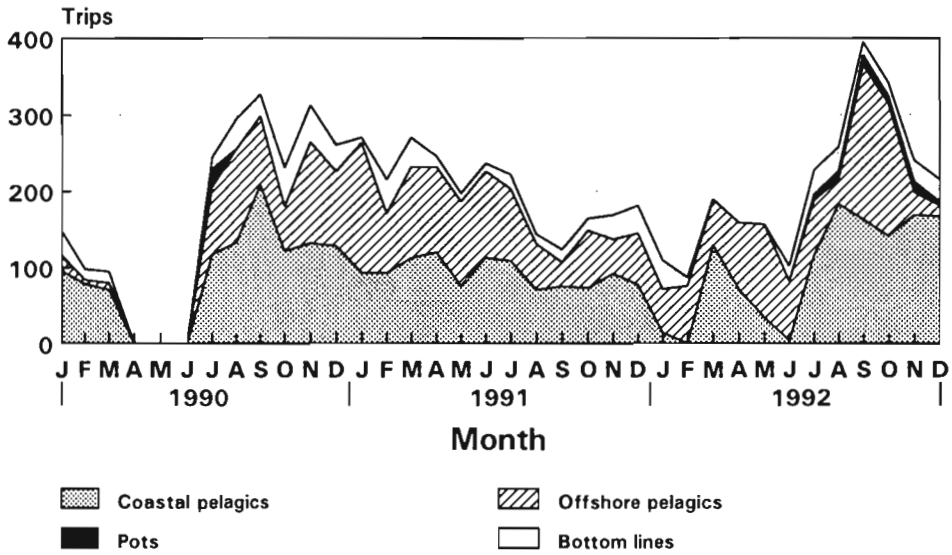


Figure 44b
Monthly landings in Pottersville
1990-1992

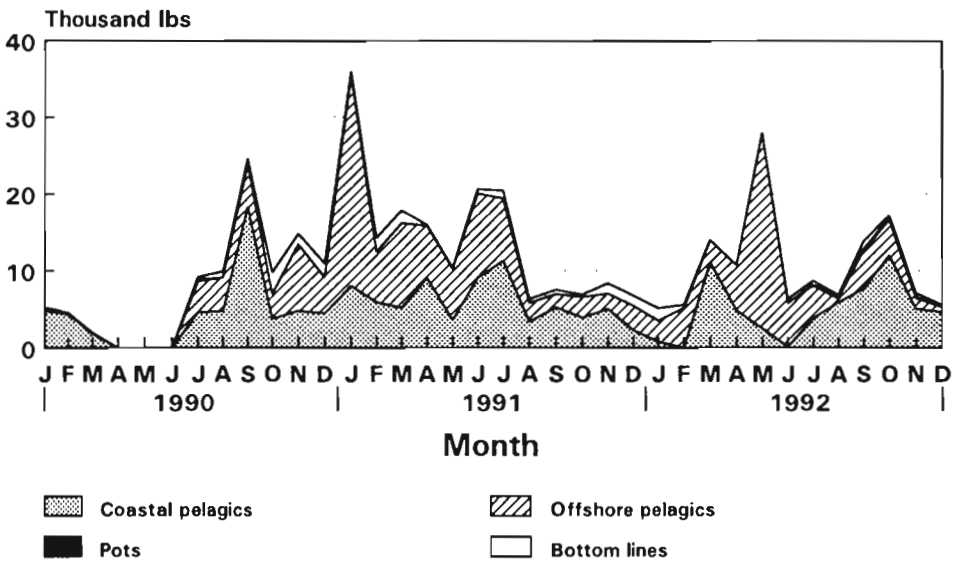


Figure 45
Monthly catch/trip of the coastal pelagic fishery of Pottersville 1990-92

