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Assessment demersal fish stocks Mauritania

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Abstract

The RIVO project "Assessment of demersal fish stocks in Mauritania" was commissioned by the Ministry of Foreign Affairs of The Netherlands to produce information on the state of the demersal fish stocks (species that live near the bottom) in Mauritania, in particular octopus and shrimps. These stocks are fished by fleets from the EU, working under the fishery agreement between the EU and Mauritania. Although there are no Dutch vessels targeting demersal fish in Mauritania, the government of The Netherlands is co-responsible for the fisheries agreement with Mauritania, and thereby for a rational and sustainable exploitation of the demersal resources.

The project pursued its objectives in close cooperation with the Mauritanian fisheries research institute IMROP. The joint activities included analyses of existing catch and effort data, the organisation of workshops and meetings (in Mauritania and in West Africa), and the collection of new data using research vessels and observers on board commercial vessels.

The results of the project showed that the octopus stock in Mauritania was overexploited, and that fishing effort was 25-30% too high. For shrimps the fishing effort was at an optimum level from the perspective of the shrimp fishery. The shrimp fishery, however, destroys a large number of undersized individuals of commercial fish species, in particular hake. For the combined demersal fisheries in Mauritania, it would be advisable that effort in the shrimp fishery was reduced, and that the fishery was conducted by more selective gears.

The conclusions of the project were presented in a number of reports and at international meetings. They presumably influenced the outcome of the negotiations in 2006 between the EU and Mauritania about the renewal of the fisheries agreement. In the new agreement, the number of licences for the EU octopus fleet was reduced from 55 to 43. This reduction, however, is still insufficient to bring fishing effort to the optimum level, unless the Mauritanian octopus fleet is reduced at the same time.

1. Introduction

1.1. Background of the project

In recent years the Dutch government has paid special attention to the coherence of its policies in Third World countries. Activities by one branch of the government should not interfere with, or counteract those undertaken by other government agencies. One of the fields where different government actions could interfere with each other are fisheries. For many developing countries, fisheries are an important part of their economy, providing food and employment to a large part of their population. At the same time, fishermen from Europe are looking for fishing opportunities in Third World countries, as their own fishing grounds in Europe have become depleted. European countries, including the Netherlands are supporting both the development of artisanal fisheries in Third World countries, and the deployment of their own industrial vessels in the same countries. It is obvious that this may lead to a conflict of interests.

A country where this risk is particularly pronounced, is Mauritania. The fish stocks are one of the few natural resources of this country, providing 30% of the total exports earnings. The fishery is the main employment for ten thousands of people, and it is a source of protein food for the local population. However, the fish stocks in Mauritanian waters are exploited also by a large fleet of industrial trawlers from Europe and other foreign countries. Some foreign fleets target species that are only of marginal interest to the local fishermen, but others compete directly with local fishermen for high value species. The most pronounced example is the octopus fishery, which is conducted by artisanal fishermen in canoes, industrial trawlers from China working under Mauritanian flag, and European trawlers working under a fisheries agreement between Mauritania and the EU. All these fleets compete for the same octopus, and overexploitation of the resource by foreign industrial vessels has a negative effect on catches of the artisanal fishermen.

When the EU-Mauritanian fisheries agreement was renewed in 2001, there were strong pleas from both Mauritanian fishermen organisations and NGOs to reduce the number of EU vessels fishing for octopus. The EU and Mauritania agreed to increase the number of octopus licenses from 42 to 55 during the period 2001-2006.

The Dutch government, that was co-responsible for the new fisheries agreement as a member of the EU, felt that there was a serious chance that the new agreement would harm the interests of the local Mauritanian fishermen. The agreement would thereby be in conflict with the policy that EU vessels should only exploit fish stocks that otherwise would remain underutilised. They decided that future EU-Mauritanian fisheries agreements should be based on better scientific information, particularly concerning the stocks that were assumed to be over-exploited. Consequently, they decided to finance a research project that would collect such information and that would provide reports that could be used during the mid-term evaluation of the agreement in 2003, and also during the negotiations of the new agreement in 2006.

