

The fish wholesalers are on the average better educated than the fishermen are: 31% have gone through high school. Professional mobility is also more common: 80% of the wholesalers had worked in other professions before starting in the fisheries business. A large portion of them comes from other sectors of commerce. In addition, 25% of the surveyed wholesalers declared having a second job, which often is tied to the fisheries sector, e.g., as a boat owner or as a representative/grader for an export company.

4) Employment: conclusions

The above analysis was concentrated on two groups of professions, the fishermen/captains based in NDB and the fish wholesalers in NKC. Even though these two professional groups are among the most important in the fisheries sector, it should be recognized that the sample population surveyed is only a small part of all the employees in the sector. Still, the survey results seem to confirm currently held knowledge and hypotheses and are therefore considered to be valid. The conclusions arrived at accordingly are the following:

- Except for the work of Wolof fishing communities in the south (and the Imraguen, who are not well represented in the NDB zone, surveyed here), marine fisheries are a very recent activity in Mauritania.
- The mobility of the actors in the sector appears high, both within and between professions and sectors and with regard to location. This is in particular true for fish wholesalers but applies also to other operators, especially in the two large towns ⁷.
- Foreigners play an important role in the fishing activity itself, that is, in primary production. This importance is both quantitative and qualitative, i.e., with regard to the number of foreign fishermen and in terms of competence and skills in fishing techniques.
- 14,000 of the 29,400 jobs estimated to be created by the fisheries sector take place on land. Fish marketing and the industrial processing of the catch landed in Mauritania are vital for generating employment.

(3) A review of management measures⁸

1) An overview of the general policies of the fisheries sector after the 1970s

Even if the richness of the fishery resources of the Mauritanian coast was already known long ago – and it had been exploited by foreign fishermen – it was only in the 1970s, as described in Section 8.1.1, (2) above, that the Mauritanian Government began paying special attention to the fisheries sector and its possibilities to contribute to the economic and social development of the country (Dia, Dip and Jouffre, 1998). The abundance of fishery resources was quickly identified as a natural resource that could be the locomotive of national economy, complementing the iron and copper that had to date been the most important natural resources. This new view of things would lead to the creation of national wealth, substantial revenues for the Mauritanian population and foreign exchange earnings necessary for redressing the balance

⁷ It should be recognized that this finding is based on information on those who enter the sector, as the number of people leaving the sector is unknown (and a much more difficult subject to study).

⁸ This section is mainly based on information from Hamadi *et Ahmed* (1998). Additional references are given in the text. There are descriptions of the historical development and fisheries policy also in Hamadi (1999), CNROP (1998a), Diop *et al.* (1999) and Dia, Diop *et Jouffre* (1998).

of payments. The Mauritanian economy, which was traditionally agropastoral and of subsistence, went through profound changes without transition including the settlement of nomadic populations and a massive flow from rural regions toward urban centers. This turmoil led to important changes in the sociodemographic and socioeconomic structure of the country. Pressing demands of the rural populations to have access to a level of well-being that only the mining industry could fulfill pushed the Mauritanian Government into requesting the contribution of the fisheries sector. As the demographic pressure intensifies, the mining industry and the fisheries industry become more and more in demand.

Accordingly, the Government extended its territorial waters successively; to 6 miles in 1970, 12 miles in 1972 and then 30 miles in that same year. The foreign fishing fleets operating in Mauritanian waters had to submit to a policy of fishing licenses. This measure was supported by the establishment of an institutional framework for the administration of the sector, i.e.:

- 1976 Creation of the Ministry of Fisheries and Marine Economy (MPEM).
- 1978 Creation of the National Center for Oceanographic and Fisheries Research (CNROP) in NDB.

In 1978, the Government declared a Mauritanian Exclusive Economic Zone (EEZ) of 200 miles. A little later, the fishing licenses policy was – except for fisheries deemed specialized – replaced by a system of fishing and chartering agreements that was part of the New Fisheries Policy (NPP). The goal of the NPP was to increase export revenues by establishing a national fishery competence and a land-based infrastructure for the processing of catches. This new strategy was based on the creation of "mixed companies" with foreign vessel owners and Mauritanian operators, where the vessels would be chartered to the Mauritanian partners and there would be an obligation to invest in a land-based infrastructure. This way a national industrial fishing fleet was created. However, a great number of the acquired vessels were old and in bad condition. Also, because of the lack of experience of the Mauritanian partners, the foreigners continued to be in control of all operations. Catch volumes landed in Mauritania were insufficient and the new industry on land remained under-utilized. To remedy this situation, various measures were implemented in the following years, i.e.:

- 1980 Introduction of mandatory quotas for the number of crewmembers of Mauritanian nationality on board industrial fishing vessels and the creation of the Center for the *Formation and Advancement of Seamen (CFPM)* in NDB. (The latter would be replaced in 1991 by the National School of Marine and Fisheries Education [ENEMP]).
- 1980 Obligation to declare all captures and to repatriate foreign currency to Mauritania.
- 1981 Opening of a Customs Office and a branch of the Central Bank of Mauritania (BCM) in Las Palmas in order to control the mandatory repatriation of foreign currency.
- 1983 Obligation to land demersal catches in NDB and to market them from there.
- 1984 Creation of the Mauritanian Company for Fish Marketing (SMCP), a state-owned company responsible for all exports of frozen products.

These measures led to a considerable increase in Mauritanian exports even if the systems put in place were not without problems. The national fishing fleet remained mostly a fleet in poor shape and the artisanal fisheries continued to be marginalized. At the same time, the first symptoms of overexploitation of demersal resources were noted. In 1987, the *General Policy*

Declaration (DPG) was issued, and a policy of development of the fisheries sector was adopted with the goal to reduce the demersal fishing effort and to restructure the sector's economy in favor of artisanal fisheries and the land-based industry. The maritime surveillance was also reinforced by:

- 1987 Creation of the Fisheries Control Division (DCP).
- 1992 Legal reinforcement of the procedures for marine monitoring, surveillance and control.
- 1994 Establishment of the Delegation for Fisheries Surveillance and Control at Sea (DSPCM) as a replacement for the DCP, in charge of controlling and monitoring fishing operations in Mauritanian waters, of preventing marine pollution and of rescue and safety at sea.

These measures improved the control of illegal fisheries. As for the protection of resources, regulatory measures aiming at decreasing the fishing effort and the pressure on demersal species were introduced:

- 1987 Annual closing of an octopus reproduction zone (measure replaced by the "biological closure" since 1995).
- 1989 Establishment of a minimum mesh size of 70 mm for trawl nets (modified to 50 mm for shrimp trawl nets in 1997).
- 1989 Ban on fishing of octopus smaller than 500 g and definition of minimum sizes for some other demersal species.
- 1989 Delimitation of fishing zones: prohibition of industrial fisheries within 6 miles of the coastal zone.
- 1991 Suspension of the licenses for investment in industrial freezer vessels, except for replacement of a damaged unit.
- 1991 Introduction of export fees through SMCP: 11% on cephalopods and 8% on other demersal species. These fees were later replaced by a fee for access to the resource – see below.

The development of the artisanal fisheries was helped by programs and projects at both national and international levels. The Japanese Government contributed with assistance in the field of techniques for octopus fishing, and with the introduction of new canoes made of plastic. In 1989, the Mauritanian-Senegalese conflict had a significant effect on artisanal fisheries due to the departure of Senegalese fishermen who had caught high-value species. This absence of suppliers of finfish forced export companies to restructure their activities towards cephalopods that were targeted by the new Mauritanian fishermen repatriated from Senegal and looking for jobs in the fisheries sector. In the same period, there was also an inflow of new actors to the artisanal fisheries who had been left off by a restructuring in industrial subsector. A significant increase in artisanal catches and in the number of canoes - of which a part only targeted octopus - was noted.

It was in the 1980s that the first professional associations were formed:

- 1982 Creation of the Fishing Fleet and Industry Federation (FIAP).
- 1986 Creation of the Fishery Industries and Artisans Federation (FIAPECHE) by "mixed companies" (partly state-owned) with economic interests different from those of FIAP's private sector members.

These two organizations would merge again in 1992, creating the National Federation of Fisheries (FNP). Regrouping all important fishery companies, the FNP has become an important partner of the Government for the management of the sector. However, since the FNP is a union of business owners that require its members to be employers of at least three persons,

small artisanal operators and workers are not represented in it. They are instead organized in professional unions created later, i.e.:

- 1993 Creation of the League of Artisanal Fishermen of NKC (LIPAN).
- 1995 Creation of the General Confederation of Workers of Mauritania (CGTM).
- 1997 Creation of the National Union of Cooperatives of Mauritania (UNCOPAM).

In 1995, the *Fisheries Sector Development Policy Letter* brought about a reorientation of the fisheries policy in accordance with the overall policy of liberalism and market economy adopted by the Government. The State withdraws from public enterprises and the restrictions on the mobility of foreign currency earnings were made more flexible. The monopoly of the SMCP had been dropped already in 1991, and in 1994 the company was partially privatized, with the State retaining some 35% of shares. A resources access right regime, replacing the export tax, was introduced for artisanal fisheries in 1995 and for national industrial fishing fleets in 1997. The support to the artisanal sector continued and, in 1996, an artisanal fish landing harbor was built in NDB (the Port of Baie du Repos – EPBR) and a Fish Market in NKC (MPN).

2) International influences

As indicated by the discussion above, the Mauritanian fisheries sector has had many international ties since its origins. The involvement of foreign fleets characterized the beginning of the exploitation of the fishery resources. The national policy was then oriented towards the creation of a national fleet but after the 1990s, the concession of licenses for foreign fleets was again agreed upon. A special agreement with China was concluded in 1991 and allowed for some thirty Chinese vessels to fish octopus in exchange for development aid. In 1996, another agreement was signed, this time with the European Union for some 170 vessels in different fisheries. The latter accord was renewed in 2001⁹.

The national fishery is also oriented towards the foreign markets through exports. In this field, the EU has influenced the marketing of fishery products by imposing its very strict rules in terms of their product safety and quality. In 1994, the Mauritanian Government passed a decree with regard to health inspection and hygiene control of the production. CNROP was designated as the sole responsible for this task, and its veterinary service issues the health certificates necessary for export.

The development of the fisheries sector has also been influenced by international development aid. It was through a Japanese cooperation project that the first fishermen cooperatives were created at the end of the 1970s (the TIMIRIS Cooperative in NDB and the NKC Cooperative). Other cooperatives were established in the 1980s in order to take advantage of various assistance projects. As some of them were not founded on serious grounds, the Government felt obliged to withhold the registration of new cooperatives until 1996.

The Company for the Promotion of Artisanal Fisheries in Mauritania (SPPAM) was created

⁹ The very first fisheries agreement with the EEC was signed in 1987.

by the State in 1984 in order to support the development of the artisanal fisheries and to provide needed credits. However, it faced some problems, among which the competition of private traders. In 1882, the Company was privatized and its role changed. To fill the vacuum of institutional financing, the Professional Association for the Promotion of Artisanal Fisheries and Marine Credit (A3PC3M) was created in 1993 with the assistance of the French development cooperation. This mutual credit institution still exists today, even if its performance has not been entirely satisfactory.

In addition to the aspects of trade and bilateral cooperation, the international influence also manifests itself at the level of global cooperation, and Mauritania has endorsed various international and regional agreements that have an effect on the national policy for the fisheries sector:

- 1989 Ratification of the convention regarding the creation of a regional committee on fisheries, Sub-Regional Committee on Fisheries (SRCF).
- 1994 Ratification of the United Nations Convention on the Law of the Sea.
- 1995 Adoption of the Code of Conduct for Responsible Fisheries issued by the FAO Conference.

3) The Banc d'Arguin National Park

The Banc d'Arguin National Park (PNBA) plays a very particular role in the management of fishery resources in Mauritania. It was created in 1976 for the protection of the natural resources and also of geological sites of scientific and esthetic importance. The management of the Park is independent from the MPFM, but the regulatory dispositions regarding fisheries still depend on the Ministry. Utilization of motorboats is forbidden in the Park. The wetland area of the Park was declared a RAMSAR site in 1982, and two satellite zones were added in 1985 – the Integral Reserves of Baie du Lévrier and Cuevecillas, in order to protect a colony of about 150 monk seals.

Management of the Park is based on a participatory approach involving the local communities of fishermen – the inhabitants of the Park – the Government and researchers. In 1998, a management plan was developed with a special focus on the protection of cartilaginous fish resources.

4) The current situation

The current fisheries policy is articulated in the *Strategy for the Management and Development of the Fisheries Sector and Marine Economy* (MPFM, 1998). The main components of this strategy are:

- Resources management through:
 - revitalization of fisheries research in order to improve the knowledge of resource potentials;
 - intensification of maritime surveillance;
 - regulation of resource access according to potentials and allowable catches by fishery.
- Integration of the fisheries sector into the national economy through:
 - paying special attention to the valorization of cephalopods and other export species;

- promoting employment generation and professional training;
- infrastructure development.
- Improvement of the institutional framework for the sector.
- Preservation of the environment and security in the sea (MPEM, 1998).

It should be noted that the Government is also engaged in an explicit policy for fighting poverty according to the HIPC (Heavily Indebted Poor Countries) program of the World Bank, and this theme dominates the current priorities for development of the country. In 1998, the Commissariat for the Fight Against Poverty, for Human Rights and for Integration was created and a Strategic Framework for the Fight Against Poverty (CSCP) was developed and approved in 2001. This strategy focuses on four main areas, i.e., the importance of economic growth through the generation of employment and of public revenues, the promotion of sectors that directly benefit needy populations, the development of human resources and of access to essential infrastructures (education and health), and the promotion of real development of the institutional framework.

All these objectives – for national development in general and for the fisheries sector in particular – are ambitious and if their priorities are not well defined, they risk becoming contradictory. The fisheries agreement with the EU, first signed in 1996 and later extended in 2001, illustrates one such contradiction. While the agreement answers to the objective that refers to the creation of revenue for the public budget, it is ineffective in generating employment and limits the possibilities of developing a national fishery by utilizing an *important portion of the resource base*.

In the spirit of the new strategy for the fisheries sector, the Fisheries Law was modified in 2000 (MPEM, 2000). The new legislation specifies the responsibility of the MPEM in establishing plans for fisheries management and development. It also stipulates that this should be done in consultation with National Advisory Council for the Management and Development of Fisheries, which should include, among others, representatives of the industry. Implementation measures for enforcing the new law are in course of preparation (October 2001), and the MPEM is discussing the matter with the FNP. It should also be noted that the FNP is aware of the degradation of resources and is said to support the implementation of remedial measures (pers. Comm.. Cherif FNP).

The FNP has a key role in the sector because of its privileged relationship with the Government and for its international ties to foreign investors and with the export subsector. The major producers in the FNP also affect the management of the SMCP and the A3PC3M. Considering these privileges, it is conceivable that the Federation does not necessarily appreciate the creation of other parallel organizations – such as, for instance, the Association of Mauritanian Wholesalers (AMM), established in March 2001 in NDB and NKC. The AMM was created with a view to organize fish wholesalers since it was felt that their interests were not satisfactorily represented in the FNP. The AMM offices are currently (October 2001) closed and the explanations given for this closure vary according to source of information. The FNP

maintains that the reasons are financial while others believe they are political and related to the FNP (field surveys 2001).

The SMCP has the extremely important role of ensuring the repatriation of foreign exchange earnings from fishery exports back to Mauritania. Since its creation, all exports of frozen fishery products from NDB should be sold through the Company and, in July 2000, the first consignments of fish exported by the new SMCP office in NKC were made. The SMCP also contributes to the public treasury by collecting taxes in the name of the State, even though the export tax does not exist any longer since the partial privatization of the Company in 1994 and the introduction of resource access rights.

The SMCP has also played a significant role in the development of the export subsector by assuming all commercial risks abroad. The Company was responsible for the sales of the products and this system allowed particularly the smaller producers – without contacts with foreign markets and often in weak financial situations – to sell their products internationally. However, with the liberalized economy and the abolition of the monopoly, the role of the SMCP has changed and the Company no longer intervenes on behalf of the producers in the same way (Dia, Diop and Jourffre, 1998). Earlier, in order to get the best prices, the SMCP collected the production of several producers and marketed all the fish together as an SMCP product. Today, this is not practiced any longer and the producers must negotiate prices with their customers themselves. The situation has become difficult for the small producers who are now obliged to subcontract with more powerful exporters in order to continue selling their products abroad. It must be assumed that this has led to a concentration of the industry. With regard to the management of the SMCP, the joint State-private administration has led to a deadlock, as public and private interests are often at odds.

The artisanal fisheries underwent a strong growth in numbers of boats and fishermen in the early 1990s. A whole range of encouragement measures and economic incentives were directed towards the artisanal subsector, e.g., fishermen's training, the construction of harbors in NDB and NKC, and the concession of credits for the purchase of boats. Despite their not being always effective, the measures did indeed contribute to the development of the artisanal fisheries. At present (October 2001), the construction of a fish market at the artisanal fish-landing site in NDB is underway and other projects for the continued development of the artisanal fisheries are also being implemented. However, today, it appears that the number of Mauritanian fishermen does not increase or only very slowly. Of the more recent fishermen utilizing octopus pots, it seems that only a portion has switched to fishing flatfish after the decrease of the octopus production in 1994-1995. Overall, very few people have turned to other fisheries; most have left the profession in recent years and the total number of canoes appears to have decreased (see Table 8.I.13). With the new agreements with Senegal, a significant part of the fishermen – some 25% according to the Baseline Survey 2000 (Cheikh *et al.*, 2001) – are Senegalese.

Table 8.I.13 Evolution of the number of canoes by type of fishing.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Octopus pots, cages and jig hooks	327	385	558	673	896	1031	1,069	587	539	418
Hand lines and longlines	170	194	368	400	439	490	923	645	685	510
Gillnets and fixed gillnets	58	48	132	137	362	100	152	228	318	777
Cast nets	0	29	26	36	96	50	14	0	0	37
Mixed gear and others	52	19	101	133	130	86	72	126	422	28
TOTAL	607	675	1,185	1,379	1,923	1,757	2,230	1,586	1,964	1,770
Inactive boats	-	-	-	-	-	-	-	827	676	417

Source: 1991-1997: FAO, 1999b; 1999-2000: CNROP «Baseline Surveys».

Remark: - : no data.

No encouragement measures exist for the national industrial fisheries sector. On the contrary, the national fleet faces difficult competition from foreign fleets that are often subsidized by their respective States. A study on fiscal matters published in 1994 showed that the Direct Fiscal Burden (FFD) for Mauritanian octopus fishermen is higher than for their colleagues in Morocco (FNP, 1994). However, after this study was carried out, the fiscal system has been changed and the export tax has been replaced by resource access rights fees.

The fiscal system at the level of artisanal fisheries is not very clear. During the survey (October 2001), the answers of the interviewed fishermen varied surprisingly much when asked about their taxes to pay. The FNP explained that the Association does not agree with new resource access fees for artisanal fishermen. Apparently, the old export fee is still officially valid for the artisanal subsector, and the FNP advises its members not to pay both taxes. This fact could explain part of the apparent confusion and it could be concluded that there are differences between the official tax system and what is being implemented in practice.

As elsewhere, the fisheries structure in Mauritania involves conflicts between the different actors. One such conflict is the rivalry between the national industrial fishery and foreign operators; European vessels catch a significant part of the available resources, competing with Mauritanian boats. The national industry blames the diminishing returns on the significant fishing effort of these foreign vessels. Their own fleet is decreasing, as the current level of profits does not allow for reinvestments (Diop *et al.*, 1999).

The most frequent problem cited by artisanal fishermen concerns zoning and the industrial fleet's lack of respect for the zone boundaries; the zone closest to coast is reserved for the artisanal fisheries. Accidents, sometimes lethal, and the loss of fishing gear reported by artisanal fishermen are also explained by artisanal incursions into the industrial zone where fatal encounters with industrial ships sometimes take place.

In addition to zoning, other technical management measures currently (October 2001)

being applied include: a minimum-size mesh for bottom trawling, a minimum-size requirement for octopus (500 g) and other important demersal species, the "biological closure" – octopus fishing being prohibited during two months every year (September and October). The DSPCM is in charge of monitoring and of controlling the application of the measures. According to their information, the number of violations has decreased recently due to an improvement of the Delegation's resources (such as motorboats and radar) and an intensification of the monitoring operations, which would have stimulated the industrial fishermen to better follow the rules.