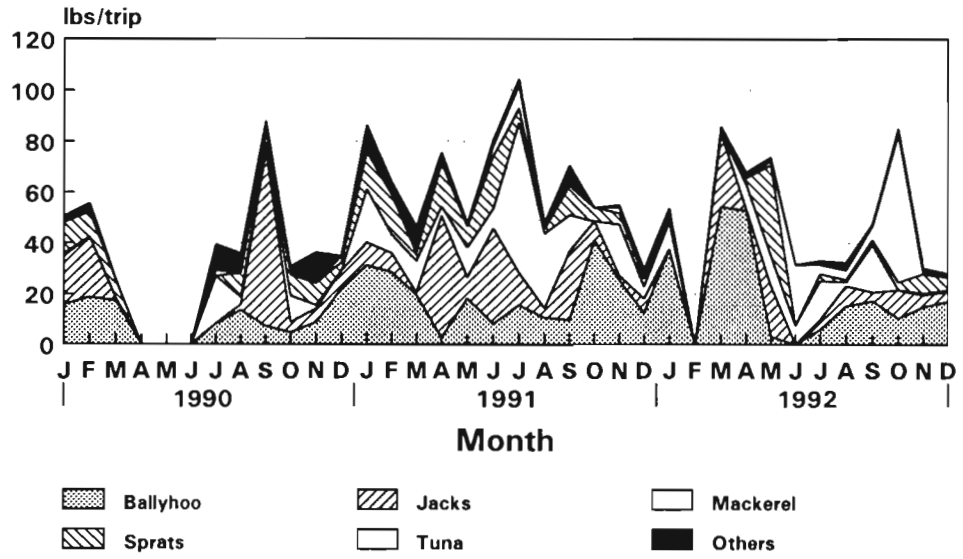


Figure 46
Monthly catch/trip of the bottom line fishery of Pottersville 1990-92