1.2. Objectives of the project

The project would have to work in close cooperation with the Mauritanian fisheries research institute CNROP (later called IMROP). The main emphasis would be on stocks that were supposedly overexploited, such as the octopus and shrimps. In addition to analysing information that already existed at IMROP, the project would collect new data by using the Mauritanian research vessel Al Awam, and by sending observers on board commercial vessels.

Because fish stocks in Mauritanian waters are strongly related to those in neighbouring waters, it was decided to study fish stocks also at a regional level. The coordination of fisheries research in West Africa is the task of CECAF (Committee on Eastern Central Atlantic Fisheries), a daughter organisation of the FAO. In recent years, no meetings of CECAF had been organised because of lack of finances. In order to revive CECAF and to stimulate regional cooperation and exchange of data, the project would also finance three annual meetings of the CECAF working group for demersal fish stocks. Demersal fish are species that live close to the sea bottom. They include octopus, shrimp, and also a number of other valuable and overexploited species.

The specific objectives of the project were formulated as follows:

- Making an annual assessment of demersal fish stocks in Mauritania
- Collecting new data on the shrimp fishery that could lead to a better assessment and management of the resource
- Increasing our knowledge on the interaction between the shrimp fishery and the fisheries on octopus and demersal fish
- Increasing the selectivity of the shrimp fishery

1.3. The RIVO contract

The project was commissioned by the Netherlands Ministry of Foreign Affairs, Department North Africa and Middle East. A call for tenders was issued in November 2002, and in January 2003 the contract was granted to the Netherlands Institute for Fisheries Research RIVO (now called Wageningen - IMARES). The reason for giving the contract to RIVO was that this institute had been cooperating with IMROP already since 1998 in the field of pelagic research (pelagic fish are species like herring and sardine that live near the surface). RIVO was well established in Mauritania, having its own office at the IMROP compound.

In the first months of 2003, the RIVO coordinator further discussed the details of the project with the IMROP director and staff. This resulted in a detailed work plan by IMROP and RIVO.

In February 2003, RIVO director Martin Scholten visited IMROP to finalise the plans for cooperation. This resulted in the signing of a general agreement of cooperation between the two institutes ("Accord-cadre"), and a detailed work plan for the period 2002-2005 (Annex 1).

The actual start of the project was delayed due to the fact that two earlier candidates for the field post in Nouadhibou in the meantime had accepted other assignments. After the recruitment of Mr. M. van der Knaap in May 2003, the project was officially launched in June 2003. Because the start of the project had been delayed by almost half a year, the Ministry of Foreign Affairs agreed to postpone the end date of the project to 30 June 2006.

1.4. Structure of the report

The present report is intended to give an overview of all project activities and results obtained. It will not repeat in detail the results of meetings and workshops that have been reported elsewhere. For this information, the reader is referred to the original reports that are mentioned in the text and that are listed in section 10. In the present report, results of meetings and other activities are summarised in a form that will be understandable (hopefully) to the non-specialist reader.

After the introduction, the report starts with a short description of demersal fisheries in Mauritania in chapter 2. This section is intended to provide the reader some background information on the various fleets active in the area, their relative importance, and their specific problems.

Chapter 3 provides a short description of the material, manpower and facilities that were available to the project.

The research activities of the project and their results are reported in chapter 4. This chapter deals with the research vessels surveys organised by the project, observations at sea, and the analysis of existing statistical information.

Chapter 5 describes the results of the various meetings in which Mauritanian fish stocks were assessed. This is the most important chapter of the report since the main objective of the project was to provide updated assessments of the demersal fish stocks, and in particular of the octopus. The project contributed to three different types of assessment working groups: RIVO-IMROP workshops organised at the IMROP institute in Nouadhibou; meetings of the international CECAF working group on demersal fish stocks, and meetings of the EU-Mauritanian scientific working group. The results of these meetings represent the main outcome of the project, and they are therefore described in some detail.