Demersal industrial fisheries cease operating completely during the biological closure: fresh fish boats and freezer boats do not leave port. This adherence to the regulations seem to coincide with a commercial strategy by which the closure period allows for an adjustment between supply and demand, with possible gains for Mauritanian exporters in terms of price. Nevertheless, during the survey period, in October 2001 when the fishery should be closed, it was noted that a number of canoes continued catching octopus, despite the interdiction. This has also been noted by the DSPCM but the catches are not significant (pers. comm. Ahmed DSPCM).

In conclusion, it can be noted that, considering the mobility and the many landing sites of the artisanal fishery, the technical management measures are difficult to enforce. Even though the artisanal harbor in NDB and the fish market in NKC receive the majority of the canoes and their catch, there are still a large number of landing points along the coast.

The existing management measures aiming at a limitation of resource access – i.e., the ban on the purchase of additional national industrial vessels, the license system for the industrial fishery and the system of registration for artisanal boats that in principle has been in force for a couple of years – have not led a significant limitation of the fishing effort. To remedy this situation, an access fee was introduced with a view to encourage a self-regulation of the resource access. For the national industrial subsector, the access fee is payable in advance, at the beginning of the year for a minimum of three months. The industry claims this system to be too rigid and with negative financial consequences, as the fee is not proportional to the actual value of the production. However, in practice, it is allowed to fish first and pay the access fee afterwards (CNROP, 1998a). Regarding the artisanal fisheries, the fishermen have contested the access right fees and, as noted above, its application remains ambiguous.

It should also be noted that there is no output control in the form of, for example, catch quotas. This probably reflects the current situation: it would be very difficult to apply such a measure, given needs for monitoring, control and surveillance it would require. Moreover, the fishery statistics deficiencies and the lack of reliable data on many aspects concerning the status of resources would make it very difficult to establish practical and realistic quota levels.

5) Summary of observations and problems

The subjects treated above can be summarized in four main categories: the political framework and the main objectives of the fisheries sector, the institutional structure and the

interest groups, the encouragement measures, economic incentives and taxes, and the direct regulatory measures (technical measures, input – fishing effort – control, and output control).

- The main characteristics of the *fishery policy objectives* have remained basically the same from the 1970s to date, i.e., the protection of resources, the optimization of revenues generated by the sector and the creation of employment opportunities. As was noted above, the three objectives are very ambitious and also somewhat contradictory. Thus, it would appear important to better define the priorities.
- The discussion on the *institutions and interest groups* focused mainly on the role of the professional associations and of the SMCP. In a possible future development towards management in partnership (see Section 8.1.2, (4), 2)), the FNP seems to be in a position for taking more responsibility with regard to resource management. However, it would be necessary to remember that the association does not necessarily represent the less important producers and operators.
- In the context of *encouragement measures*, it was noted that artisanal fisheries have evolved considerably in the past few decades. However, this development was achieved not only thanks to the incentives provided but was also helped by other events. The fact remains that the number of new highly skilled Mauritanian fishermen is still low. *Taxes* are potentially powerful incentives for limiting the number of operators or gear and simultaneously ensure public revenues. It appears that this kind of regulatory measure could be further explored by better adapting existing taxes to the development objectives of the sector.
- It is noted that direct resource management measures in the form of *regulations* do not include limits to fishing effort or production volumes (quotas). The existing technical management measures seem ineffective, at least in part, even if the number of violations appears to have decreased significantly. When developing a new management plan, it would seem important to emphasize the feasibility and the applicability aspects of the dispositions to be put into effect.

(4) Other observations

1) Monitoring of indicators and the establishment of a socioeconomic database

Socioeconomic aspects are increasingly recognized as important for resource management and researchers and decision-makers require more and more data on the subject. CNROP's LASE supplies this kind of information to others and also needs it for its own socioeconomic research. However, the collection and compilation of these important data have not received due attention or priority to date and the work is currently done *ad hoc*. Therefore, it is suggested that a structured system for the collection and organization of socioeconomic data be created in CNROP. In addition to the data collection itself, a computerized database should be established and procedures for the documentation and publication of information should be contemplated. This database could be set up, at least in the beginning, at the LASE even though an integration with other CNROP statistics and information systems should be foreseen in the longer term.

The work should be based on a limited number of simple and clear indicators for which the data collection does not require extensive resources and time but which are, of course, at the same valuable for monitoring the development of the sector. These indicators are to be selected *according to needs identified by researchers and decision-makers*. At first, it is suggested that the number of indicators is limited to about ten. Certain information is already available with

other institutions and in these cases ways of communicating should be established. However, there is also a need for collecting information in the field in an organized way. It would appear important to cover *a priori* the following aspects:

- Sale prices (at different links in the distribution chain) by species and product type;
- Employment (direct and indirect);
- Macroeconomic aggregates;
- Export volumes (and values) by species, by product type and by country of destination;
- Costs and origins (local production or imports) of inputs;
- Revenues and profit margins of main activities and products.
- Local fish consumption.

It would also be desirable to have the basic data needed for drawing up profit and loss accounts for the main fishing methods and processing units. Given the dynamics of the sector and the complexity of the financial relations, such information would be especially useful for developing different scenarios and sensitivity analyses through models, for instance by means of a spreadsheet application as suggested in Section 8.1.2, (4), 3).

2) Management in partnership and participatory approaches

The *Code of Conduct for Responsible Fisheries* (FAO, 1999a) brings up "management in partnership" and clarifies the necessity of sharing management-related responsibilities between authorities / public institutions and private interested parties. For a management plan to be effective and respected, it must be accepted by the different parties involved and their interests must be adequately reflected to make them feel responsible.

Today (October 2001), in Mauritania, as described in Section 8.1.2, (3), 4), the work on the development of implementation measures related to the new Fisheries Law is being done in consultation with professionals in the sector: zoning, for instance, is currently being discussed with the FNP. These discussions are a very important initiative and the necessity to involve interest groups and the private sector in the management and development of resources should be emphasized again. It implies "the recognition that the efficiency and implement ability of the management measures are often highly dependent on the support gained from the interested parties" (FAO, 1999a: page 55). This process should preferably begin already at the level of preparatory surveys and research for the management plan and researchers, especially in the field of socioeconomics, should utilize participatory approaches. This observation is closely related to the fact that there is an urgent need for improving the regular collection of relevant data as well as for allowing researchers and administrators to gain better knowledge of the local environment through regular field trips and by getting to know fishermen and other operators.

3) Costs and earnings analyses in artisanal fisheries

As seen in Section 8.1.1, (2) (see Table 8.1.1), there is a great variety of fishing techniques utilized in the Mauritanian artisanal fisheries. These techniques vary according to the zone, the season and the skills of the fisherman himself. A comprehensive analysis of costs and earnings of the artisanal subsector would thus be very difficult. For the purpose of the present study, five main types of fishing were chosen for which exploratory profit and loss accounts were drawn

up. These profit and loss accounts are based on data collected during the surveys of the Project and on assumptions and extrapolations made accordingly. The five types of fishing methods are:

- Octopus pots in NDB (1-7 day trips)¹⁰
- Hand lines and longlines in NKC (1-7 day trips)
- Gillnets (for jewfish fishing) in NKC, Southern Zone of Cap Timris and in the south (one-day trips)
- Flatfish gillnets (for sole fishing) in NDB (one-day trips)
- Rays and sharks nets in the PNBA¹¹

For each method, an annual "typical profit and loss account" was developed based on averages calculated on values reported by individual fishermen interviewed in the survey. These accounts were thereafter recalculated into "minimum accounts", using the available information on investments and variable costs but adjusting the annual catch volume to the minimum level giving an Internal Rate of Return (IRR) of at least 15% as well as monthly earnings for the crew of at least 10,000 UM per person (on a 12-month base). The annual catch estimates utilized in initial individual accounts were generally based on fishing data for a single day. Therefore, this "reversed" approach was considered more sensible; that is, to calculate the *minimum turnover necessary for a reasonable result, instead of calculating a result from a probably poorly estimated turnover*. These "minimum accounts" are presented in Appendix IV. The calculations could be further used in a more global analysis of the amount of fishery resources needed by relating the minimum production volume per canoe with the total number of canoes (the actual number or a desirable number used in a development scenario).

Given that the surveys only covered very limited periods, there are likely to be data deficiencies and the accounts should be considered only indicative. Among the gaps and main assumptions made, the following should be mentioned:

- In certain cases, the reliability of the information given by the fishermen is questionable.
- It was not possible to consider mixed fishing methods in which the fisherman changes gears or his target species during the year. All accounts drawn up so far are for a single type of fishing technique, assuming a homogeneous activity throughout the year.
- Due to the lack of precise data, some costs had to be estimated, sometimes by using similar information from a different fishing method.
- The taxes for fishermen are not clear as there seem to be discrepancies between the *official regulations* and what happens in practice. Also, it seems that the fees paid by the fisherman vary according to the precise conditions of his relationship with the wholesaler or his employer.
- Expenditures for fishing gear were calculated as a total annual cost without distinguishing between the investment cost / depreciation and costs for repairs.

¹⁰ The fishermen may stay up to seven days at sea as they often use a rotation system for transporting and landing their catch.

¹¹ The data on the ray and shark fishery in the PNBA are from analyses made by a working group of the ACGEBA Project.

- The calculations do not consider financial charges or possible opportunity costs. Instead, an IRR of 15% was utilized as the profitability threshold. The set IRR also allows for comparisons between different types of fisheries.

There is an aspect related in particular to the last point above that is important but difficult to capture and to deal correctly with: the vertical integration of the sector (see Section 8.I.2, (1)) Considering its importance, one could argue that the financial analyses of the primary production subsector (the profit and loss accounts of the canoes) should not be done independently from a similar analysis of other parts of the industry and of the marketing and distribution system. The close financial ties that exist between fishermen and exporters (the processing plants) undeniably have an influence on the finances of each group. For example, the primary production subsector benefits from "subsidies" in the form of advance payments and credits given by the processing plants to the fishermen, but "pays handsomely" by selling their products at a value lower than the market price. The real benefits probably go to the export company or the foreign importer and not to the fishermen: the former are the stronger actors in the system and can set prices and decide on the profit margins at different levels. A more elaborate global analysis should be done for a better understanding of the overall profitability of the artisanal fisheries subsector.

Nevertheless, in spite of these deficiencies, it is felt that the work started – represented by the exploratory profit and loss accounts in this report as well as the initiative by the socioeconomic research group of the ACGEBA Project (October 2001) – should be pursued so that a more detailed analysis of the artisanal fisheries in Mauritania can be arrived at. The calculations have been made in MS Excel and are thus easy to modify and new scenarios can be explored. Assuming that the variable costs or the value of the catch change – or that they were badly estimated in the first place in the "minimum account" – alternative results can be calculated. A selection of such alternative scenarios was in fact calculated and are presented in Table 8.I.14 along with the original "minimum accounts" for the different fishing methods.

Table 8.I.14 Different scenarios for the annual production needed (in kg) for sustaining the operations of a canoe (by fishing method).

	Octopus pot traps in NDB (1-7 days trips)	Hand lines and longlines in NKC (1-7 days trips)	Gillnets (jewfish) in NKC, Southern Zone of Cap Timris and southwards (one-day trips)	Flatfish gillnets (sole) in NDB (one-day trips)	Rays and sharks nets in the PNBA
«Minimum account»	4,500	5,400	16,560	12,050	8,820
20% increase in sale price of catch	3,770	4,480	13,880	11,140	7,480
20% increase in fuel cost	4,660	5,850	17,140	12,210	N/A
20% decrease in sale price of catch	5,600	6,750	20,700	13,450	10,840

According to these scenarios, it can be concluded that an octopus-fishing canoe must catch

between 3,800 and 5,600 kg annually to earn a profit. By multiplying these estimates with the number of active canoes fishing octopus – 530 units¹² – one arrives at a total production of 2,000 to 3,000 tonnes of cephalopods per year caught by artisanal fisheries. At a price of 700 UM/kg, the value of this production amounts to 1,400 – 2,100 million UM, or US\$ 6.0 – 8.8 million¹³. Table 8.I.15 shows similar calculations for the other fishing methods covered by the study. According to these estimates, it appears that the minimum annual production of demersal species by artisanal fisheries has to be between 12,000 and 17,000 tonnes if the subsector is to be profitable overall.

Table 8.I.15 Minimum volume and value estimates for the demersal species production by the artisanal subsector (by fishing method).

	<i>Octopus pots, cages, jig hooks</i>	<i>Hand lines, longlines</i>	<i>Fixed gillnets / gillnets (jewfish)</i>	<i>Flatfish gillnets (sole)</i>	<i>Tollo nets (sharks and rays)</i>	<i>Total</i>
Number of boats	530	660	220	330	30	1770
Average price UM/kg	700	510	250	300	140	
Scenario 1 (tonnes)	2,010	2,970	3,060	3,660	230	11,930
Scenario 2 (tonnes)	2,970	4,490	4,550	4,420	320	16,750
Scenario 1 (million UM)	1,410	1,510	760	1,100	30	4,810
Scenario 2 (million UM)	2,080	2,290	1,140	1,330	50	6,890

Source : CNROP «Baseline Surveys» 1999 and 2000 (Cheikh et al., 2001).

Note: The number of canoes is the average value for 1999 and 2000 and excludes the units operating in other activities than those selected, as well as the ones considered non-active. Boats reported as utilizing «mixed gear» in 1999 were proportionally allocated among the specific methods.

According to SMCP statistics, exports of octopus from artisanal pot fishing amounted to 2,606 tonnes in 1999 and 3,492 in 2000, reaching values of US\$ 9.4 million in 1999 and US\$ 9.1 million in 2000. It should be noted that the SMCP only started to market production from NKC in July 2000 and hence a part of the volume – even though the production in the south is generally not significant – was not yet included in their statistics. The actual volume caught by the artisanal fisheries is therefore probably somewhat higher than the minimum of 2,000 – 3,000 tonnes calculated above. Nevertheless, overall, the analysis gives the impression that the profitability of the subsector is fragile and that a large number of boats probably operate close to break-even. Even if detailed statistical data on artisanal fisheries are not available, it seems clear that the total catch volumes and the revenues per fishing trip and per octopus-fishing artisanal unit have declined after 1993 (Inejih, 2000). This

¹² The estimate of the average number of canoes using octopus pots, cages and jig hooks in 1999 and 2000 is based on data from the CNROP «Framework Surveys» (Cheikh, 2001).

¹³ Exchange rate: US\$ 1 = 235 UM (SMCP, 2000).

trend is confirmed by an apparent decrease in the number of canoes involved in octopus fishing (CNROP «Baseline Surveys», Mohamed Cheikh *et al*, 2001).

As already mentioned, the analyses presented here are only tentative and preliminary, but they still give an indication of present trends. It is suggested that more advanced analyses follow the present initiative in order to arrive at a better understanding of the financial aspects of the artisanal subsector and also allow for better managing its development.

8.1.3 General conclusions and recommendations

(1) Consequences for the fisheries management plan

The socioeconomic section of the present Project had as its objective to collect and analyze social, economic and political information in order to facilitate the formulation of recommendations for a demersal resources management plan - the expected overall outcome of the Project itself -- that is well suited to the actual status of the sector. As explained in Section 8.1.1, (4), it is essential to consider sociopolitical and economic factors in this work. Based on the surveys carried out and in accordance with the study results presented above, the conclusions in this respect can be summarized as follows:

- Through the marketing system, the fisheries sector is driven by the large export companies and their clients abroad. In recent years, a gradual vertical integration and a distinct concentration of the industry can be noted. Any management measure should consider this fact in order to be effective.
- Even if the maritime surveillance and control capacity has improved in recent years and the number of violations seems to have dropped, certain management measures are still difficult to implement effectively in the context of the Mauritanian fisheries sector. The measures most likely to be effective should include limitations of fishing effort – by regulating the number of vessels and licenses – and total closures of fisheries (during periods of several months). Such measures are easier to manage and control than, for instance, establishing production quotas and other technical measures. In case it is deemed appropriate to limit catch by means of quotas, it would probably be more effective if restrictions are imposed on exports – by limiting the issue of export licenses in volume per product – than do so at the primary producers level.
- The possibility to manage the development of the sector by means of encouragement measures, economic incentives and taxation deserves to be further studied, and the measures already in place should be reexamined. Such measures are likely to be fair, on the condition that they are clear and transparent. If appropriate encouragement measures can be identified and implemented, they could become a powerful tool together with management and regulatory measures. Taxes would also contribute to public revenues.
- The new Fisheries Law anticipates more importance to be given to management in partnership. This approach should be encouraged by introducing transparent procedures and by making fishermen aware of their responsibilities.
- It must be recognized that the renewal of the fisheries agreement with the EU in September 2001 significantly limits the options for the development and management of resources and fisheries. The production of the foreign fleet is likely to represent an important portion of the total allowable catch of many species.

- All proposals for management measures should be supported by specific studies on probable socioeconomic effects (employment, revenues, etc.), and appropriate accompanying measures should be foreseen in order to mitigate possible negative effects.

(2) Other remarks and propositions

The conclusions and recommendations mentioned above refer more directly to the identification of management measures that could be implemented in the future. However, there are also other conclusions and ideas resulting from the socio-economic studies and even if these may only be indirectly related to the technical aspects of the management plan, they are important in the broader context of the development of the fisheries sector, e.g.:

- The objectives assigned to the fisheries, i.e.:
 - the protection of the resources,
 - the optimization of the revenues generated by the sector,
 - the generation of employment,
 and more recently;
 - the contribution to the fight against poverty
 are very ambitious and, particularly in the short run, contradictory. It is therefore important to be sensible and realistic in the definition of priorities by evaluating middle- and long-term options for the development of the sector.
- To better evaluate the options related to selected objectives and priorities, it would be essential to conduct analyses with regard to the economic and social contributions made by different subsectors. For instance, even if there are very few quantitative data, it is likely that the products from the artisanal fishery are of a much higher value than those of the industrial fisheries. It would appear important that such economic and social consequences be precisely and continuously evaluated, so that the decision-makers can base their strategic decisions on scientific, genuine and objective information.
- The jobs generated by the sector are important and about half of them are in land based activities, particularly in downstream activities. The number of traditional Mauritanian fishermen is limited, and it must be recognized that a significant and sustainable increase of this number would take time. One could eventually even ask if such development is necessary: the foreign fishermen who land their catch in Mauritania also contribute to the generation of employment. It seems wise to give priority to the creation of land based jobs, by increasing the volume of landed products and their level of valorization. Such an approach would naturally also contribute to the creation of added value and would therefore have important economic consequences. On this matter, it should also be noted that there is a land based processing capacity that is largely underutilized.
- An important deficiency with regard to research related to the management and development of resources is the lack of reliable information, particularly on artisanal fisheries. This concerns particularly the volume of catches and exports, as well as the specific composition of catches, but there are also several socioeconomic aspects that are not well known. Without solid knowledge regarding the performance and the impact of this subsector, it will be difficult to evaluate its social and economic potential, and therefore this shortcoming should be remedied urgently.
- The capacity of the fisheries administration and research in the field of fisheries socioeconomics is far from sufficient. Given the importance of economic and social analyses for resource and fisheries management, a reinforcement of this capacity and the

related competences is indispensable together with strengthened cooperation between the CNROP and the MPEM.

With respect to research activities and the utilization of the results of the socioeconomic research – closely related to the last point above – it is suggested that the following actions and activities are integrated into the work plan of the CNROP / LASE:

1. Regular monitoring of key socioeconomic issues and development of a computerized database containing relevant socioeconomic data according to the guiding principles proposed in Section 8.1.2, (4), 1) above.

2. Publication of a socioeconomic statistics bulletin.

To ensure that information and data are not lost – which is often the case with unpublished studies and facts – it is suggested that an annual socioeconomic statistics bulletin is published. This publication does not need to be an ambitious project to start with: a few pages presenting key data would be sufficient. The bulletin could possibly also feature a section on specific themes with a summary of the results of studies conducted.

3. Improved knowledge by researchers of the local environment by establishing more regular contacts between the LASE and the operators of the sector.

It is suggested that the LASE researchers spend a defined period of time every month in the field, e.g., at the ports and markets in NDB and NKC. Regular visits, for instance two days in a month, during which they could conduct informal surveys, would allow the researchers to improve their knowledge of the sector's local environment, and also to be always up-to-date on any developments in the sector. A good basic knowledge of the real situation is indispensable for any socioeconomic work, which is usually more qualitative than quantitative. With advanced notions on the current situation, it should also be easier to design specific surveys. In addition, the researchers would be better known by their interlocutors, who would in turn probably be more inclined to give them precise information. It is also desirable that participatory approaches be employed in interviews. There is a need to train field agents and researchers in techniques such as PRA.