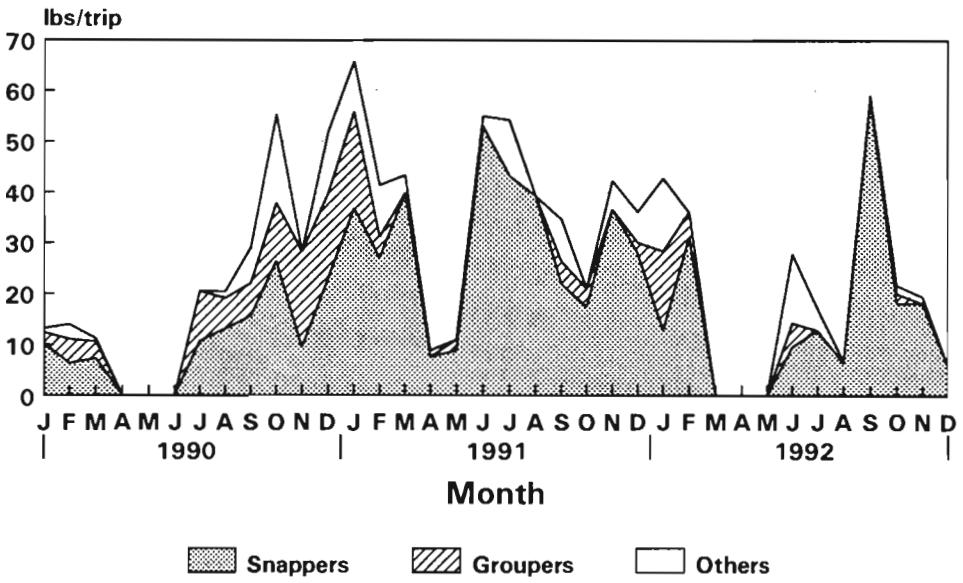
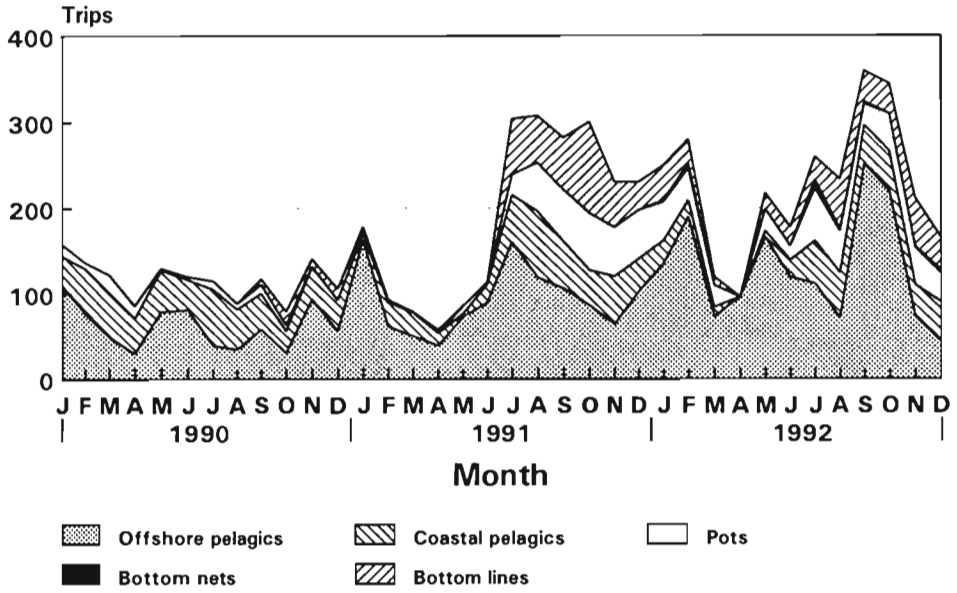
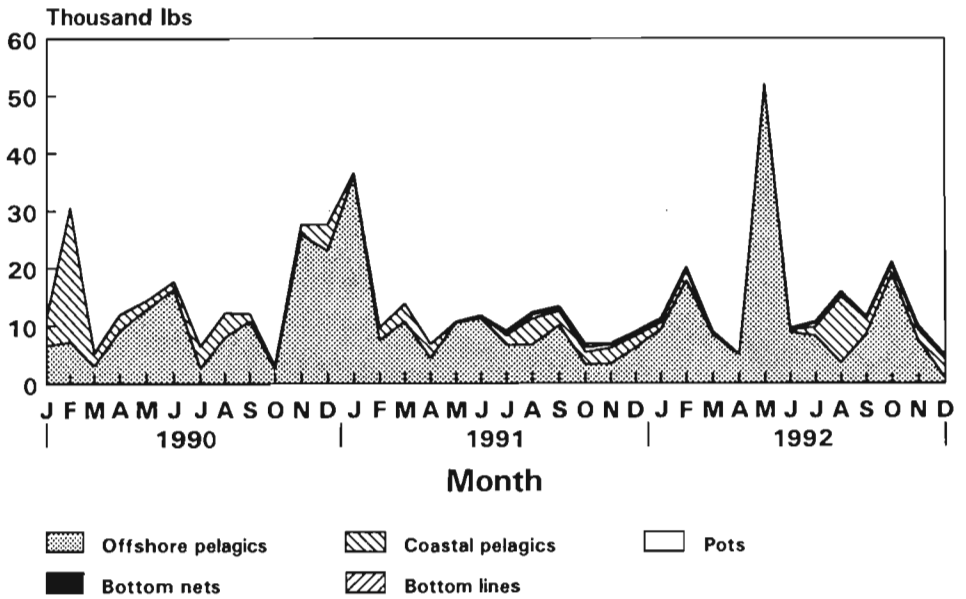