Chapter 6 deals with the provision of management advice directly to the Mauritanian government. This was restricted to one meeting on the management plan for octopus and one meeting on shrimps. Otherwise, project staff were not (allowed to be) involved in the provision of management advice directly to Mauritanian government officials.

The training of IMROP staff in the framework of the project is discussed in section 7.

Apart from providing specific support for stock assessment and research on demersal fish stocks, the project also contributed to "institution building" of IMROP by providing material for the general benefit of the institute. This aspect is discussed in chapter 8.

Finally the overall results and conclusions of the project are summarised in chapter 9.

2. A brief description of demersal fisheries in Mauritania

Two main types of fishery can be distinguished in Mauritania: the pelagic fisheries, aimed at fish schooling near the surface, and the demersal fisheries aimed at fish living near the bottom. The two types of fishery are very different in fleet composition, value of the catch, and problems related to management. Although this report deals primarily with the demersal fisheries, we shall also briefly describe the pelagic ones to complete the overview of all Mauritanian fisheries.

The pelagic fisheries are conducted mainly by large industrial trawlers from foreign countries (including The Netherlands). The pelagic species include sardinella, sardine, mackerel and horse mackerel. Total catches are in the order of 500,000 tons/year. The fish are exported to other West African countries such as Ivory Coast, Ghana and Nigeria. Because pelagic species have a low value (around € 0.50 per kg), industrial exploitation is only profitable if done on a large scale. This explains the large size of the vessels (100 - 145m) involved in this fishery. In recent years, a small artisanal fishery has started in the Nouakchott region, but the catches by this fleet are only in the order of 20,000 tons/years. For the moment, there does not seem to be a direct competition between artisanal fishermen in Mauritania and the industrial pelagic fleet. The pelagic fleet, however, may compete with the much larger artisanal fishery in Senegal, which is partly dependant on the same stocks that are fished by industrial trawlers in Mauritania.

Whereas conflicts between the foreign industrial fleets and local artisanal fishermen do not seem to be very great in the pelagic fishery in Mauritania, this situation is quite different for the demersal stocks. The species caught in the demersal fishery have a much higher value than the pelagic species (at least € 3.00/kg for octopus, shrimps and hake). This makes it profitable to exploit these species with relatively small trawlers (± 30 m) and also with canoes. The demersal stocks are the main target for the Spanish trawlers that work in Mauritania under the EU-Mauritanian agreement. In addition, they are exploited by a fleet of about 140 vessels of Chinese origin that presently operate under Mauritanian flag. The main demersal species, the octopus, is also the target of an artisanal fleet that comprises over 2000 canoes (a number that is still increasing), operating from Nouadhibou and a large number of small settlements along the coast.

Catch rates in the octopus fleet (expressed in kg/day) have been steadily declining since the start of this fishery in the 1960s. Because of the high value of the species, there is a constant pressure of new vessels that want to enter this fishery. The steadily increasing fishing effort creates the risk of over-exploitation. This means that not only the catch/day but also the total annual catch is decreasing. Over-exploitation caused by national and foreign trawlers will directly affect all catches and thereby the livelihood of ten thousands of artisanal fishermen.

In addition to the octopus fleet, the demersal fishery also includes vessels fishing for shrimps, hake and roundfish.

The shrimp fishery is conducted exclusively by trawlers. These are either Spanish trawlers working under the EU fisheries agreement, or vessels working under Mauritanian flag. The latter fleet is composed of ex-Spanish vessels, normally working with a Spanish captain, and partly owned by Spanish companies. As there is no artisanal fishery for shrimp, there is no conflict between industrial and artisanal fishermen for this species.

The same is more or less true for the hake fishery, which is conducted almost entirely by Spanish vessels. Hake is distributed in deeper water along the shelf edge where small vessels operate longlines. The fleet operates under Mauritanian flag, but it is almost completely owned by Spanish and Portuguese companies, working with a national agent that holds the artisanal licence.