4. Improved knowledge by researchers through subregional and international cooperation for the establishment of more regular contacts between the LASE and its scientific counterparts in the subregion and abroad.

5. Recruitment of personnel for the LASE

To be able to ensure adequate socioeconomic monitoring and research, the LASE needs to be strengthened with regard to personnel. There is a need to recruit both senior researchers and technicians. These new team members should have a background in social sciences, and it would be desirable to have at least one female researcher in order to facilitate the coverage of aspects related to women.

6. Implementation of specific studies.

Even if the organization of basic data is considered the most urgent task for the LASE, there is also a number of themes and problems that deserve to be studied in more detail. There is also a need to consolidate and refine the results of the studies realised by the Project by continuing work in the subject areas that were identified as particularly important. Among such themes, the following are considered being of priority:

- A follow-up on, and a more thorough treatment of, the costs and earnings analysis for the artisanal fisheries initiated by the present Project. This new study could include, among other items:
 - Data collection by interviewing fishermen during longer periods of time, covering at least a full year of activities.
 - A critical examination of the exploratory profit and loss account calculations made to date and verification of the proposed methodology.
 - A historical analysis of the evolution of the profitability of different fishing methods.
- An analysis of added values created by the different subsectors. It should be done as much "horizontally", that is, by comparing different fishing methods, as "vertically", in order to identify where in the marketing and distribution chain profits are created and who benefits from them.
- An examination of the perception of the industry on the status of resources and of the how the industry adjusts their strategies and behavior based on this perception. Such a review would be built on a process consisting of a dialogue with the interest groups and operators of the sector in order to better understand their strategies and decision-making processes. The objective would also be to have an exchange of viewpoints on the seriousness (or non-seriousness) of the status of resources and the reasons behind it.

(3) Summary of findings and suggestions

As explained in the beginning of the chapter, the mandate given to the socio-economic part of the Project were very general and the first task of the study team was to identify relevant issues and to draw up terms of reference. The objectives that were defined in this process are considered to be attained for most of the studies but at the same time it is also recognized that research is a continuous activity and that it would be desirable to continue the work that has been started. Table 8.I.16 summarises the *main results and propositions made which would be relevant* for a continuation of the research work.

Table 8.I.16 Summary of the findings and proposals of the socio-economic part of the landing site survey.

<i>STUDY</i>	<i>FINDINGS AND CONCLUSIONS</i>	<i>FUTURE TASKS</i>
The marketing system	The study gives a description of the marketing and distribution systems in the different geographical regions and makes a first analysis of the financial relations existing between the different operators. It is noted that a process towards increased vertical integration is taking place. There are close ties between the fishers and the exporting companies which are in turn closely associated with the foreign importers and the sector is driven by its downstream segments.	In addition to consolidating and adding more detail to the general results of the study, there are several subjects on which in-depth studies would be useful. For example, an analysis of the value-added created by the different segments of the sector could be considered. Such an analysis should be made both "horizontally", i.e., comparing different fishing methods, and "vertically" to identify where in the distribution and marketing chain profits are created and who benefits from them.
Employment and labour structure	Through the work on employment aspects, a methodology for estimating the number of job opportunities created by the sector was developed and the main professional groups of the sector were defined. An analysis of some of the socio-demographic aspects of the main groups of operators was also carried out. It could be noted that the sector employs some 30,000 people that there is a high level of mobility within this workforce, and that foreigners play an important role, particularly in the artisanal fisheries. It is also noteworthy that almost half of the total number of jobs created is on land.	Basic information on employment related issues are socio-economic indicators that should be monitored on a regular basis. The data collected so far constitute an information base that – with additions as necessary – can be used for more detailed analyses on, for example, the possible impact of management measures on employment within different professional groups or in different geographical regions.
Review of management measures	The study carried out was basically a review of already existing literature on management measures and no in-depth analyses were made. Nevertheless, it could be noted that the management measures most likely to be effective include <i>limitations of fishing effort and complete closures of fisheries. Incentive measures and taxation should also be considered. Moreover, it would appear important to reflect on the overall objectives assigned to the fisheries sector since they appear to some extent contradictory.</i>	A more in-depth review could be carried out by analysing specific management measures in more detail. In order to better appreciate the available options with regard to objectives and priorities, it would be important to assess the economic and social contributions by different subsectors. A review of the perception of the industry with regard to the state of resources could also be considered together with an analysis of how the industry adjusts its strategies and behaviour according to this perception.
Monitoring of indicators and a socio-economic database	The work on a socio-economic database was limited to discussions on the subject and to reconfirming the urgent need to organise the collection and compilation of this type of data in a systematic way.	Basic socio-economic aspects have to be monitored in a structured way and on a regular basis and a computerised socio-economic database needs to be developed. The various aspects to cover would include, among other things, employment, macroeconomic aggregates, prices, export volumes, and fish consumption. It is also suggested that a socio-economic statistical bulletin is published.
Participatory approaches	The new Fisheries Law anticipates more importance to be given to management in partnership and this approach should be encouraged. The importance of management in partnership and of participatory approaches is thus noted but the time and means available did not allow for any further work on these issues.	With regard to research, there is first of all a need to strengthen the capacities of LASE and to improve the knowledge by its researchers of the local environment by establishing more regular contacts between LASE and the operators in the sector. It is also desirable that participatory approaches are used in field work and there is thus a need to train field workers and researchers in participatory research techniques (e.g., PRA).
Cost and earnings analysis	Based on the information collected, exploratory profit and loss accounts were developed for a selected number of fishing methods. By calculating different scenarios, estimates of minimum catches in the artisanal demersal fishery were arrived at. For a canoe targeting octopus to be profitable, it was estimated that the annual production had to be between 3,800 and 5,600 kg. The artisanal demersal fishery as a whole has to catch at least between 12,000 and 17,000 tonnes per year to be profitable.	A continuation and expansion of the work could include, among other things, the following: <ul style="list-style-type: none"> • The collection of data from fishers during a longer time period, i.e., one year. • A critical review of the profit and loss accounts established by the study and a verification of the proposed methods. • A historical analysis of the development of the profitability of different fishing methods.

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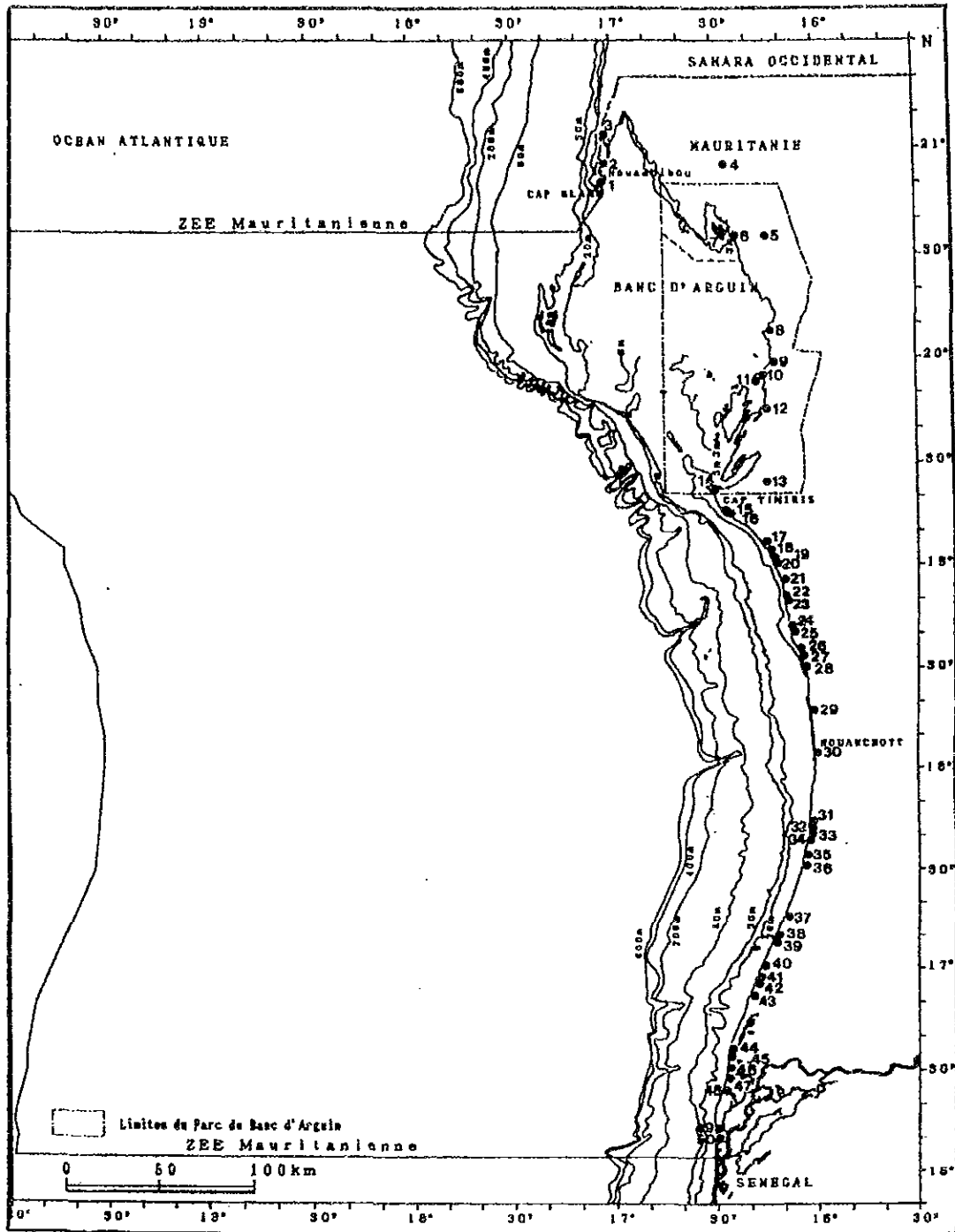
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Appendix I Map of surveyed villages and camps.

Appendix I List of surveyed villages and camps.

Map reference	Site (village / camp)	GPS coordinates		Approximate distance (km)	
				To next site	Cumulative
1	Nouadhibou - Cansado, CNROP (survey headquarters)	N 20°51'23.8"	W 017°01'53.3"	0	0
2	Nouadhibou - north	N 20°55'10.5"	W 017°02'52.3"	11	11
3	Nouadhibou (exit)- Police Control Station	N 21°01'50.5"	W 017°01'49.6"	10	21
4	Restaurant on Nouakchott - Nouadhibou road	N 20°56'53.1"	W 016°26'59.9"	61	82
5	Detour to Agadir (off main road)	N 20°35'47.0"	W 016°16'26.5"	43	125
6	Agadir - Landing Site	N 20°34'02.2"	W 016°24'15.1"	14	139
7	Agadir - Island / Village	N 20°36'33.5"	W 016°26'55.4"	7	146
8	R'Keis	N 20°07'20.6"	W 016°15'21.3"	58	204
9	Ten-Alloul	N 19°58'19.3"	W 016°13'45.4"	17	221
10	Iwik - PNBA	N 19°53'03.1"	W 016°17'42.4"		
11	Iwik - Village	N 19°52'41.2"	W 016°18'12.4"	13	234
12	Tessot	N 19°44'40.5"	W 016°16'24.3"	15	249
13	Awgej	N 19°23'20.4"	W 016°25'02.4"	42	291
14	Mamghar	N 19°21'27.6"	W 016°30'31.5"	10	301
15	Ireif	N 19°15'58.1"	W 016°28'26.2"	11	312
16	Camp N1	N 19°14'58.4"	W 016°27'43.2"	2	314
17	Camp N2	N 19°07'12.9"	W 016°17'25.8"	23	337
18	Camp N3	N 19°04'24.2"	W 016°15'14.4"	7	344
19	Camp N4	N 19°03'33.1"	W 016°14'53.8"	1	345
20	Mhajarat	N 19°01'54.9"	W 016°14'06.5"	3	348
21	Camp N5	N 18°55'08.1"	W 016°11'01.6"		
22	Tiwilit	N 18°52'21.7"	W 016°10'32.2"	19	367
23	Camp N6	N 18°50'27.1"	W 016°10'10.5"	4	371
24	Camp N7	N 18°41'45.9"	W 016°09'11.2"	9	380
25	Lemcid	N 18°41'19.6"	W 016°08'24.1"	8	388
26	Building	N 18°36'35.8"	W 016°06'45.4"	9	397
27	Camp N8	N 18°35'00.6"	W 016°05'46.7"	3	400
28	Blewakh	N 18°31'05.0"	W 016°04'19.0"	8	408
29	Nouakchott - Police Control Station	N 18°18'45.6"	W 016°00'54.3"	23	431
30	Nouakchott - Hotel	N 18°06'47.6"	W 016°01'39.3"	24	455
31	PK 28	N 17°45'53.4"	W 016°02'34.4"	37	492
32	Camp S1	N 17°44'31.1"	W 016°02'40.1"	3	495

Appendix I List of surveyed villages and camps.

Map reference	Site (village / camp)	GPS coordinates		Approximate distance (km)	
				To next site	Cumulative
33	Camp S2	N 17°43'13.9"	W 016°02'44.9"	2	497
34	Camp S3 (PK 42)	N 17°41'07.2"	W 016°03'00.2"	4	501
35	Camp S4	N 17°33'57.4"	W 016°04'17.5"	13	514
36	PK 65	N 17°31'20.7"	W 016°04'54.8"	5	519
37	Camp S5	N 17°17'50.4"	W 016°09'30.0"	26	545
38	Camp S6	N 17°10'33.7"	W 016°12'33.7"	15	560
39	Camp S7	N 17°09'27.9"	W 016°13'02.7"	2	562
40	Building	N 17°01'12.7"	W 016°16'42.7"	17	579
41	Camp S8	N 16°58'00.7"	W 016°18'08.8"	7	586
42	Camp S9	N 16°57'11.5"	W 016°18'28.6"	2	588
43	Camp (nomadic)	N 16°53'34.9"	W 016°19'59.6"	7	595
44	Building	N 16°36'18.1"	W 016°26'36.3"	34	629
45	Camp (nomadic)	N 16°34'54.1"	W 016°26'47.1"	3	632
46	Camp (nomadic)	N 16°31'14.0"	W 016°27'03.3"	7	639
47	Camp (nomadic)	N 16°29'11.7"	W 016°27'18.2"	4	643
48	Camp S10	N 16°25'32.2"	W 016°28'14.3"	7	650
49	Camp (nomadic)	N 16°21'02.8"	W 016°29'53.8"	9	659
50	N'Diogo	N 16°10'03.2"	W 016°30'43.5"	20	679

APPENDIX II

METHODOLOGY AND QUESTIONNAIRES

DEVELOPMENT OF THE STUDY

The work on the socioeconomic aspects was carried out by a study group formed by the consultant, who went on four missions to Mauritania, and her counterpart and other colleagues of the CNROP. The first mission was dedicated to an overview of the fisheries sector and to the identification of suitable themes for the study within the global references of the socioeconomic section, i.e., the gathering and analysis of social, political and economic information that would help formulating recommendations for a management plan for demersal resources. For this, semistructured interviews and discussions were conducted with source people and actors in the sector. The study team met with private operators and related organizations (fishermen, wholesalers, export companies, the FNP, the SMCP), researchers of other departments in the CNROP, the administration of the DEARH/MPPEM, and development cooperation partners (Project "Sustainable administration of fishery resources and management of the marine environment", the administration and projects of the PNBA, Project PDPAS, the NGOs Mauritanie 2000, GRET and Tenmiya, and the FAO). These meetings took place in NDB and NKC, as well as in fishing villages along the coast during a field survey. In addition, an inventory of reports and publications was assembled and relevant documents were gathered and studied.

From this dataset of information and analysis, the themes for study were selected during the second mission, i.e.:

- *Description of the marketing and distribution system and of the export industry, and its role in financing the primary production subsector.*
- *Analysis of the labor structure and the importance of the employment generated by the fisheries sector.*
- *Review of the management measures hitherto applied, and their advantages and shortcomings from a sociopolitical perspective.*

Additional research was conducted on the need for *a socioeconomic database*, the utility and necessity of *participatory approaches*, and the *analysis of some tentative accounts related to certain methods of artisanal fisheries*.

It was also during the second mission that more detailed terms of reference for each study were elaborated. The methodology employed had to be adapted to the means available to the socioeconomic section, and it was decided to continue having semistructured interviews and questionnaire surveys. It was not possible, for instance, to organize workshops or to hire local PRA consultants, necessary elements for a more thorough participatory approach, so the surveys had to make use of quite traditional methods. At the time of the second mission, another survey along the coast was conducted in order to test the questionnaires and begin data collection.

In the third mission, work was focused on data collection in NKC and NDB with artisanal fishermen, fish wholesalers and licensed export companies. After an initial preparatory phase when all team members worked together, the questionnaire surveys were all trusted to the CNROP technicians, particularly those concerning the study on the marketing system. These technicians were well familiarized with the fishermen and the environment, an important condition for obtaining reliable information. Surveys with export companies were conducted in collaboration with DVIS veterinarians for the same reason.

All information collected was organized in MS Excel (costs and earnings analysis and data on export companies) and MS Access (data on employment and financing to fishermen) software. During the fourth and final mission, some additional surveys were conducted in NDB, but the mission was mainly dedicated to the analysis and preparation of elements for this Final Report.

EMPLOYMENT IN THE SECTOR

The first task of the study on employment was to identify the main types of profession categories. For this, the five geographic zones already defined (see the section *Summary of regional marketing structures*) were utilized, with further division in large towns. Thus, NDB was divided into seven sites and NKC into two. In these places, some companies were studied and a list was made with part of the employers and their occupations and the number of their employees. Once the different professional categories were established, the number of persons employed in each category was estimated through observation and discussions with the operators themselves. Given the existence of data on the PNBA and, to a certain extent, on the Imragen zone off the Park between Mamghar and NKC, priority of the survey was given to the two major towns, and secondary data was utilized in part for employment estimates in other zones.

For the export companies, the classification of the different professions and positions that was developed at the time of the latest CNROP survey on employment was used. These categories may need to be reexamined in the future. For the questionnaires, the already existing CNROP forms were modified (see *No. 1 Census list – employment at a specific site* and *No. 2 Questionnaire on the number of employees (export companies)*, included below).

An additional questionnaire was elaborated for collecting more detailed information on certain sociodemographic indicators of each actor (*No. 3 Questionnaire on level of education / professional experience*). This was at first submitted to people of all different occupations, but then the survey focused on the wholesalers in NKC and the fisherman/captains in NDB as these were the key professions and a larger sample size in the limited time available was sought for these professional groups. The results of this questionnaire allowed exploring the sociodemographic profile of these actors.

THE MARKETING SYSTEM

The description of the marketing system and the role of the export companies begun by the identification of the actors in the various geographic zones and by clarifying their internal relationships (see Figure 8.1.6 and the *Report of the Second Mission*). Three questionnaires were then developed to collect more information on the commercial and financial relations of the operators, i.e.: *No. 4 Questionnaire to export companies (licensed)*, *No. 5 Questionnaire to wholesalers / fishmongers*, and *No. 6 Questionnaire to fishermen / boat owners and analysis of a fishing unit*.

However, the situation among the wholesalers revealed to be complex and Questionnaire No. 5 was dropped as initially prepared and replaced by semistructured interviews that better reflected their situation. The two other questionnaires were gradually modified as the survey advanced: this was especially the case with the fishermen, to whom more precise questions on costs and earnings were added. Questionnaires No. 4 and No. 6 are presented further below.

As this study was particularly complex and often demanded information of a delicate nature, the collected data are sometimes open to interpretations. An important part of this work also comprised discussions with resource persons and gathering secondary data, and the results represent a synthesis of all this work.

MANAGEMENT MEASURES

The examination of management measures was mainly based on already available information. Many studies have already been conducted on this subject (CNROP, 1998a; Diop *et al.*, 1999; Hanadi *et Ahmed*, 1998) so a synthesis of these was made with additional material from new observations and information. A summary in English was prepared to facilitate exchanges with the Project team leader. The presentation in this Report is a translation and an elaboration on the first version.