Figure 47a
Monthly activity in Newtown 1990-1992



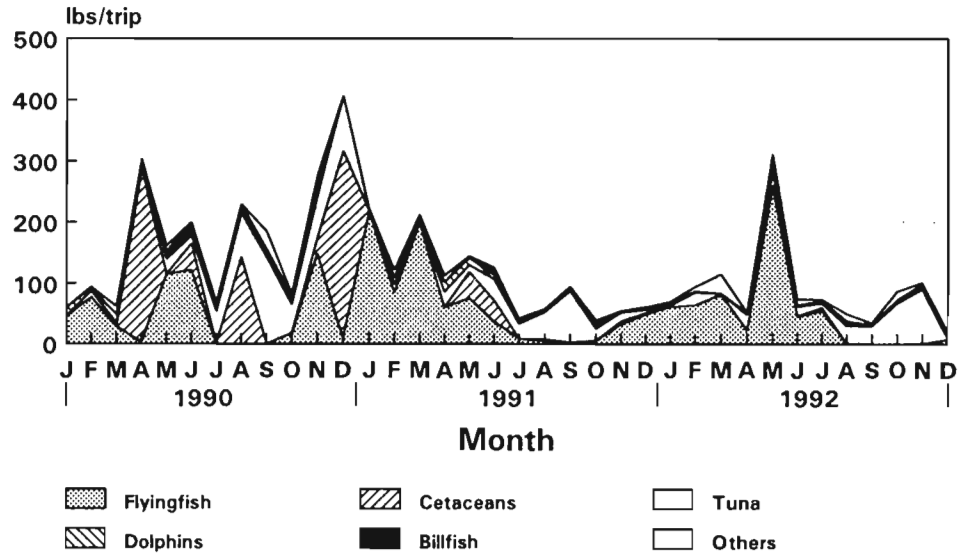
N.B. 2 different stats collectors

Figure 47b
Monthly landings in Newtown 1990-1992



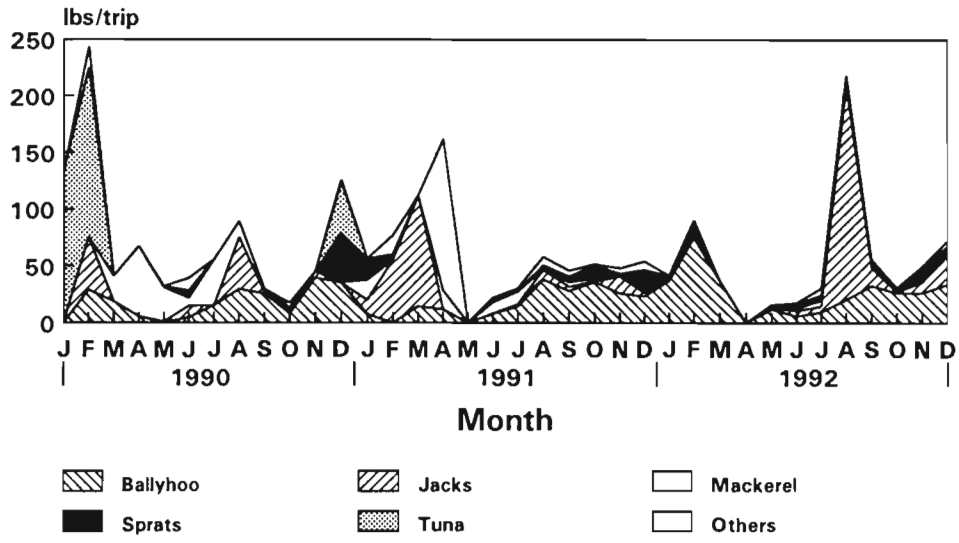
N.B. 2 different stats collectors

Figure 48
Monthly catch/trip of the offshore pelagic fishery of Newtown 1990-1992