The other demersal species are grouped as "roundfish". These include soles, sea breams, croakers, snappers, groupers etc. They are caught both by industrial trawlers (Spanish and Mauritanian) and by artisanal fishermen using gillnets. The number of industrial trawlers that primarily target roundfish species is limited. However, the trawlers that target roundfish have driven the gillnet fishermen to shallow places and often destroy nets of these fishermen. The roundfish stocks seem to have been overexploited already for a long time. The roundfish stocks are most likely also affected by catches of undersized roundfish by the octopus and shrimp trawlers. The high fishing effort on these stocks, therefore, has a negative impact on the artisanal fishery for roundfish.

A more comprehensive description of the various fleets in Mauritania and their evolution in recent years is presented by Inejih et al. (2004) and Tjoe-awie et al. (2006).



Demersale trawler

3. Material and manpower used by the project

The funds provided by the Ministry of Foreign Affairs for the various activities of the project are presented in Annex 1.

3.1. Manpower

The manpower provided by the project included one full-time fisheries biologist and one part-time project manager, both of them based in Nouadhibou. Both the fisheries biologist and project manager were changed during the course of the project. Fisheries biologist Martin van der Knaap left the project in September 2003 and was replaced by Kees Goudswaard in December of that year. From the beginning of 2005 Henk Heessen became responsible for the project management. Corten left RIVO in June 2005, but continued to assist the project as consultant until the end of the project in June 2006.

In addition to the permanent experts, the project engaged a number of consultants on a temporary basis. A list of foreign experts involved in the project is presented in Table 1.

From the Mauritanian side, two IMROP biologists were assigned semi-permanently to the project. In addition, a large number of IMROP scientists and technicians worked on an ad-hoc basis for the project. Their names and functions are also presented in Table 1.

Name	affiliation	position	period
Ad Corten	RIVO	project leader	2003-2005
Henk Heessen	RIVO	project leader	2005-2006
Martin van der Knaap	consultant	consultant	2003
Kees Goudswaard	RIVO	biologist	2004-2006
Margreet van Vilsteren	RIVO	biologist	2003
Cheikh Abdelahhi Ould Inejih	IMROP	counterpart project leader	2003-2006
Ebaye Ould Mohamed Mahmoud	IMROP	head of department	2003-2006
Beyah Ould Meissa	IMROP	senior technician	2003-2006
Sidi Yahya Ould Cheikna	IMROP	biologist	2003-2006
Khallahi Ould Mohamed Fall	IMROP	head of department	2003-2006
Mohamed Bouzouma	IMROP	gear technologist	2005-2006
Didier Gascuel	Agrocampus Rennes	consultant	2006
Didier Jouffre	IRD	consultant	2004

Table 1. Project staff and consultants

3.2. Material

A list of material available to the project is presented in Table 2.

Item	provider
research vessel Al Awam	IMROP
running costs for 3 surveys of Al Awam	RIVO
shrimp trawl for Al Awam	RIVO
beam trawl for Amrique	RIVO
office space for project staff	IMROP
per diems for observers on board commercial shrimp trawlers	RIVO
measuring boards for observers	RIVO
fish identification guides	RIVO
Toyota Hi-Lux 4WD	RIVO
1 computer and 1 laptop	RIVO
video projector	RIVO

Table 2. Material available to the project



Het Mauritaanse onderzoeksvaartuig "Al Awam"

4. Research activities

In order to reach the project objectives, a number of research activities were developed. These included observations at sea as well as analysis of existing data ashore. A review of the various research activities is presented below.

4.1. Research vessel surveys

IMROP had made regular surveys of demersal fish stocks in Mauritanian waters since 1981. These surveys were conducted by the old research vessel "N'Diogo" in the years until 1995, and with the new "Al Awam" in subsequent years. However, all these surveys had focussed on fish and octopus, and not on shrimps. The data from these historical surveys were analysed during workshops in June and December 2005, and the results are presented in section 5.