PROBLEMS ENCOUNTERED

Data collecting ended up being more difficult and time-consuming than the consultant expected. This notion is valid for both the fieldwork at the fishing villages and for the work done in the NDB and NKC. Besides practical and logistic considerations, it must be recognized that fishermen and other actors are not always willing to answer questions or to discuss whatever subject openly with strangers who happen to be passing through. In the villages where development projects already have been through, the interviewees sometimes were likely to say whatever they thought the mission wanted to hear rather than to tell the truth, with the perception that in that way more projects and aid might come by. Therefore, it is necessary to verify, and verify again, the information obtained, for further interpretation.

In general, in surveys like the present one, there are often difficulties in communication and comprehension of concepts and ideas, as presented in discussions or in a questionnaire, that go

beyond the language barrier and translation. The researcher, the local agent, the interpreter and the interviewee do not always understand exactly the same thing by a question or expression. This is a particularly relevant difficulty for questionnaire surveys where precise answers are needed, and therefore precise words whose meaning must be understood in the same manner are utilized, not allowing easily for longer, qualifying explanations. This seems not to have been a problem in the present study, but the first versions of the questionnaires had this shortcoming: they were often ambiguous and did not cover all possible alternatives, which led to poorly defined answers that would not fit the questions. An example is the question on the number of people in the household in Questionnaire No. 3, where the definition of "household" was not clear. By the same token, with respect to financing to fishermen -- a complicated and delicate subject -- Questionnaire No. 6 could not be properly adjusted before the study team had acquired a good understanding of the systems and practices in operation.

For a statistically significant result, sampling should be at random, thus giving the same chance to the whole population to be selected for the survey. In this study, that approach was not always possible. Selection of the sample population was indeed done at random, but among the actors present, for example at the MPN, the survey resorted to people there available at the time of its passing by and to volunteers to answer the questionnaire.

CONTINUATION OF THE STUDY

If a follow-up to the surveys is planned, a phase of critical evaluation is proposed so that all material, methodologies and questionnaires could be reexamined and validated again. Such an examination should be done in close cooperation with the researchers, local agents and, if possible, also with the actors of the sector themselves. Even if the methodology employed is deemed valid, it seems important to verify its procedures in a continuous manner, especially given the dynamics of the sector. Of course, it would also be very interesting to validate the already obtained results with the people who supplied the information on which they were based.

Employment survey

Questionnaire on level of education / professional experience

(to employees, fishermen, processors, wholesalers, etc.)

N° _____

Date of interview				Day	Month	Year		
Interviewer:					Name of interviewee:			
Place of interview (zone and region/town):								
Occupation or kind of work (main activity):					Sector:			
Secondary activity (ies):					Sector:			
General information on the job - main activity:					For fisherman, specify techniques he knows how to use:			
Permanent presence		<input type="checkbox"/>	Seasonal		<input type="checkbox"/>	1. Pots		6. Castnets
Employee		<input type="checkbox"/>	Self-employed		<input type="checkbox"/>	2. Lines		7. Ring nets / gillnets
If employed, name of employer or company:					3. Cages			
					4. Longlines			
					5. Jig hooks			
					6. Castnets			
					7. Ring nets / gillnets			
					8. Encircling nets			
					9. Beach seines			
					10. Others: _____			
If employer, how many employees?					Owner / manager <input type="checkbox"/>			
Permanent		Occasional		TOTAL		Captain <input type="checkbox"/>		Seaman <input type="checkbox"/>
Associates	M	F	M	F		Owner - number of boats <input type="checkbox"/>		Lessee - number of boats <input type="checkbox"/>
General information on the interviewee								
Age: _____		Sex: <input type="checkbox"/> M <input type="checkbox"/> F		Native language / nationality: _____		Place of birth: _____		No. Region: _____
Intragen? YES NO								
Level of education :								
None	Can read and write fisher	Can read and write	Primary school	Secondary school	Higher education	Koranic school	Professional training (NONE, FISHERIES OR OTHER).	
Professional experience - jobs / current and former economic occupations:								
POSITION / KIND OF WORK			YEAR(S) (from XX to XX)		EMPLOYER		SECTOR	
_____			_____		_____		_____	
_____			_____		_____		_____	
_____			_____		_____		_____	
Information on dependants and household								
Head of household:		M	<input type="checkbox"/>	F	<input type="checkbox"/>	Number of people in household:		
Kinship of interviewee with head of household:				Children (< 10 years):		M	F	Total
What is the occupation of the head of the household (if retired, mention his/her former occupation)?		SECTOR:		Adults:				
				Elderly persons:				
				TOTAL:				
Remarks:								
OCTOPUS FISHERMAN: WHAT DOES HE DO DURING THE CLOSED SEASON?								

Marketing survey

Questionnaire to export companies (licensed)

Date of interview:			N°		
Day	Month	Year			
Interviewer:			Interviewee:		
Place of interview (zone and region/town):			Name of business:		
Type of activity:					
Type of business (owners/partners)					
<i>Infrastructure and capacity for processing</i>					
Freezer tunnels (number and capacity):			Total capacity:	t / h	
Freezer chambers (number and capacity):			Total capacity:	t / h	
Storage chambers - frozen (number and capacity):			Total capacity:	t	
Storage chambers - 0°C (number and capacity): - raw products:			Total capacity:	t	
Storage chambers - 0°C (number and capacity): - processed products:			Total capacity:	t	
Filleting rooms (number and maximum production):			Maximum production:	t / day	
Salting basins (number and capacity):			Total capacity:	t / day	
Facilities for drying (number and capacity):			Total capacity:	t / day	
Ice machines (number and capacity):			Total capacity:	t / day	
Other					
<i>Main markets:</i>					
Market:	Number of clients:		Products/species:	Sales system (periodicity of purchases / means of transportation / representation / etc.):	
	Fixed	Occasional:			
<i>Suppliers of raw material (fish):</i>					
	Type:	Number:		Part of total volume	Remarks:
		IRM:	Foreign:		
Own industrial vessels					
Chartered vessels:					
Own canoes:					
Chartered canoes:					
Wholesalers/fishmongers:					
Independent fishermen:					
Other:					
<i>Details of the contracts with chartered artisanal fishermen</i>					
Duration of contract			Verbal or written contract:		Official of Ministry:
					YES NO
Services provided by fisherman:			Services provided by company:		Number of camps
Other conditions:					
<i>Other types of prefinancing to fishermen or wholesalers:</i>					
Remarks:					

Marketing survey

Questionnaire to fishermen / boat owners and analysis of a fishing unit

Date of interview, Day Month Year			N°				
Interviewer.			Name of owner of fishing unit / interviewee				
Place of interview (zone and region/town).			Total number of fishing units owned				
			Identification of surveyed fishing unit:				
Kind of activities performed by the fishing unit (all types of fishery in the past 12 months)							
<input type="checkbox"/> Sole		<input type="checkbox"/> Jewfish		<input type="checkbox"/> Pelagic fish			
<input type="checkbox"/> Mullet		<input type="checkbox"/> Cuttlefish / squid		<input type="checkbox"/> Octopus			
<input type="checkbox"/> Lobster		<input type="checkbox"/> Other high-value fishes		<input type="checkbox"/> Others			
Specify							
<i>Clients / main markets:</i>							
Species / products.	Client / market	Number of clients	Pricing process:				
			Market / sale to best offer	Bargaining / amicable negotiation	10-day periods SMCP	Price fixed by contract	Other
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Details on agreements/deals/contracts with clients (wholesalers/plants):</i>							
<i>1) CONTRACT WITH (wholesaler or plant):</i>			<i>TARGETED SPECIES:</i>				
Type of agreement		Verbal agreement <input type="checkbox"/>	Written contract <input type="checkbox"/>	System of accounts and vouchers <input type="checkbox"/>	Other <input type="checkbox"/>		
Financing / advances:		General prefinancing <input type="checkbox"/>		Investment credit (boat, engine, gear - specify on page 2) <input type="checkbox"/>			
		Advance on production - accounts settled immediately after fishing trip <input type="checkbox"/>		Advance on production - accounts settled once every 15 or 30 days <input type="checkbox"/>			
Payment to fisherman.		Sale of entire production <input type="checkbox"/>	Prioritary sale / certain species <input type="checkbox"/>	No conditions for sale <input type="checkbox"/>			
Duration		Contract for a year or a season <input type="checkbox"/>	Until financing is paid back <input type="checkbox"/>	Unlimited <input type="checkbox"/>			
		Renewable <input type="checkbox"/>					
Other conditions							
<i>2) CONTRACT WITH (broker or plant):</i>			<i>TARGETED SPECIES:</i>				
Type of agreement		Verbal agreement <input type="checkbox"/>	Written contract <input type="checkbox"/>	System of accounts and vouchers <input type="checkbox"/>	Other <input type="checkbox"/>		
Financing / advances:		General prefinancing <input type="checkbox"/>		Investment credit (boat, engine, gear - specify on page 2) <input type="checkbox"/>			
		Advance on production - accounts settled immediately after fishing trip <input type="checkbox"/>		Advance on production - accounts settled once every 15 or 30 days <input type="checkbox"/>			
Payment to fisherman.		Sale of entire production <input type="checkbox"/>	Prioritary sale / certain species <input type="checkbox"/>	No conditions for sale <input type="checkbox"/>			
Duration		Contract for a year or a season <input type="checkbox"/>	Until financing is paid back <input type="checkbox"/>	Unlimited <input type="checkbox"/>			
		Renewable <input type="checkbox"/>					
Other conditions							

Marketing survey

Questionnaire to fishermen / boat owners and analysis of a fishing unit

Date of Interview: Day Month Year			N°		
Interviewer:			Name of owner of fishing unit / interviewee:		
Place of interview (zone and region/town):			Identification of surveyed fishing unit:		
Details on financing and operational costs INFORMATION ON ONE BOAT AND CURRENT FISHING ACTIVITY					
Current fisheries:				Duration of season (which months?):	
Production by fishing trip - catches last trip (DATE:):					
Species:		Kg:		Price:..... UM/kg	
Species:		Kg:		Price:..... UM/kg	
Species:		Kg:		Price:..... UM/kg	
Species:		Kg:		Price:..... UM/kg	
Boat:	Type:.....	Length:.....	Year of purchase:.....	Price UM:.....	
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	
Engine:	Type:.....	Horse power:.....	Year of purchase:.....	Price UM:.....	
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	
Maintenance and servicing boat and engine (average costs per season) UM:.....					
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	
Gear:	Type:.....	Number:.....	Average life of gear:.....	Price/piece UM:.....	
	Type:.....	Number:.....	Average life of gear:.....	Price/piece UM:.....	
	Type:.....	Number:.....	Average life of gear:.....	Price/piece UM:.....	
Estimate of total cost of gear per seasonUM (including replacement and repair)					
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	
Crew:	Number of crew:..... (including captain)		System of remuneration:.....		
Dockers, guards and other labor:	System of remuneration:.....				
Total cost per season UM:.....					
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	
Fishing trip: Duration:	days	Number of fishing trips per month:.....	Number of fishing trips in a season:.....		
Cost of fuel / fishing trip UM:.....		Other expenses (ice, food, etc) per fishing trip UM:.....			
.....					
.....					
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	
Other expenses (right to access, fees, insurance, FNP shares, etc.) per season UM:.....					
.....					
Credit/financing by:	Self: <input type="text"/>	Client: <input type="text"/>	Other: <input type="text"/>	specify who:.....	

EMPLOYMENT IN THE FISHERIES SECTOR IN NOUADHIBOU

Sectors / groups of professions	Number of establishments / independent operators	Associates and permanent employees (including the employer if an individual)	Occasional employees	Total number of persons working in the profession
ARTISANAL FISHERIES				
Boat builders and owners	780	-	-	-
Boat owners	180	180	-	180
Captains	180	600	-	600
Crew	-	3,120	-	3,120
SUBTOTAL ARTISANAL FISHERIES	1,140	3,900	-	3,900
INDUSTRIAL FISHERIES				
Vessel owners (and consignors) / national fleet	25	-	-	-
Crew (officers, seamen, workers)	-	2,002	-	2,002
Administration (land-based)	-	150	-	150
Vessel owners / pelagic fleet	5	-	-	-
Crew (officers, seamen, workers)	-	855	-	855
Administration (land-based)	-	30	-	30
Foreign fleet / IU	170	-	-	-
Crew (officers, seamen, workers)	-	549	-	549
SUBTOTAL INDUSTRIAL FISHERIES	200	3,586	-	3,586
EXPORTS				
Licensed export companies	30	803	217	1,020
Other exporters (transit, subcontracting and storage) except for the subregion	12	96	84	180
SUBTOTAL EXPORTS	42	899	301	1,200
FISHERIES INDUSTRY				
Production and sales of packing materials	4	14	-	14
Production - fishing gear	8	53	8	66
Construction - vessels/boats	1	6	-	6
Production - ice	2	6	-	6
Production - other	-	-	-	-
SUBTOTAL FISHERIES INDUSTRY	15	114	8	122
PROCESSING AND FRESH FISH TRADE				
Bait vendors	-	-	-	-
Artisanal fish processors	376	411	12	423
Wholesale fresh fish traders	915	2,300	1,358	3,658
Retailers (fishmongers, street vendors)	115	173	14	187
Fish cleaners	21	21	-	21
SUBTOTAL PROCESSING AND FISH TRADE	1,427	2,905	1,384	4,289
FISHERIES TRANSPORT				
Consignments and maritime transport (for export)	5	278	50	328
Transport (canoe)	50	100	-	100
Transport (horsecart)	393	393	-	393
Transport (car / pickup van)	105	130	-	130
SUBTOTAL FISHERIES TRANSPORT	553	901	50	951
FISHERIES COMMERCE				
Ship chandlers (IF)	5	60	0	60
Commerce - fishing gear and spare parts	159	322	5	327
Commerce - fuel	23	40	-	40
Commerce - other	1	2	-	2
SUBTOTAL FISHERIES COMMERCE	188	424	11	435
FISHERY SERVICES				
Repair and maintenance shops (including IF shipyards)	27	103	10	113
Other services	23	97	50	127
TOTAL FISHERY SERVICES	50	200	60	260
OTHER OCCUPATIONS IN FISHERIES				
Dockers / harbor related labor	46	510	40	550
Guards	102	102	-	102
Others	3	3	-	3
SUBTOTAL OTHER PROFESSIONS IN FISHERIES	151	615	40	655
TOTAL DIRECT EMPLOYMENT	3,766	15,544	1,837	15,387
INDIRECT EMPLOYMENT				
Restaurants, cafeterias and snack carts	42	82	-	82
Small shops and food vendors (other than fish)	58	86	-	86
Street retailers - street vendors	120	110	10	120
Other vendors	19	19	-	19
Phone services	12	15	-	15
Taxi	80	80	-	80
TOTAL INDIRECT EMPLOYMENT	331	392	10	402
GRAND TOTAL NOUADHIBOU	4,097	15,936	1,847	15,783

EMPLOYMENT IN OF THE FISHERIES SECTOR IN NOUAKCHOTT

<i>Sectors / groups of professions</i>	<i>Number of establishments / independent operators</i>	<i>Associates and permanent employees (including the employer if an individual)</i>	<i>Occasional employees</i>	<i>Total number of persons working in the profession</i>
ARTISANAL FISHERIES				
Boat builders and owners	600	-	-	-
Boat owners	130	140	-	140
Captains	130	460	-	460
Crew	-	2,700	-	2,700
SUBTOTAL ARTISANAL FISHERIES	860	3,300	-	3,300
INDUSTRIAL FISHERIES				
Vessel owners (and consigners) / national fleet	-	-	-	-
Crew (officers, seamen, workers)	-	-	-	-
Administration (land based)	-	-	-	-
Vessel owners / pelagic fleet	-	-	-	-
Crew (officers, seamen, workers)	-	-	-	-
Administration (land based)	-	-	-	-
Foreign fleet / EU	-	-	-	-
Crew (officers, seamen, workers)	-	-	-	-
SUBTOTAL INDUSTRIAL FISHERIES	-	-	-	-
EXPORTS				
Licensed export companies	16	576	555	1,131
Other exporters (transit, subcontracting and storage) except for the subregion	15	111	126	230
SUBTOTAL EXPORTS	31	720	681	1,401
FISHERIES INDUSTRY				
Production and sales of packing materials	1	41	1	42
Production - fishing gear	-	-	-	-
Construction - vessels/boats	3	45	8	53
Production - ice	3	20	-	20
Production - other	-	-	-	-
SUBTOTAL FISHERIES INDUSTRY	7	106	9	115
PROCESSING AND FRESH FISH TRADE				
Wharf vendors	20	70	-	70
Artisanal fish processors	120	200	100	300
Wholesale fresh fish traders	300	450	100	550
Retailers (fishmongers, on-spot vendors)	840	840	-	840
Fish cleaners	280	280	-	280
SUBTOTAL PROCESSING AND FISH TRADE	1,560	1,840	200	2,040
FISHERIES TRANSPORT				
Consignments and maritime transport (for export)	-	-	-	-
Transport (canoe)	-	-	-	-
Transport (horse cart)	100	100	-	100
Transport (car / pickup van)	13	26	-	26
SUBTOTAL FISHERIES TRANSPORT	113	126	-	126
FISHERIES COMMERCE				
Ship chandlers (IF)	-	-	-	-
Commerce - fishing gear and spare parts	4	12	-	12
Commerce - fuel	16	39	8	47
Commerce - other	-	-	-	-
SUBTOTAL FISHERIES COMMERCE	20	51	8	59
FISHERY SERVICES				
Repair and maintenance shops (including IF shipyards)	16	63	-	63
Other services	20	81	-	81
TOTAL FISHERY SERVICES	36	144	-	144
OTHER OCCUPATIONS IN FISHERIES				
Dockers / barber-related labor	-	450	50	500
Guards	-	-	-	-
Others	-	-	-	-
SUBTOTAL OTHER PROFESSIONS IN FISHERIES	-	450	50	500
TOTAL DIRECT EMPLOYMENT	2,640	6,717	948	7,685
INDIRECT EMPLOYMENT				
Restaurants, cafeterias and snack carts	20	72	-	72
Small shops and food vendors (other than fish)	32	128	-	128
Small retailers - street vendors	50	50	-	50
Other vendors	-	-	-	-
Phone services	3	6	-	6
Taxi	180	180	-	180
TOTAL INDIRECT EMPLOYMENT	285	436	-	436
GRAND TOTAL NOUAKCHOTT	2,925	7,173	948	8,121

APPENDIX IV

"PROFIT AND LOSS ACCOUNTS" FOR FIVE MAIN TYPES OF FISHERIES

- Octopus pots in NDB (1-7 day trips)
- Hand lines and longlines in NKC (1-7 day trips)
- Gillnets (for jewfish fishing) in NKC, Southern Zone of Cap Timris and south (one-day trips)
- Flatfish gillnets (for sole fishing) in NDB (one-day trips)
- Rays and sharks nets in the PNBA

PROFIT AND LOSS ACCOUNT: MINIMUM CAPTURES FOR IRR > 15% AND MONTHLY CREW SALARY > 10,000 UM		
NOUADHIBOU OCTOPUS POTS / 1-7 DAY TRIPS		
	UM	UM
INVESTMENTS		
Canoe	1,500,000	
Engine	600,000	
TOTAL INVESTMENTS		2,100,000
REVENUE:		
Annual catch (kg)	2,940	
Price/kg	700	
TOTAL REVENUE		2,058,000
OPERATIONAL COSTS		
Octopus pots	204,000	
Fuel	525,000	
Crew	0	
Other expenses per trip	280,000	
Maintenance and repairs - canoe and engine	210,000	
Guards, checkers, etc	300,000	
Storage and plot	42,000	
Taxes and fees	85,150	
TOTAL COSTS		1,646,150
CASH FLOW *)		411,850
DEPRECIATION		
Canoe	150,000	
Engine	120,000	
TOTAL DEPRECIATION		270,000
NET RESULT		141,850
MONTHLY NET RESULT (operational months)	14,185	

* Cash flow is defined here without considering installments to pay back for financing the investment