N.B. 2 different stats collectors

Figure 49
Monthly catch/trip of the coastal pelagic fishery of Newtown 1990-1992



N.B. 2 different stats collectors
February 1990 : 344 lbs/trip

Figure 50a
Monthly activity in Scottshead-Soufriere (SSMR area) 1992-1994

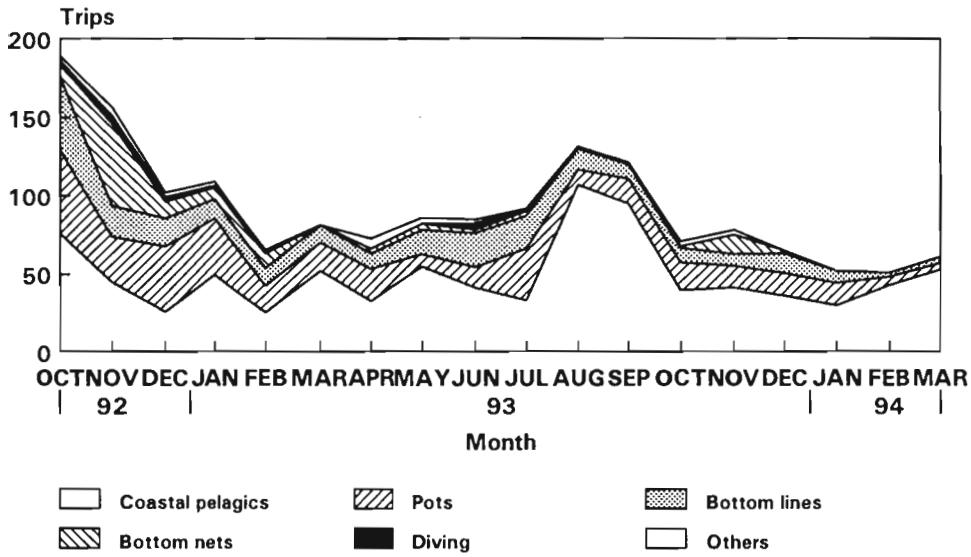


Figure 50b
Monthly landings in Scottshead and Soufriere (SSMR area) 1992-1994

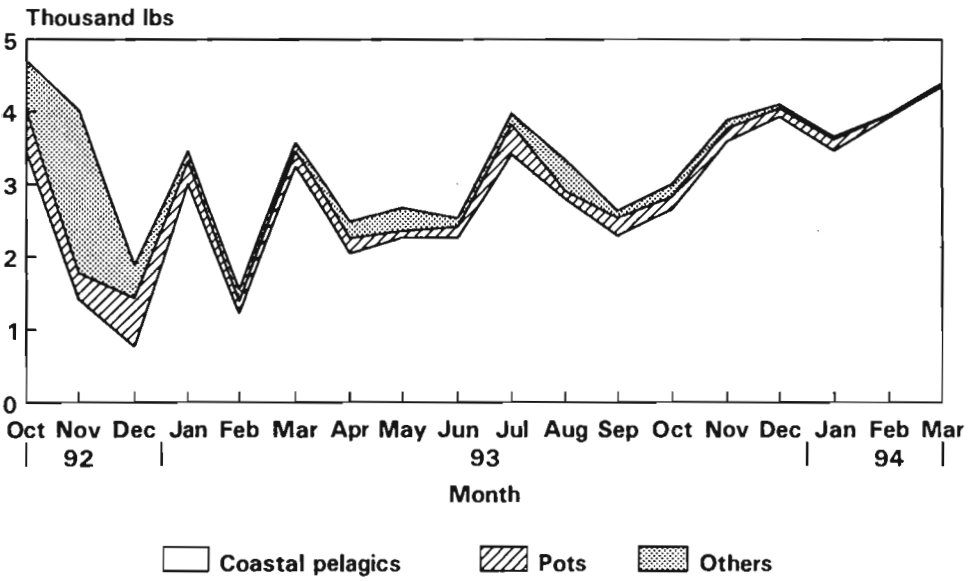


Figure 51
Average catch composition of the coastal pelagic fishery in the SSMR area

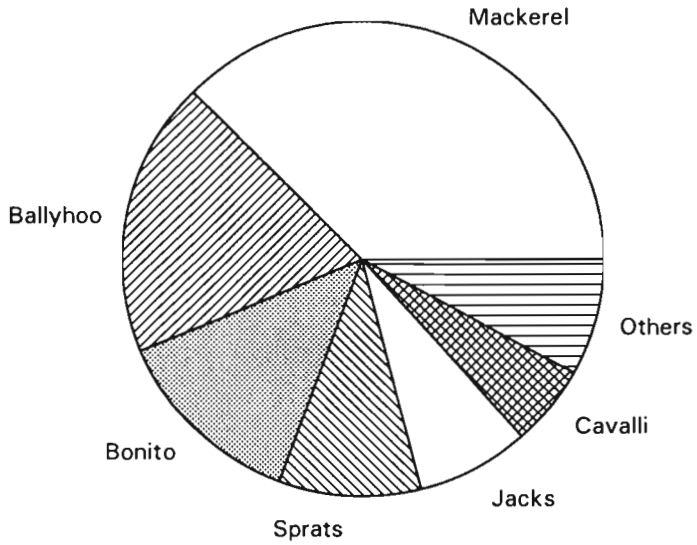
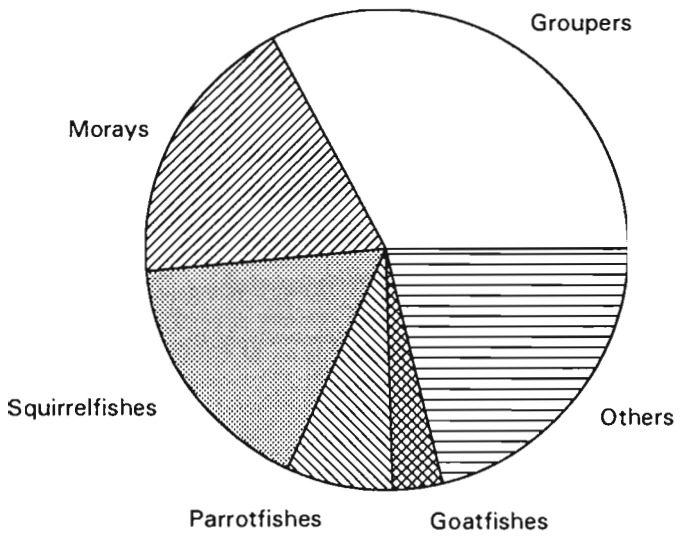