In order to test the feasibility of conducting special trawl surveys for shrimps, two surveys were organised using a special shrimp trawl. These surveys, made in 2003 and 2004, covered the entire Mauritanian shelf. RIVO expert Kees Goudswaard participated in the second survey.

It turned out that the special shrimp trawl used in these surveys was no more efficient in catching shrimps than the standard bottom trawl used in IMROP demersal surveys.

The Mauritians used a stratified random sampling method. This means that the whole Mauritanian zone was divided in three sections: North, Central and South. Within each section a number of trawl sets was made in each depth zone, regardless of bottom type. For an initial exploration this is a good method, but once the species distribution is known, a survey should be directed at areas of high density. The results of regular bottom trawl surveys in earlier years (aimed at demersal species and octopus) had already provided a good picture of the shrimp distribution in Mauritania. It was known already that the shrimps were concentrated in specific areas (Figure 1). In this case, a survey aimed at estimating shrimp abundance should have been directed primarily at these areas of high abundance. Moreover, shrimps are short living animals and their abundance will fluctuate strongly throughout the year. One annual survey, therefore, is insufficient to provide an estimate of average stock abundance.

For 2005 a programme with fixed stations during four short surveys – of one week each – was proposed in the areas of shrimp concentrations. The idea was to conduct these shrimp surveys in combination with the special octopus surveys (just before and after the closed season). Unfortunately, the programme suffered from bad weather during the first survey, and from mechanical problems with the Al Awam during the second and third survey. After these attempts, it was decided that it was of no use to continue this part of the programme, knowing that IMROP was not interested to continue this type of surveys after the end of the RIVO project.