TERMS AND ASSUMPTIONS	
Season:	
Octopus fishing	
Gear: octopus pots	
Season duration (No. of operational months):	10
Trips/year:	35
Average catch/trip (kg):	84
Average price:	700
Material:	
Set of octopus pots (60 traps):	17
Price/set of pots (UM):	15,000
Gear life (months):	15
Canoe:	Plast. 11 m.
Economic life span (years):	10
Engine:	Yamaha 40 CV
Economic life span (years):	5
Maintenance and repair in % of investment	10%
Crew:	
Nationality of owner:	IRM
Number of crew (owner excluded):	6
Crew is paid for utilization of their own pot traps (financed by the owner). The owner buys 50% of their production at reduced prices (25-30% less than the market price). Therefore there is no labor cost in this calculation.	
Operational costs:	
	UM
Fuel cost per trip:	15,000
Other expenses per trip:	8,000
Guards and checkers (month):	30,000
Storage and plot at port (month):	3,500
EPBR taxes (month):	1,500
FNP fees (tonne)	1,500
City taxes (year):	4,000
Tax percentage:	3%
IRR	15%

MINIMUM MONTHLY CATCH VALUES PER SEAMEN (MONTHLY SALARY > 10,000 UM)			
		UM	UM
Catch sold to owner with a 30% discount:	130 kg	490	63,700
Catch sold at market prices	130 kg	700	91,000
Annual catch per seaman:	260 kg		154,700
Annual cost of pot trap sets (per seaman)	2 sets	15,000	30,000
Annual net result per seaman:			124,700
Monthly result (operational months):			12,470
Monthly result (12 months):			10,392

MINIMUM ANNUAL CATCH PER PIROGUE		Kg
Catch - owner		2,940
Catch - seamen		1,560
CATCH		4,500

PROFIT AND LOSS ACCOUNT: MINIMUM CAPTURES FOR IRR > 15% AND MONTHLY CREW SALARY > 10,000 UM		
NOUAKCHOTT HAND LINES AND LONGLINES / 1-7 DAY TRIPS		
	UM	UM
INVESTMENTS		
Canoe	200,000	
Engine	300,000	
TOTAL INVESTMENTS		500,000
REVENUE:		
Annual catch (kg)	5,400	
Price/kg	510	
Additional catch (kg)	45	
Price/kg	730	
SALES REVENUE:		2,754,000
VALUE IN KIND (FISH)		32,850
TOTAL REVENUE		2,786,850
OPERATIONAL COSTS		
Gear	70,000	
Fuel	1,120,000	
Other expenses of the trip	560,000	
Dockers (in fish)	140,000	
Crew	604,281	
Maintenance and repair - canoe and	75,000	
Storage, etc	-48,000	
Taxes and fees	54,000	
TOTAL COSTS		2,671,281
CASH FLOW *)		115,569
DEPRECIATION		
Canoe	20,000	
Engine	60,000	
TOTAL DEPRECIATION		80,000
NET RESULT		35,569
MONTHLY NET RESULT (operational months, including part of crew)	19,553	

* Cash flow is defined here without considering installments to pay back for financing the investment

IRR	19%
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TERMS AND ASSUMPTIONS		
Season:		
5-7 days trips		
Engines: Hand lines and longlines		
Season duration (No. of operational months): 8		
Trips/year: 28		
Average catch/trip (kg) for sales (and dockers): 193		
Average price (UM/kg): 510		
Additional catches/trip (kg): 45		
Average price (UM/kg): 730		
Species:	% volume	Average price
White grouper	12%	1630
Sea bream	37%	500
Bluefish	27%	180
Others	24%	340
Material:		
Hand lines and longlines: 15 + 10		
Annual cost: 70,000		
Canoe: Wooden 10 m.		
Economic life span (years): 10		
Engine: Yamaha 25 CV		
Economic life span (years): 5		
Maintenance and repair in % of investment: 15%		
Crew:		
Nationality of owner: Senegal		
Number of crew (including captain / owner): 6		
Crew is paid "m parts": 1 part for the vessel, 1 part for the engine, and 1 part for each seaman.		
Dockers and guards are paid in fish (3-5 kg white grouper or 10-15 kg pandora sea bream).		
part of the catch, about 45 kg at a value of 33,000 UM, is given before the distributor to friends and family of the captain		
Operational costs:		
UM		
Fuel cost per trip: 40,000		
Other expenses per trip: 20,000		
Guards, checkers, dockers, etc. (trip): 5,000		
Storage, etc. in port (month): 4,000		
Harbor fees (month): 1,500		
FNP shares (trip, per foreign seaman): 1,500		
City taxes (year): 4,000		
Other expenses: 0		

SEAMEN SALARIES	
	UM
Annual remuneration of crew (6 including captain / owner)	725,138
Captain / owner's part:	120,856
Annual net result per seaman:	120,856
Monthly result (operational months):	15,107
Monthly result (12 months):	10,071

MINIMUM ANNUAL CATCH PER PIROGUE	
	Kg
CATCH	5,400

PROFIT AND LOSS ACCOUNT: MINIMUM CAPTURES FOR IRR > 15% AND MONTHLY CREW SALARY > 10,000 UM		
CAP TIMRIS - NOUAKCHOTT - SOUTH GILL NET (JEWFISH) / ONE-DAY TRIPS		
	UM	UM
INVESTMENTS		
Canoe	1,800,000	
Engine	600,000	
TOTAL INVESTMENTS		2,400,000
REVENUE:		
Annual catch (kg)	16,560	
Price/kg	250	
TOTAL REVENUE:		4,140,000
OPERATIONAL COSTS		
Gear	250,000	
Fuel	690,000	
Crew	1,777,778	
Other expenses per trip	690,000	
Maintenance and repair - canoe and engine	240,000	
Guards, dockers etc.	0	
Storage and plot, etc.	0	
Taxes and fees	13,000	
TOTAL COSTS		3,660,778
CASH FLOW *)		479,222
DEPRECIATION		
Canoe	180,000	
Engine	120,000	
TOTAL DEPRECIATION		300,000
NET RESULT		179,222
MONTHLY NET RESULT (operational months)	19,914	

* Cash flow is defined here without considering installments to pay back for financing the investment

TERMS AND ASSUMPTIONS	
Season:	
One-day trips	
Gear: Gillnets / fixed gillnets	
Season duration (No. of operational months):	9
Trips/year:	230
Average catch/trip (kg)	72
Average price:	250
Material:	
Gill nets:	11
Annual cost:	250,000
Canoe:	Plast. 12 m.
Economic life span (years):	10
Engine:	Yamaha 40 CV
Economic life span (years):	5
Maintenance and repair in % of investment	10%
Crew:	
Nationality of owner:	IRM
Number of crew (including captain; owner does not go out fishing):	5
Crew is paid "in parts"; 1/3 for fishing gear, and 2/3 shared among the fishermen and the fishing unit	
Operational costs:	
Fuel cost per trip:	UM 3,000
Other expenses per trip:	3,000
Guards, checkers, dockers, etc. (trip):	-
Storage, etc. in port (month):	-
Harbor fees (month):	1,000
City taxes (year):	4,000
Other expenses:	0
IRR	15%

SEAMAN SALARIES	
	UM
Annual remuneration of crew:	1,777,778
Annual net result per seaman:	355,556
Monthly result (operational months):	39,506
Monthly result (12 months):	29,630
MINIMUM ANNUAL CATCH PER PIROGUE	
	Kg
CATCH	16,560

PROFIT AND LOSS ACCOUNT: MINIMUM CAPTURES FOR IRR > 15% AND MONTHLY CREW SALARY > 10,000 UM		
NOUADHIBOU FLATFISH GILL NET (SOLE) 7 ONE-DAY TRIPS		
	UM	UM
INVESTMENTS		
Canoe	1,400,000	
Engine	600,000	
TOTAL INVESTMENTS		2,000,000
REVENUE:		
Annual catch - soles (kg)	5,450	
Price/kg	550	
Annual catch - other species (kg)	6,600	
Price/kg	100	
TOTAL REVENUE		3,657,500
OPERATIONAL COSTS		
Gear	550,000	
Fuel	330,000	
Other expenses per trip	412,500	
Crew	1,554,667	
Maintenance and repair - canoe and Guards, dockers etc.	200,000	
Storage, etc.	187,000	
Taxes and fees	0	
	26,000	
TOTAL COSTS		3,260,167
CASH FLOW *)		397,333
DEPRECIATION		
Canoe	140,000	
Engine	120,000	
TOTAL DEPRECIATION		260,000
NET RESULT		137,333
MONTHLY NET RESULT (operational months, including part of crew)		47,818

* Cash flow is defined here without considering installments to pay back for financing the investment

TERMS AND ASSUMPTIONS	
Season:	
One-day trips	
Gear: Flatfish gillnets (soles)	
Season duration (number of operational months):	11
Trips/year:	165
Average catch/trip - soles (kg) :	33
Average price:	550
Average catch/trip - other species (kg):	40
Average price:	100
Material:	
Nets:	125
Annual cost:	550,000
Canoe:	Plast. 10 m.
Economic life span (years):	10
Engine:	Yamaha 40 CV
Economic life span (years):	5
Maintenance and repair in % of investment	10%
Crew:	
Nationality of owner:	IRM
Number of crew (including captain / owner):	5
Crew is paid "in parts"; 1/3 for fishing gear, and 2/3 shared among the fishermen and the fishing unit	
Operational costs:	
	UM
Fuel cost per trip:	2,000
Other expenses per trip:	2,500
Guards, checkers, dockers, etc. (trip):	17,000
Storage, etc. in port (month):	-
Harbor fees (month):	2,000
City taxes (year):	4,000
Other expenses:	0

IRR	15%
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SEAMAN SALARIES	
	UM
Annual remuneration of crew (5 including captain / owner):	1,943,333
Captain / owner's part:	388,667
Annual net result per seaman:	388,667
Monthly result (operational months):	35,333
Monthly result (12 months):	32,389
MINIMUM ANNUAL CATCH PER PIROGUE	
	Kg
Catch - soles	5,450
Catch - other species	6,600
CATCH	12,050

PROFIT AND LOSS ACCOUNT: MINIMUM CAPTURES FOR IRR > 15% AND MONTHLY CREW SALARY > 10,000 UM		
PNBA RAYS AND SHARKS		
	UM	UM
INVESTMENTS		
Sailboat	1,400,000	
TOTAL INVESTMENTS		1,400,000
REVENUE:		
Annual catch - rays and sharks (kg)	7,980	
Price/kg	150	
Annual catch - other species (kg)	840	
Price/kg	85	
TOTAL REVENUE		1,268,400
OPERATIONAL COSTS		
Gear	448,000	
Crew	475,650	
Other expenses per trip:	71,400	
Maintenance and repair - sailboat	49,000	
Other expenses	0	
TOTAL COSTS		1,044,050
CASH FLOW *)		224,350
DEPRECIATION		
Sailboat	70,000	
TOTAL DEPRECIATION		70,000
NET RESULT		154,350
MONTHLY NET RESULT (operational months, including part	52,150	

* Cash flow is defined here without considering installments to pay back for financing the investment

TERMS AND ASSUMPTIONS	
Season:	
1-2 day trips	
Gear: Nets	
Season duration (No. of operational months)	6
Trips/year:	42
Average catch/trip - rays and sharks (kg):	190
Average price:	150
Average catch/trip - other species (kg):	20
Average price:	85
Material:	
Nets:	?
Annual cost:	448,000
Sailboat:	Lanche
Economic life span (years):	20
Maintenance and repair in % of investment	3.5%
Crew:	
Nationality of owner:	IRM
Number of crew (including captain / owner):	4
50% of the total production remains with the owner, the other 50% is shared among the captain and the crewmembers	
Operational costs:	UM
Other expenses per trip:	1,700
Other expenses:	

IRR	15%
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SEAMAN SALARIES	
	UM
Annual remuneration of crew (4 including captain / owner):	634,200
Captain / owner's part:	158,550
Annual net result per seaman:	158,550
Monthly result (operational months):	26,425
Monthly result (12 months):	13,213
MINIMUM ANNUAL CATCH PER MOTORBOAT	
	Kg
Catch - rays and sharks	7,980
Catch - other species	840
CATCH	8,820

8.II. CURRENT STATUS OF THE ARTISANAL FISHERY

8.II.1 Objectives

For the reasonable management measures of the fishery resources, it is necessary to estimate the level of utilization of the stock by species as well as to understand accurately the standing stock in the target zone. But, as for the information utilized for the estimation of the current status of fisheries in the IRM, the available information on the artisanal fisheries, especially the catch and size by species, is shortage with comparing the industrial fisheries. For this reason, a field survey was conducted as part of the Landing Site Survey, interviewing people and taking measurements and weighing samples of fish species being landed at fishing villages and fishermen encampments scattered along the coast, and focusing on measuring the length of specimens of the key species targeted in this study. Information was also collected regarding fishing methods and gear used. Some aspects regarding regional characteristics of the fisheries and marketing were also covered by the survey but since these issues are dealt with in chapter 8.I, the findings are not reported here.

8.II.2 Methodology

(1) Survey timetable and duration

The survey was carried out at 2 times as follows.

1st field survey: 14 April 2001 - 29 June 2001(77 days)

2nd field survey: 25 October 2001 - 6 November 2001(43 days)

(2) Survey sites

Towns, fishing villages and fishermen encampments surveyed are shown in Figure 8.II.1. The activities performed in each of those communities are listed in Table 8.II.1.

It should be noted that the survey also attempted to evaluate the importance of the inland water fishery (Basin of the Senegal river and the artificial lakes) even though the overall terms of reference for the Study do not cover this area. A list of the exploitable species is available (see Appendix 8.II.1). However, the basic data for assessing a sustainable exploitation are not available.

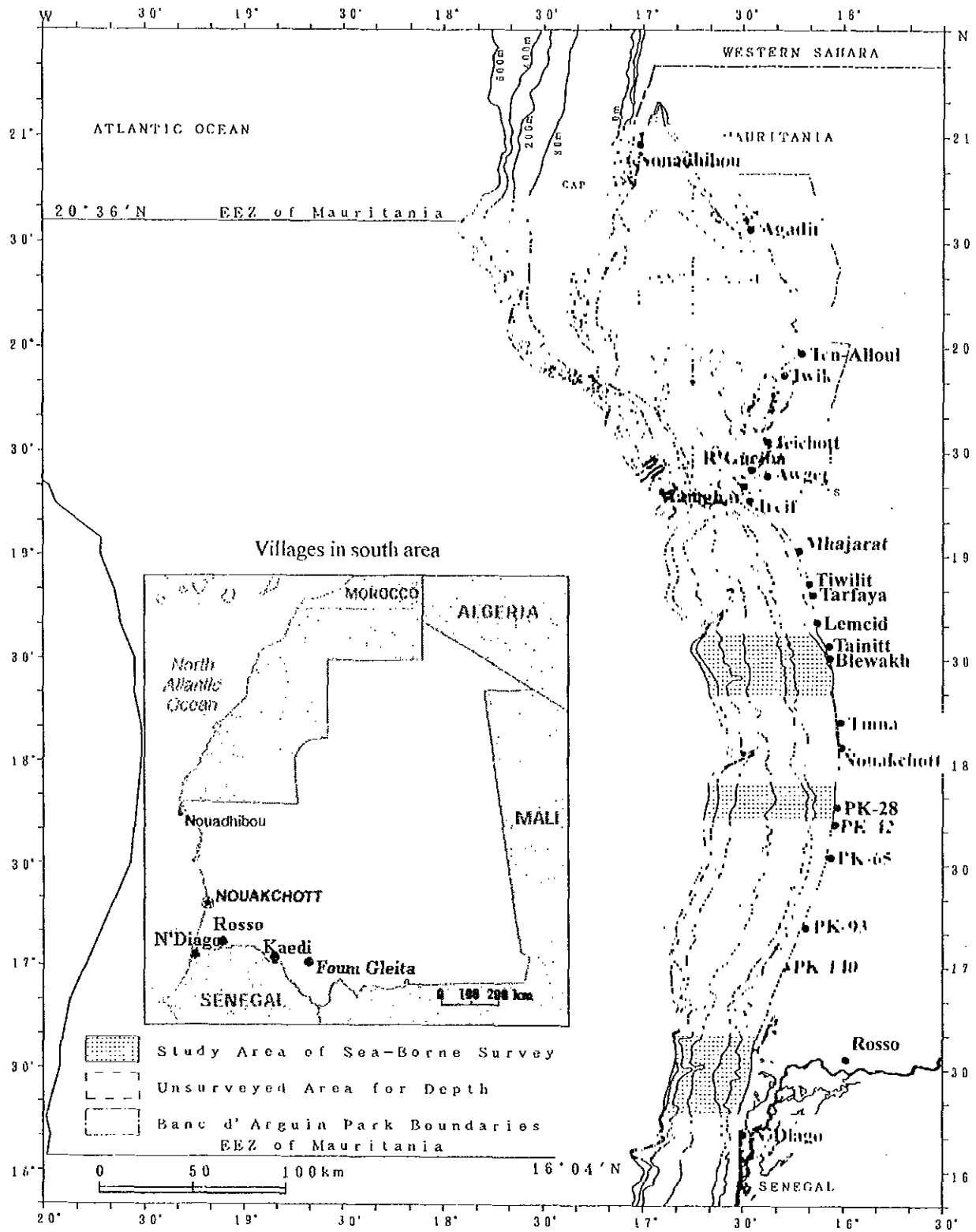


Figure 8.II.1 Field survey localities.

Table 8.II.1 Field survey localities and activities performed.

Region	Location	1 st field survey			2 nd field survey		
		IS	BLM	BWM	IS	BLM	BWM
PNBA	Agadir	x	x		x	x	
	Ten-Alloul	x	x	x	x	x	x
	Iwik	x	x	x	x	x	x
	Teichott	x	x	x	x	x	x
	R'Guciba	x	x		x	x	
	Awgej				x	x	
Between PNBA and NKC	Mamghar	x	x	x	x	x	x
	Jreif	x	x		x	x	
	Mhajarat	x	x		x		
	Tiwilit	x	x		x	x	
	Lemcid	x	x		x	x	
	Blewakh	x	x	x	x	x	x
	Tinna	x	x		x		
Moving camps	Tarfaya	x	x	x	x		
	Tainitt	x	x		x		
	PK-28	x	x	x	x	x	x
	PK-42	x	x		x	x	x
	PK-65	x	x				
	PK-93	x	x		x		
Villages in south area	PK-140	x	x	x	x	x	
	Rosso	x					
	N'Diago	x	x				
	Kaedi				x		
NDB	Foum Gleita				x		
	NDB	x	x		x	x	
NKC	Fish market	x	x	x	x	x	x
	Downtown market	x					

Remarks: IS: Interview survey, BLM: Body Length Measurement, BWM: Body Weight Measurement.

(3) Survey Team personnel

The following people took part in the field survey:

CNROP:	M.Mohamed Ould Cheikh	Statistics Engineer	NDB	1 st & 2 nd
	Sidi Mohamed Ould M'Beyrick	Technician	NDB	1 st & 2 nd
	Saiko Oumar Kide	Technician	Agadir	1 st
	do.	do.	Tessot	2 nd
	O.Ahmed Salem	Helper	Ten-Alloul	1 st & 2 nd
	Abdelahi O.Ahmed	Technician	Iwik	1 st
	do.	do.	Agadir	2 nd
	Ely Ould Cheikh	Technician	R'Guieba	1 st & 2 nd
	Nouh Ould Beye	Technician	Teichott	1 st & 2 nd
	Tahirou Samba	Technician	Mamghar	1 st & 2 nd
	Talla Ismaila	Technician	Mamghar	1 st & 2 nd
	Ba Mahmoud	Technician	Blewakh	1 st & 2 nd
	Sid'Ahmed Ould Lahwal	Technician	MPN/NKC	1 st & 2 nd
	Diakite Djibril	Technician	MPN/NKC	1 st & 2 nd
	JICA:	Keizo Takahashi	Sanyo Techno Marine, Inc.	1st & 2nd

(4) Interview Survey

For the Interview Survey, different types of questionnaires¹ were distributed, directed to individual fishermen, representatives of the fishing villages and fishermen encampments, fish wholesalers, fishery companies dealing with artisanal fishermen and interested parties of the fisheries industry and in the marketplace, so as to obtain the information required by the study objective in a personal manner.

(5) Length measurement

The length of specimens belonging to key species targeted in this study was measured simultaneously with the interviews, by means of the measuring-card punching method¹. Whenever possible, the specimens were also weighed after their being measured. Also, at the landing site in NDB during the resources survey, this measurement was properly carried out by the scientists of CNROP and JICA.

8.II.3 Results

(1) Fishing activities in the different geographical areas

Table 8.II.2 presents the main target species, fishing methods, depth of fishing areas, fishing seasons, average crew size, etc. noted during the survey in the different geographical areas². Tables showing the established calendars for fishing activities are included in Appendix 8.II.2.