Figure 52
Average catch composition of the pot fishery of the SSMR area



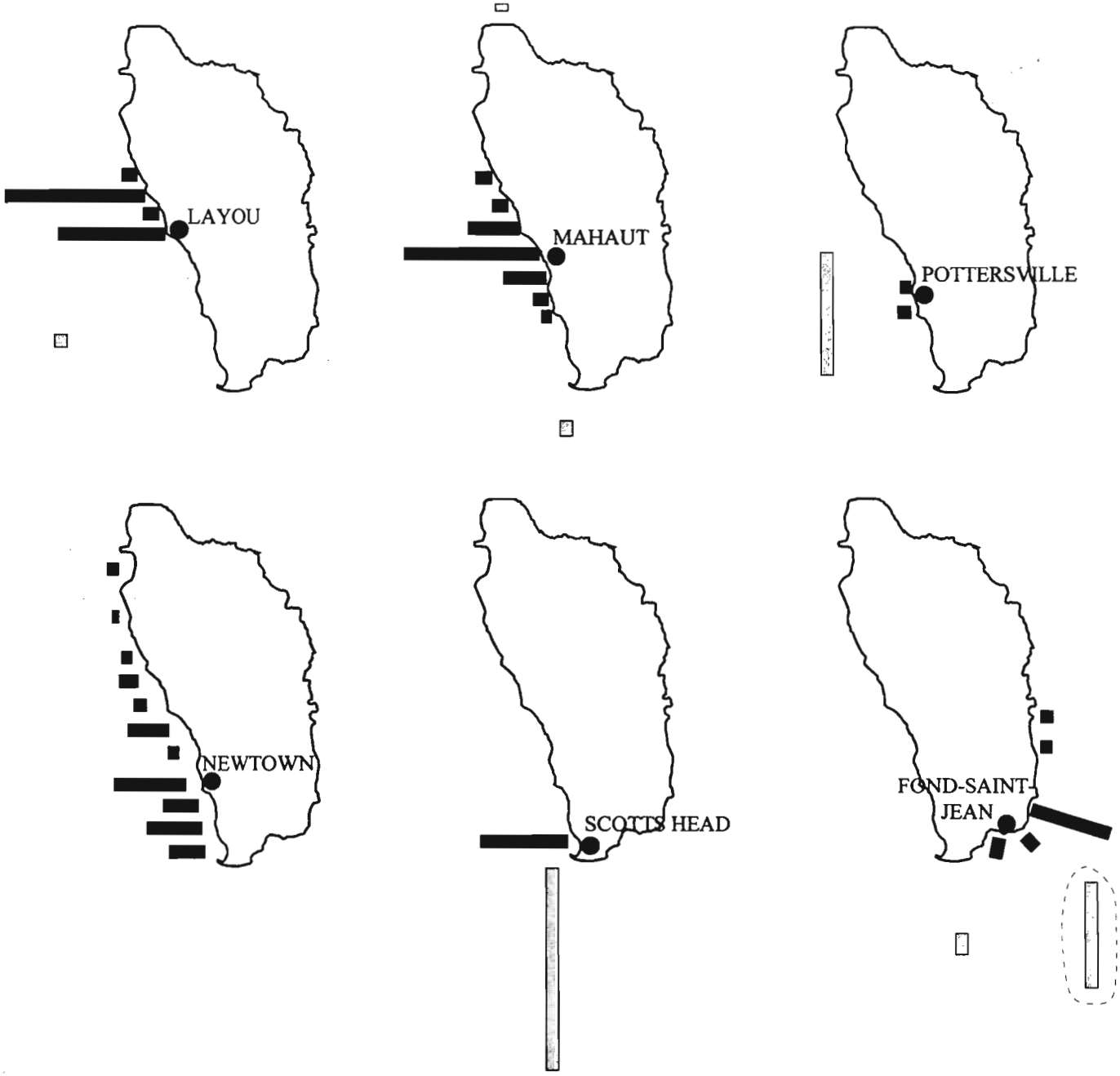


Figure 53. Distribution of fishing areas by landing site (length of bars if proportional to proportion of each area ; dark bars indicate offshoreareas, clear vertical bars indicate coastal areas ;