1) Imraguen fishing communities / PNBA: Agadir, Ten-Alloul, Iwik, Teichott, R'Gueiba and Awgej

The species targeted by the fishers in the PNBA include mullet, croakers and rays and sharks, and the fishery is seasonal. The task is to make it feasible to fish the whole year. The small, traditional Imraguen nets for capturing mullets is largely employed over shoals. Fishing grounds are located on shoals in shallow waters within the PNBA, at water depths of 5 to 15 m, extending offshore for about 2–3 nautical miles off each village.

2) Imraguen fishing communities outside the PNBA / south of Cap Timiris: Mamghar, Jreif, Mhajarat, Tiwilit, Lemeid and Blewakh

Fishing is done in pirogues powered by small community-owned outboard motors, by means of gear such as gill nets – mainly for catching croakers – lines and octopus pots, and the production is sent to NKC. The fishing grounds are located some 5-6 nautical miles off each community, at water depths of less than 20 m. Under the guidance of wholesalers, species that can easily be turned into money, such as sea breams or groupers, are caught by hand-held lines.

¹ The detailed methods refer to the GUIDE METHODOLOGIQUE DE L'EXECUTION, I. ETUDE EN MER and III. ETUDE AU SOL (JANVIER 2000) submitted to the DEARH and CNROP with the RAPPORT INITIAL (JANVIER 2000) at the start of the study.

² These geographical areas correspond to the areas identified in chapter 8.I (see table 8.I.1 and descriptions on pages 8.I-17 - 19). However, the two areas of NDB (north) and NKC have here been grouped together.

3) The area south of NKC: Tarfaya, Tainitt, PK-28, PK-42, PK-65, PK-93 and PK-140

Fishing is done in pirogues powered by small outboard motors, with gill nets and lines. These communities are organized by the export companies and move around according to the seasons, the cold season being the main fishing period. Key species are high value species, in demand by the export companies. The industry provides supplies such as fuel, meals and gear and the operations are carried out with efficiency and high yields but it was noted an important quantity of discards was noted. The fishing pressure exerted by the camp fleet is regarded as a threat to settling communities.

4) NKC and NDB / areas close to the cities

From fishing with octopus pots in NDB to the use of purse seines in NKC to catch pelagic fish, many kinds of fishing methods are reported here.

(2) Means of production in the different geographical areas

Table 8.II.3 shows the size of fishing fleet, fishing gear, fishing techniques, etc. observed during the surveys. According to the survey, there is a total of 2,364 pirogues (active and inactive). This estimate is quite close to the findings of the Baseline Surveys carried out by CNROP (see table 8.I.13). About 80% of boats were found in NDB and KNC. This result indicates strongly the biased production field as well as the importance of NDB and NKC for the artisanal fisheries production.

(3) Infrastructure for the artisanal fishery

Basic infrastructure for the artisanal fishery is practically non-existing except for in the two main cities. In NKC, there is a fish market that was constructed in 1996. In NDB, a landing site for the artisanal fishery was constructed in the same year to which a fish market has been added in 2002. In the Imraguen area south of Cap Timiris, a number of buildings and community infrastructure (meetings rooms, fish drying stands, health posts, etc) has been constructed recently with the assistance of Japanese aid.

Table 8.II.2 Fishing methods and seasons observed during the surveys.

Sub regions & fishing communities	Main target species	Fishing methods	Depth range	Fishing seasons	Average crew	Discard species
Imraguen fishing communities / PNBA Agadir, Ten-Alloul, Iwik, Teichott, R'Gueiba, Awgej	<i>Argyrosomus regius</i>	Courbine net	5 ~ 10m	Dec. ~ May	4	
	<i>Mugil cephalus</i>	Imraguen net	5m	Sep. ~ Dec.	4	
	<i>Pagrus caeruleostictus</i>	Line fishing	10m	Nov. ~ Dec.	4	
	<i>Epinephelus aeneus</i>	Line fishing	10m	May ~ Sep.	4	
	<i>Arius sp.</i>	Courbine net	5 ~ 10m	Dec. ~ May	4	
	<i>Rhizoprionodon acutus</i>	Courbine net	5 ~ 10m	Dec. ~ May	4	
	<i>Sparus aurata</i>	Imraguen net	5m	Sep. ~ Dec.	4	
Imraguen fishing communities outside the Park / south of Cap Timiris Mamghar, Jreif, Mhajarat, Tiwilit, Lemcid, Blewakh	<i>Argyrosomus regius</i>	Courbine net	5 ~ 10m	Feb. ~ Oct.	3 ~ 4	
	<i>Mugil cephalus</i>	Imraguen net	5m	Nov. ~ Jan.	3 ~ 4	<i>Ethmalosa fimbriata</i>
	<i>Octopus vulgaris</i>	Octopus pot / Hocking	10 ~ 25m	Jun./Jul. Nov./Dec.	3 ~ 4	<i>Rhinoptera marginata</i>
	<i>Pagrus caeruleostictus</i>	Line fishing	10 ~ 25m	Apr. ~ Jun.	3 ~ 4	<i>Rhinobatos cemiculus</i>
	<i>Epinephelus aeneus</i>	Line fishing	10 ~ 25m	Apr. ~ Jun.	3 ~ 4	<i>Dasyatis pastinaca</i>
	<i>Palinurus regius</i>	Langosta net	5 ~ 10m	Nov. ~ Jan.	3 ~ 4	<i>Dasyatis marmorata</i>
	<i>Mustelus mustelus</i>	Courbine net	5 ~ 10m	Feb. ~ Oct.	3 ~ 4	
South of NKC Tarfaya, Tainitt, PK-28, PK-42, PK-65, PK-93, PK-140	<i>Octopus vulgaris</i>	Octopus pot	10 ~ 25m	Jun./Jul. Nov./Dec.	3 ~ 4	<i>Arius sp.</i>
	<i>Pagrus caeruleostictus</i>	Line fishing	10 ~ 25m	May ~ Jul.	3 ~ 4	<i>Plectorhynchus sp.</i>
	<i>Epinephelus aeneus</i>	Line fishing	10 ~ 25m	May ~ Jul.	3 ~ 4	<i>Ethmalosa fimbriata</i>
	<i>Palinurus regius</i>	Langosta net	5 ~ 10m	Apr. ~ Jun.	3 ~ 4	<i>Sardinella aurita</i>
	<i>Solea senegalensis</i>	Solea net	5 ~ 10m	Apr. ~ Jun.	3 ~ 4	<i>Rhinobatos cemiculus</i>
	<i>Argyrosomus regius</i>	Courbine net	5 ~ 10m	Apr. ~ Jun.	3 ~ 4	<i>Mustelus mustelus</i>
	<i>Sepia officinalis</i>	Solea net	5 ~ 10m	Apr. ~ Jun.	3 ~ 4	<i>Rhizoprionodon acutus</i>
NKC and NDB / areas close to the cities	<i>Octopus vulgaris</i>	Octopus pot	10 ~ 25m	Jul./Aug. Nov./Jan.	3 ~ 4	
	<i>Mugil cephalus</i>	Mulet net	10 ~ 25m	Oct. ~ Jan.	10 ~ 12	
	<i>Palinurus regius</i>	Langosta net	5 ~ 10m	Nov. ~ Dec.	3 ~ 4	
	<i>Pagrus caeruleostictus</i>	Line fishing	10 ~ 25m	Mar. ~ Nov.	3 ~ 4	
	<i>Sardinella aurita</i>	Purse seine	10 ~ 25m	Jan. ~ Oct.	10 ~ 12	
	<i>Solea senegalensis</i>	Solea net	5 ~ 10m	Nov. ~ Dec.	3 ~ 4	
	<i>Argyrosomus regius</i>	Courbine net	5 ~ 10m	Jan. ~ May	3 ~ 4	

Table 8.II.3 Means of production in the artisanal fishery observed during the surveys.

Sub regions & fishing communities	Fishing boats				Main fishing gear and spec
	Numbers	Operating	Length	HP	
Imraguen fishing communities / PNBA	85	36			Imraguen net
Agadir	7	5	8.5	No engine	- Length 60m
Tcn-Alloul	9	7	9	No engine	- Depth 1m
Ivik	16	8	9	No engine	- Mesh size 110mm
Teichott	25	10	8.5	No engine	- Nylon monofilament
R'Gueiba	22	4	8.5	No engine	
Awgej	6	2	8.5	No engine	
Imraguen fishing communities outside the PNBA / south of Cap Timiris	138	93			Courbine net
Mamghar	18	15	13	40	- Length 200m
Jreif	42	26	8.5	40	- Depth 5m
Mhajarat	22	15	12	40	- Mesh size 160mm
Tiwilit	14	10	12	40	- Cotton
Lemcid	12	7	12	40	
Blewakh	30	20	11	40	
South of NKC	241	187			Solea net
Tarfaya	17	14	9	40	- Length 100m
Taimitt	20	20	8	40	- Depth 5m
PK-28	50	20	8.5	40	- Mesh size 80mm
PK-42	46	30	8.5	40	- Nylon monofilament
PK-65	13	13	10	40	
PK-93	65	60	10	40	
PK-140	30	30	10	40	
NKC and NDB / areas close to the cities	1,900	1,000			Octopus pots
Nouadhibou	1,200	800	9	40	- Length 150m - Depth 25m - No. of pots 50
Nouakchott	700	200	9~18	40~90	

(4) Estimated annual production

In 2001, interviews were conducted in 21 villages in the inshore zone of the IRM on the actual results of monthly operations (November and December values were estimated). Among the items asked in the interview were fishing effort (number of operational boats x number of days of operation) and the quantity of fish of a given species landed by a given boat. From those quantities, the total amount of all

artisanal fishery landings in 2001 was estimated in about 14,000 tonnes³, 80% of which thought to have been landed in NDB and NKC.

However, since those estimated basic data were obtained not from written records, but from the unwritten memories of a number of fishermen and fisheries-related persons, their reliability was considered low.

(5) Prices

Table 8.II.4 shows the per kilo and unit prices of each key species as observed during the surveys in the different landing sites.

1) Inraguen fishing communities / PNBA

It was found that no single species commands a high price within the communities. In Agadir, the fishermen have developed their own transportation route leading to NDB, and its use allows for more profitable commerce there than in other communities.

2) Inraguen fishing communities outside the PNBA / south of Cap Timiris

There is a standardization of prices imposed by wholesalers, and prices for each species are about the same in all communities. When the catch is large, it is common to see discounts of 10–20% being offered. Considering the shipping charges to the NKC market, the fact that the wholesalers' price is the same in Manghar or Blewakh means that the same transportation costs are applied regardless of the communities being closer to or farther from NKC.

3) The area south of NKC

Fish prices in the camp communities are established when the company that organized the camps themselves buys the catch from the fishermen. In addition, it is said that, by the time accounts are settled with respect to operational cost loans, there is a substantial cost deduction that essentially cuts to half the common wholesaling price for those products. Therefore, a large quantity of fresh fish is drained from the camps to the wholesalers, resulting in a pressure to pull down fish prices.

4) NKC and NDB / areas close to the cities

In general, fish pricing is more profitable there in comparison with other communities. According to observations during the survey in 2001, the prices at fishing markets did not vary much and remained stable.

³ This estimated value agrees in general with the estimates for annual demersal fish production (12,000–17,000 tonnes – Table 8.I.15).

Table 8.II.4 Fish prices observed during the surveys.

Sub regions & fishing communities	Price of round fresh fish in UM / kg								Price of processed fish / kg		Price of round fresh fish in UM / individual			
	Serranidae	Sciaenidae	Spandae	Mugilidae	Soleidae	Cynoglossidae	Septidae	Octopodidae	Dried	Oiled	Sharks/rays	Clupeidae	Arridae	Palinuridae
<u>Imraguen fishing communities / PNBA</u>														
Agadir	700	150-200	300	120	-	-	-	-	50-120	1,500-2,000	50	-	50	-
Ten-Alloul	400	140	20	200	-	-	-	-	50-70	1,500-2,000	20	-	10-50	-
Iwik	400	120	150-400	150	-	-	-	-	50-70	1,500-2,000	20	-	20	-
Teichott	150	100	400	150	-	-	-	-	50-70	1,500-2,000	20	-	10	-
R'Gueiba	-	100	50-100	130	-	-	-	-	50-70	1,500-2,000	20	-	10	-
Awgej	-	100	100	120	-	-	-	-	50-70	1,500-2,000	20	-	10	-
<u>Imraguen fishing communities outside the PNBA / south of Cap Timiris</u>														
Mamghar	700	150-200	300	120	-	-	-	250-300	50-100	2,000	10-50	0	10-20	2,000
Jreif	800	180-200	300	-	250-300	250-300	-	250-300	50-100	1,500-2,000	10-50	0	10-20	1,500-2,000
Mhajarat	700-800	100-150	160	300	250-300	250-300	200-250	300	50-100	1,500-2,000	10-50	0	10-20	1,000-1,500
Tiwilit	700-800	100-150	100	300	250-300	250-300	200-250	300	50-100	1,500-2,000	10-50	0	10-20	1,000-1,500
Lemcid	700	150-200	300	-	300	300	200-350	300	100-1,500	2,000	10-50	0	10-20	1,500-2,000
Blewakh	700	200-250	300	200	300-350	300-350	200-250	-	1,000	2,000	10-50	0	10-20	1,700-2,000
<u>South of NKC</u>														
Tarfaya	800	150-200	150	-	-	-	-	250-300	100-1,500	-	10-50	0	10-50	1,500-2,000
Tainitt	800	160	150-200	-	-	-	-	250-300	120-150	-	10-50	0	10-50	1,500-2,000
PK-28	800-1,000	150-200	300-400	-	200-250	200	200	-	-	-	-	0	10-50	1,000-2,500
PK-42	700	100	200	100	200-250	200-250	200-250	-	-	-	-	0	10-50	1,000-2,500
PK-65	500	300	150	-	200-250	200	200	-	-	-	-	0	10-50	1,000-2,500
PK-93	700	100	300	100	300	200	200	-	-	-	-	0	10-50	1,000-2,500
PK-140	1,000	100-150	300	-	300	200	200	-	-	-	-	0	10-50	1,000-2,500
<u>NKC and NDB / areas close to the cities</u>														
Nouadhibou	-	200-250	50-300	50-100	-	-	-	300-350	-	-	20-50	-	10-50	2,000-3,000
MPN / Nouakchott (Consumer price)	1,300	350	300-600	150	800-1,200	800-1,000	300-350	300-350	-	-	10-50	20-30	10-50	3,500

(6) Size composition for the landed target species

Body length of target species was measured in catch landing sites in fishing villages and in NDB and NKC, in the inshore zone of the IRM, in the *cold and warm season surveys* in Phases 1 and 2 and/or in *transitional period surveys*. Target species were 14 in total: 10 fishes, 3 cephalopods and one crustacean. All those species were caught and landed by artisanal fishermen. Because of the small number of individuals and frequency of measurements by station, it was not possible to acquire size composition data separately by landing site, by fishing gear or by fishing method (see Table 8.II.2). Thus, here, size composition by species on a monthly basis in the entire Mauritanian coast (limited to NDB in Phase 1) is illustrated in Figures 8.II.2 to 8.II.15. Distinctive features of size composition for landed target species are presented below.

1) Smooth-hound *Mustelus mustelus* (Figure 8.II.2: total length class at intervals of 5 cm)

The dominant modal class and the mean size were small in October (65–70 cm class; 67 cm) and November (60–65 cm class; 65 cm). From April to June, the dominant modal class and the mean size were in the 70–95 cm and 71–89 cm ranges respectively. Frequency was low, but in May of Phase 2 the large individuals with a total length of around 150 cm were landed.

2) White grouper *Epinephelus aeneus* (Figure 8.II.3: total length class at intervals of 5 cm)

More than two modes were observed in the size composition, the dominant modal class being present between 35 and 80 cm class. The mean size was in the 46–64 cm range, and was minimal in April and maximal in May (Phase 1).

3) Meagre *Argyrosomus regius* (Figure 8.II.4: total length class at intervals of 5 cm)

More than two modes were observed in the size composition, the dominant modal class appearing below 55 cm in total length (May in both Phases; October and November in Phase 2) and above 90 cm in total length (October in Phase 1; April and June in Phase 2). The mean size was large in October in Phase 1 (125 cm) and April in Phase 2 (146 cm). In the other months, the mean size was in the 50–100 cm range.

4) West African goatfish *Pseudupeneus prayensis* (Figure 8.II.5: fork length class at intervals of 1 cm)

The dominant mode in May in Phase 2 occurred at 19–20 cm class. The mean size was 21 cm.

5) Bluespotted seabream *Pagrus caeruleostictus* (Figure 8.II.6: fork length class at intervals of 2 cm)

With the exception of October in Phase 1 (mono-modal distribution), the size composition presented more than two modes. The dominant modes were observed between 18 and 28 cm class except for 32–34 cm class in October in Phase 2. The mean size was between 25 and 29 cm except for 32 cm in October in Phase 2, without much variation. In June in Phase 2 this frequency was low, but the large individuals of over 40 cm in fork length were observed.

6) Canary dentex *Dentex canariensis* (Figure 8.II.7: fork length class at intervals of 2 cm)

The distribution pattern of the size composition was mono-modal or bi-modal depending on the month. The dominant mode was present between 30 and 34cm class in October and November in Phase 2; in other instances it was observed at class less than 30cm. The mean fork length was between 30 and 34cm in June, October and November in Phase 2; in other instances it was about 28 cm.

7) Red pandora *Pagellus bellottii* (Figure 8.II.8: fork length class at intervals of 1 cm)

The dominant mode in May, October and November in Phase 2 occurred between 21 and 24 cm class. The mean fork length for those months was 23 cm, 25 cm and 20 cm respectively.

8) Flathead mullet *Mugil cephalus* (Figure 8.II.9: fork length class at intervals of 2 cm)

The size composition was obtained for May to June and November in Phase 2. The size composition in November showed a mono-modal distribution with a mode at 50–52 cm class, and bi-modal distribution in other months. The dominant modes of the latter case were present between 40 and 44cm class in April and June, and at 24–26cm class in May. The mean fork length was, in chronological order, 43 cm, 28 cm, 38 cm and 51 cm.

9) Golden grey mullet *Liza aurata* (Figure 8.II.10: fork length class at intervals of 2 cm)

In April in Phase 2, the size composition showed three modes, respectively at 40–42 cm, 50–52 cm and 56–58 cm classes. Except for the predominant mode at 50–52 cm class, the peaks of other two modes were low. The mean fork length was 50 cm.

10) Senegalese sole *Solea senegalensis* (Figure 8.II.11: total length class at intervals of 2 cm)

Except for the month of April (when three predominant modes were present at 34–36 cm, 42–44 cm and 48–50 cm classes), the size composition showed a mono-modal or bi-modal distribution. The dominant modes in other months occurred in the 26–36cm range. The mean size was in the 32–40 cm range, with the exception of a 28 cm value in June and November in Phase 2. The mean size in April–June in Phase 2 was 40 cm, 36 cm and 28 cm respectively, decreasing in chronological order.

11) European squid *Loligo vulgaris* (Figure 8.II.12: mantle length class at intervals of 1 cm)

The dominant modal class and the mean size in May in Phase 1 were 12–13 cm and 14 cm respectively. Another mode with a low peak was observed at 19–20 cm class.

12) Common cuttlefish *Sepia officinalis* (Figure 8.II.13: mantle length class at intervals of 1 cm)

Except for the poorly sampled month of November, the size composition showed a poly-modal distribution. The dominant mode in each month was in the 17–24 cm range, and most of the landed specimens were medium size of around 20 cm. In May in Phase 2, large-size landings with a mode at 35–36cm class were observed.

13) Common octopus *Octopus vulgaris* (Figure 8.II.14: mantle length class at intervals of 1 cm)

The size composition showed a bi-modal distribution. Except in the poorly sampled month of May, landing centered on medium-size with a mode around 15 cm. In June, large individuals with a mode at

20-21 cm class were also landed.

14) Green spiny lobster *Panulirus regius* (Figure 8.II.15: total length class at intervals of 2 cm)

The size composition presented more than two modes. With the exception of May in Phase 2, with a mode in the 12–16 cm range and the mean size of 22 cm, the dominant or predominant modal class, occurred in the 20–40 cm range, with the mean size in the 27–32 cm range. Although the frequency was low in May in Phase 2, the large individuals of about 40 cm were landed in that month.

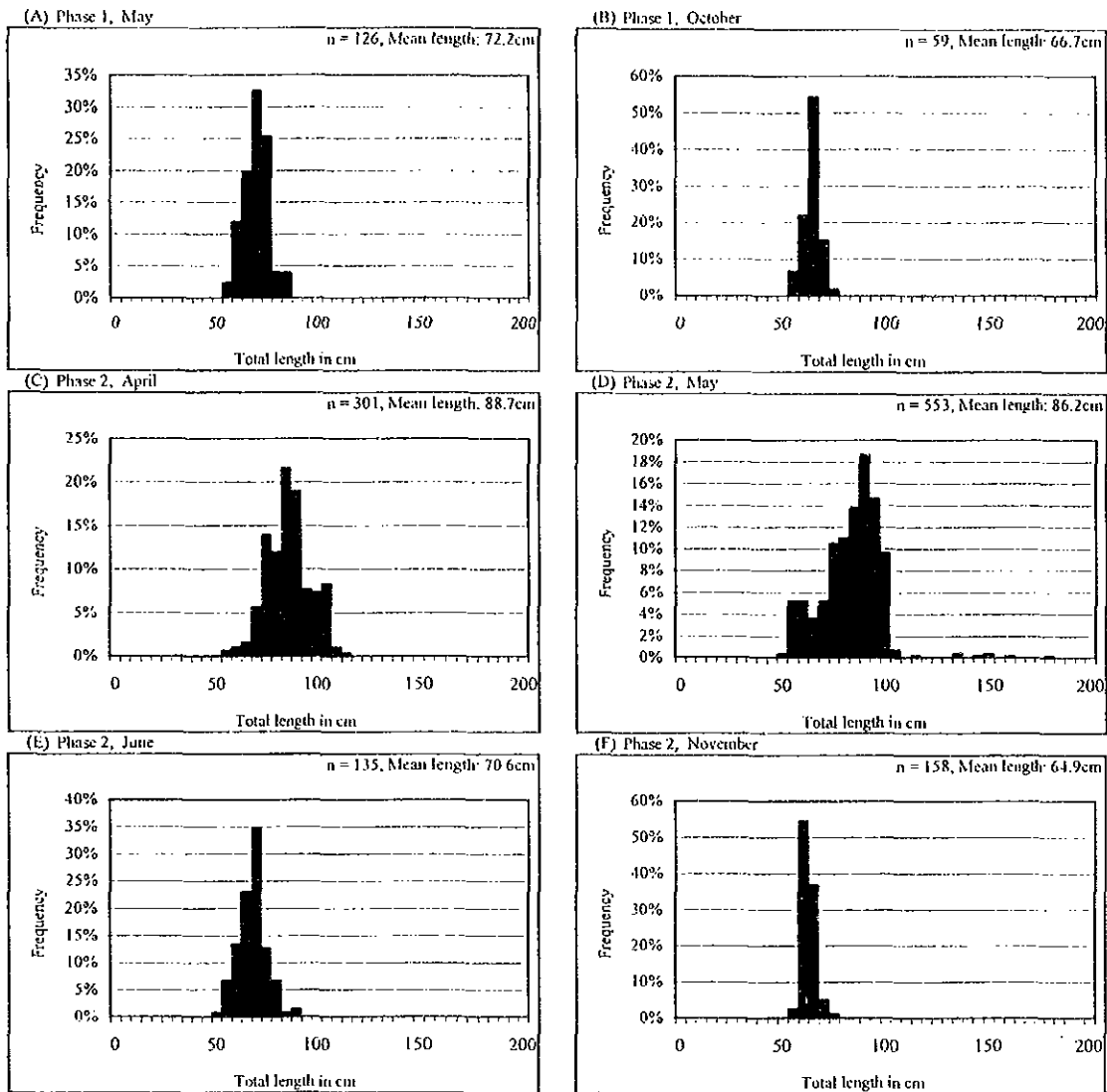


Figure 8.II.2 Size composition of landed smooth-hound *Mustelus mustelus*.

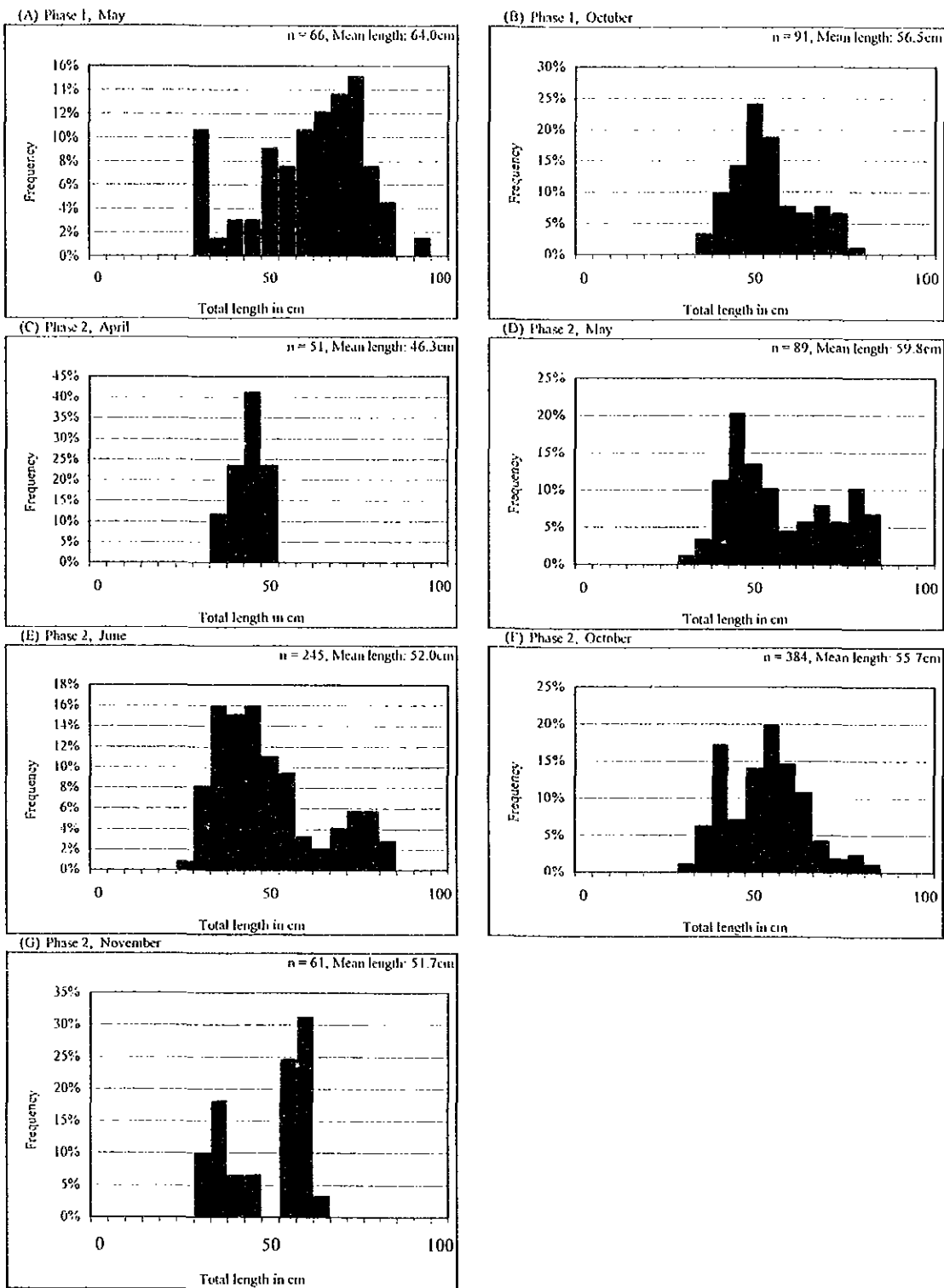


Figure 8.II.3 Size composition of landed white grouper *Epinephelus aeneus*.

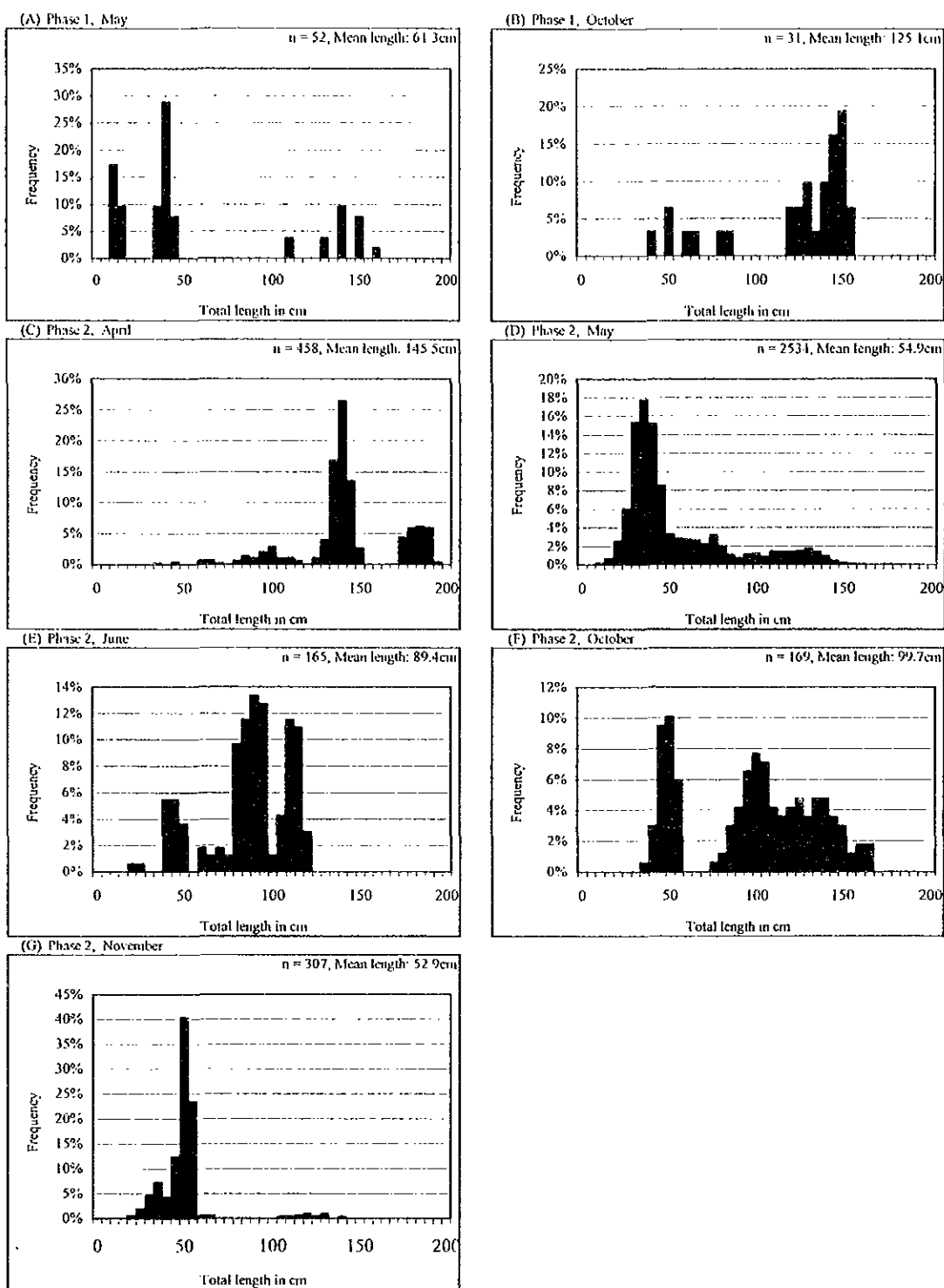


Figure 8.II.4 Size composition of landed meagre *Argyrosomus regius*.

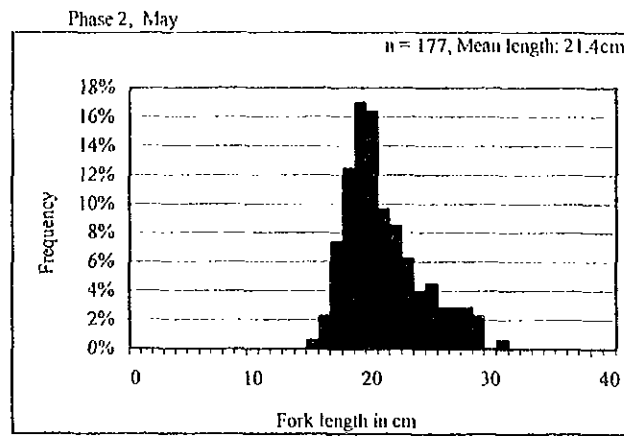


Figure 8.II.5 Size composition of landed West African goatfish *Pseudupeneus prayensis*.

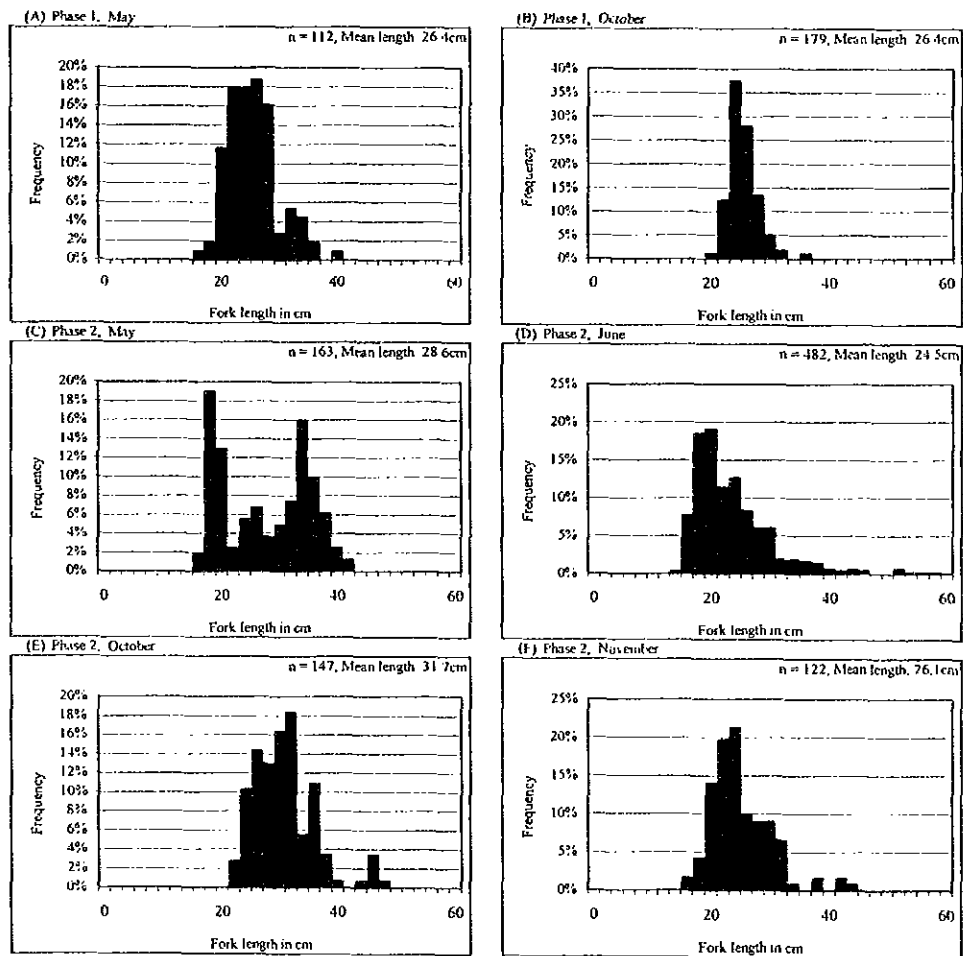


Figure 8.II.6 Size composition of landed bluespotted seabream *Pagrus caeruleostictus*.

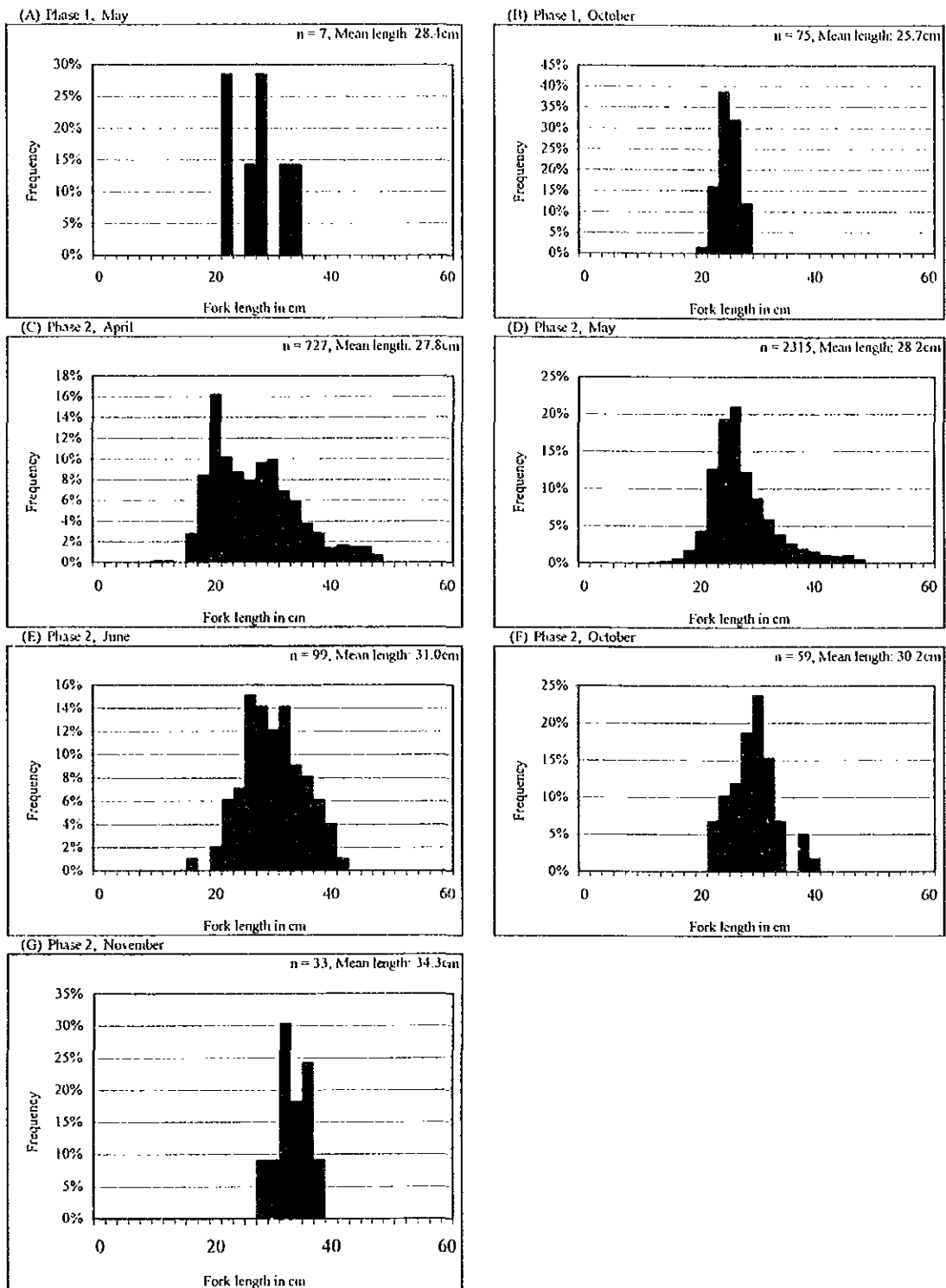


Figure 8.II.7 Size composition of landed Canary dentex *Dentex canariensis*.