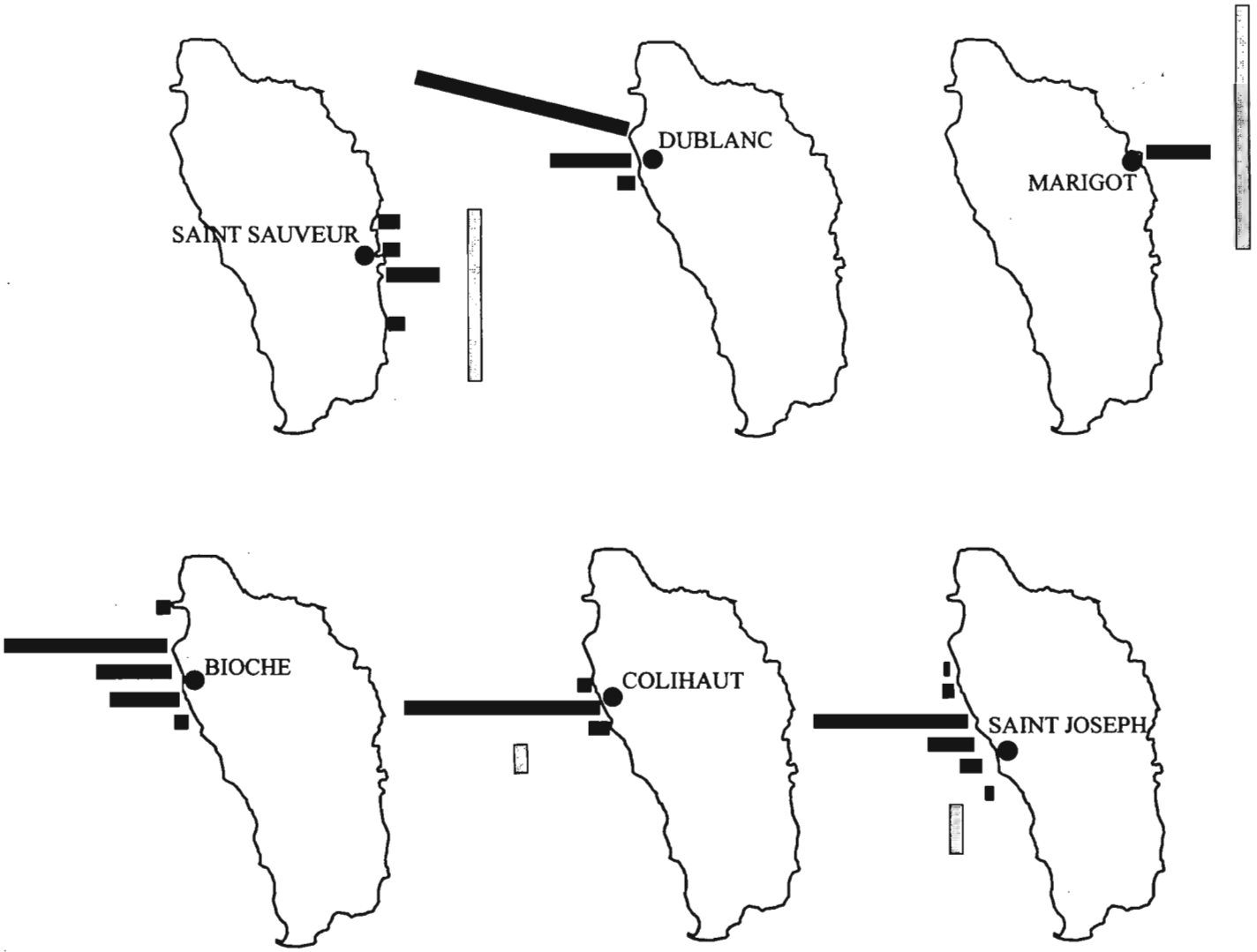


Figure 53 (continued). Distribution of fishing areas by landing site (length of bars if proportional to proportion of each area ; dark bars indicate offshoreareas, clear vertical bars indicate coastal areas ;