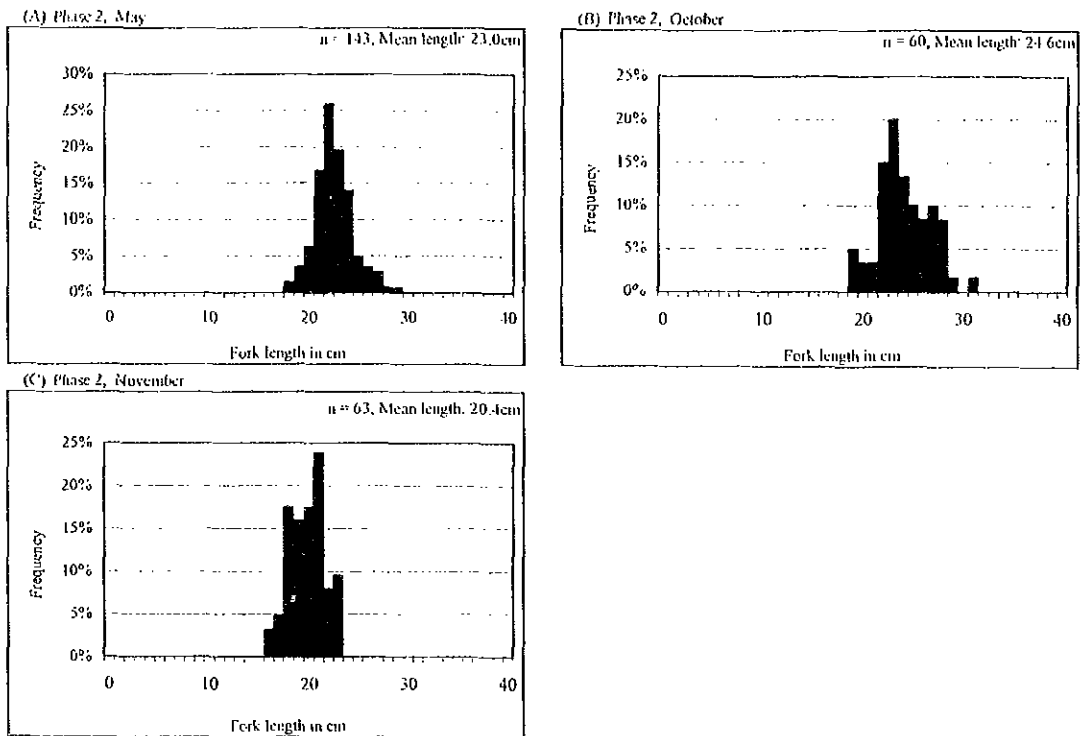


Figure 8.II.8 Size composition of landed red pandora *Pagellus bellottii*.

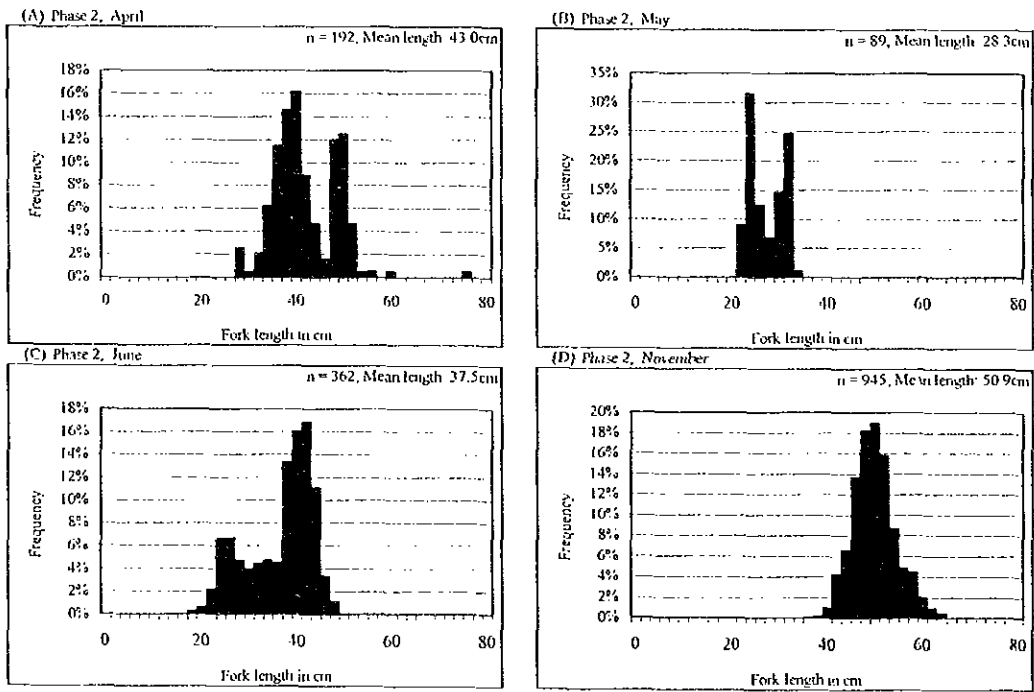


Figure 8.II.9 Size composition of landed flathead mullet *Mugil cephalus*.

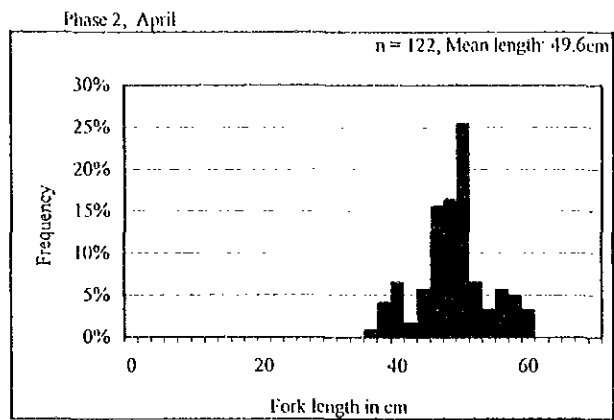


Figure 8.II.10 Size composition of landed golden grey mullet *Liza aurata*.

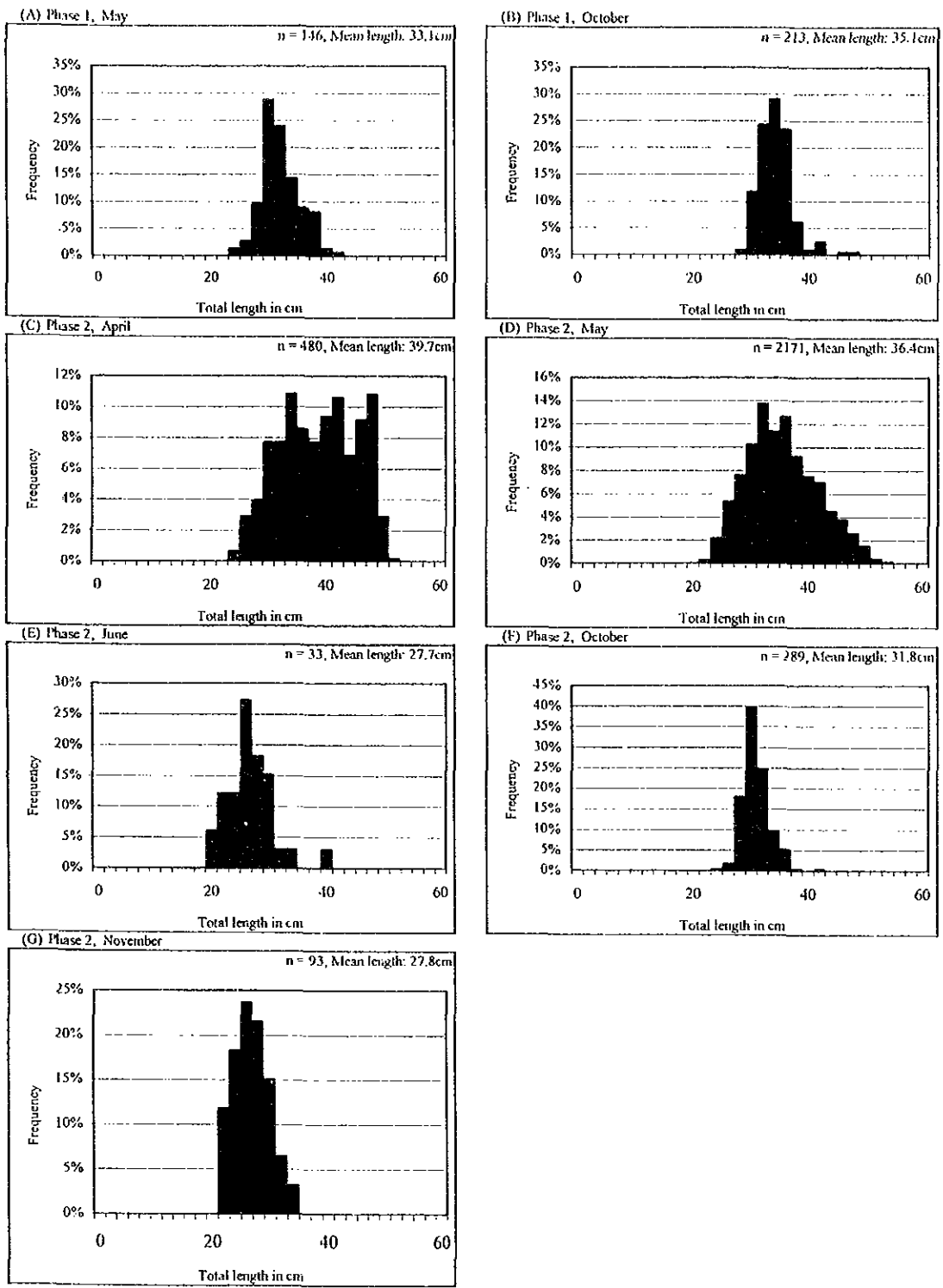


Figure 8.II.11 Size composition of landed Senegalese sole *Solea senegalensis*.

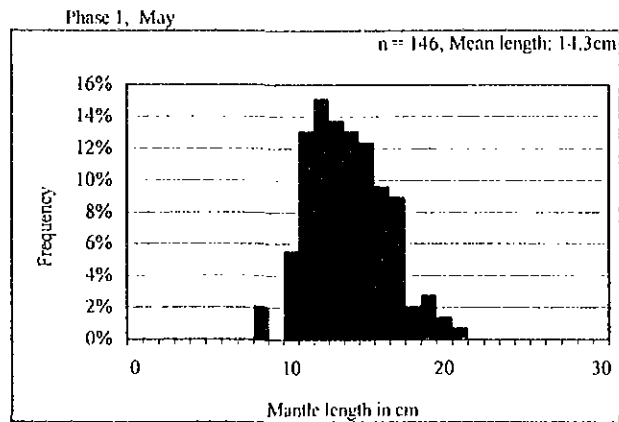


Figure 8.II.12 Size composition of landed European squid *Lotigo vulgaris*.

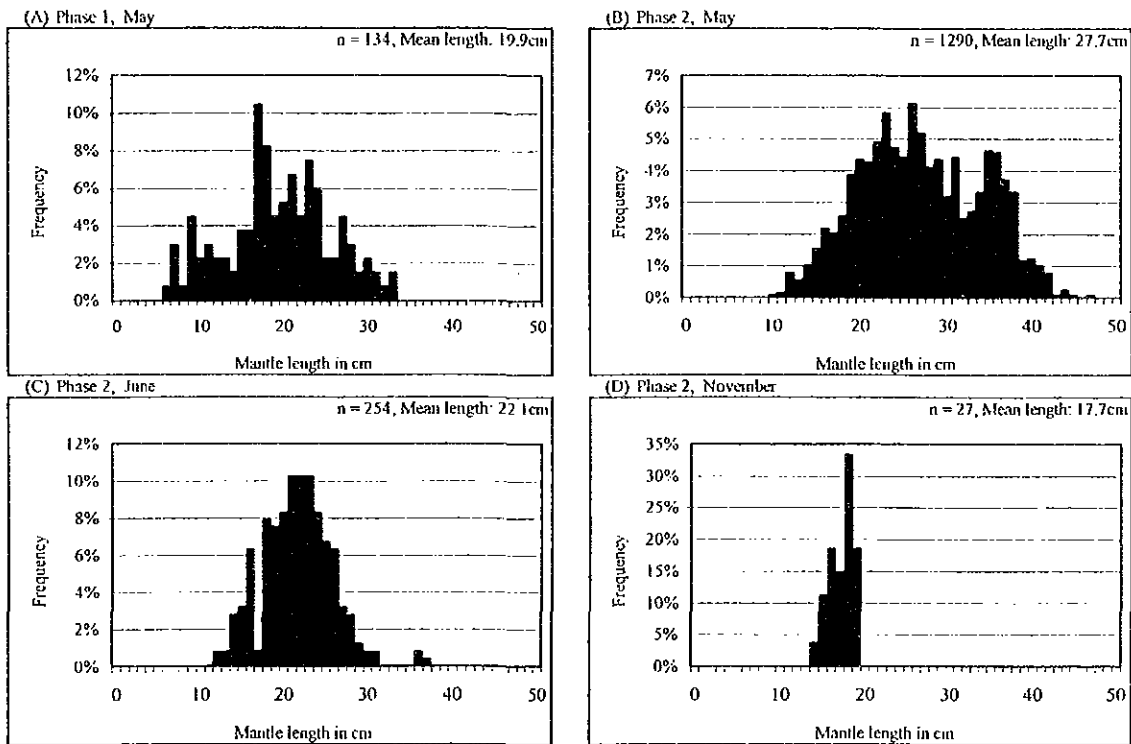


Figure 8.II.13 Size composition of landed common cuttlefish *Sepia officinalis*.

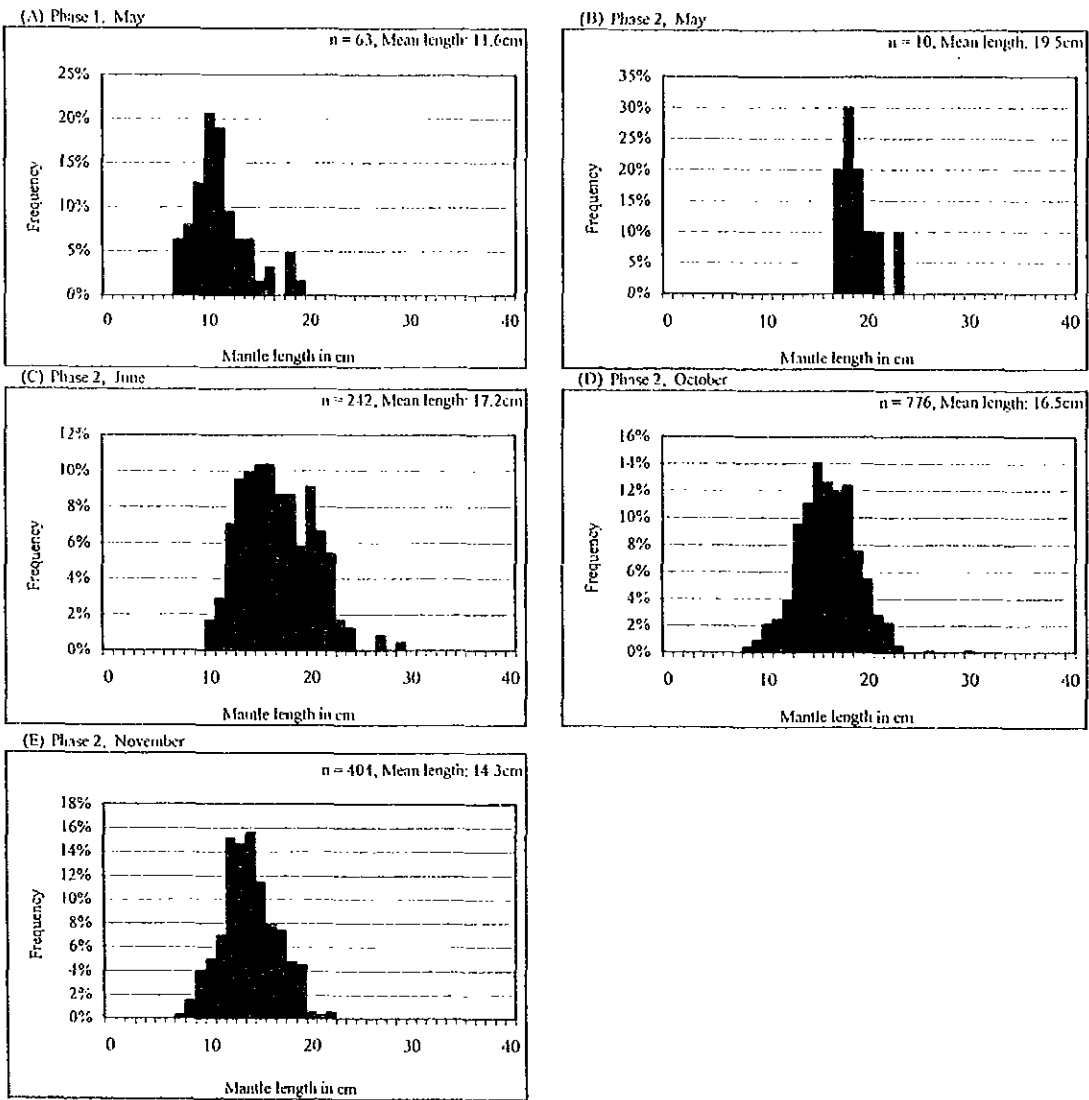


Figure 8.II.14 Size composition of landed common octopus *Octopus vulgaris*.

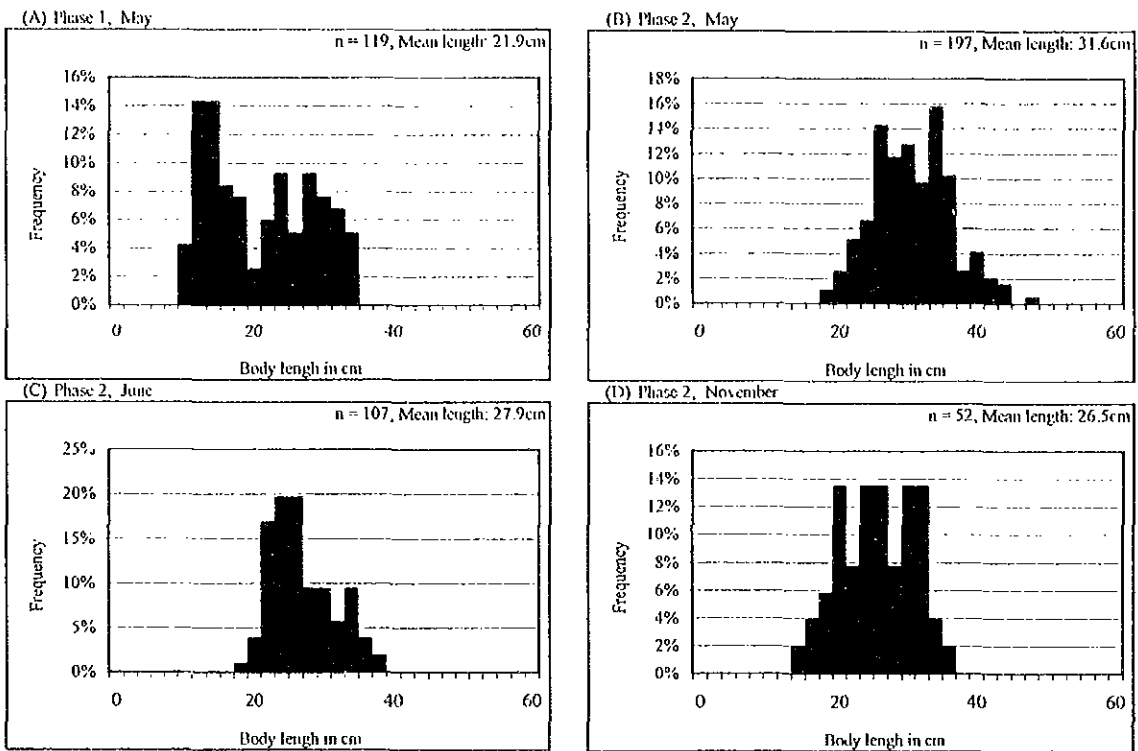


Figure 8.II.15 Size composition of landed green spiny lobster *Panulirus regius*.

Appendix 8.II.1 Main species of the artificial lakes of Rikiz, Foun Gleita etc.

Wahrindi <i>Synodontis schall</i>	Mango tilapia <i>Sarotherodon galileus</i>
North African catfish <i>Clarias gariepinus</i>	Silversides <i>Alestes baremoze</i>
Nurse tetra <i>Brycinus nurse</i>	Nile tilapia <i>Oreochromis niloticus</i>
<i>Labeo senegalensis</i>	African carp <i>Labeo coubie</i>
Niger barb <i>Barbus foureaui</i>	Mormyrids <i>Mormyrus rume</i>
<i>Hyperopisus bebe</i>	Elephantfish <i>Pollimyrus isidori</i>
<i>Petrocephalus bovei</i>	Bayad <i>Bagrus bayadi</i>
Semutundu <i>Bagrus docmac</i>	African butter catfish <i>Schilbe mystus</i>