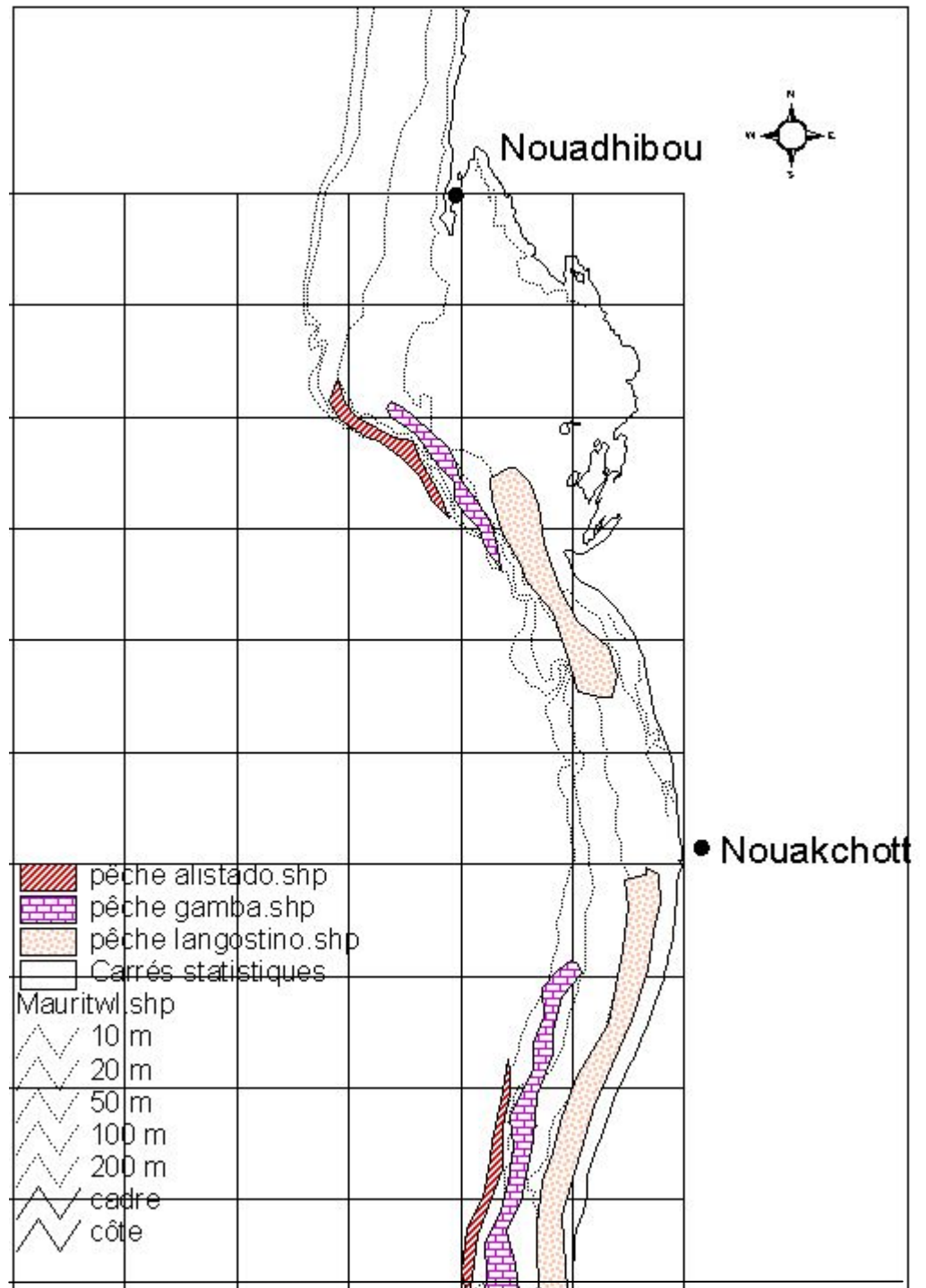


Figure 1. The distribution of commercial shrimp fisheries in Mauritanian waters

4.2. Observations on board commercial fishing vessels

Although scientists may collect important information by going to sea with research vessels, some data can only be collected by joining commercial vessels on their fishing trips. These observations will show what the fishing vessels are actually catching, and what part of the catch is thrown back into the sea.

4.2.1. Definition of various fractions of the catch

The (shrimp) species that the fishermen intend to catch is called the target species. All other species in the catch are called by-catch. The by-catch may consist of fish, octopus, and debris. Part of the by-catch may consist of valuable fish species that are retained on board. Other by-catch species have no commercial value, or the vessel has no room to store them on board. This fraction of the catch is thrown back into the sea, and is almost all dead. The fraction of the catch returned to the sea is called the discards.

Because shrimp fishermen have to use small-meshed nets in order to catch shrimps, they normally take large amounts of undersized commercial species as by-catch. The main part of this by-catch has no commercial value and is discarded. Discards of undersized commercial species in the shrimp fishery will affect the number of fish that will reach an adult size, and thereby may seriously reduce catches in other sectors of the fishery.

Information on the amount and size composition of discards can only be obtained by sending observers on board commercial fishing vessels. In the framework of the project, first the existing information on discards in the shrimp fishery was analysed. Secondly, a special programme was initiated to send IMROP scientists and technicians on board commercial shrimp trawlers in order to collect new information.

4.2.2. Existing observer data at the start of the project

In the years prior to 2003, IMROP scientists had made only sporadic observations on board commercial shrimp vessels. These observations dated back a long time and were not considered representative of the current situation.

In addition to the data collected by IMROP, data were available from the observer programme run by the Mauritanian inspection service DSPCM ((Délégation à la Surveillance Pêche et au Contrôle en Mer). These data had been collected on board EU vessels in the framework of the EU-Mauritanian fisheries agreement 1996-2001. During a working group meeting at IMROP in 2002, a preliminary analysis of these data had been made by IMROP scientists (FAO, in press). RIVO expert Martin van der Knaap examined the data and concluded that their quality was low. This was ascribed to the fact that the DSPCM observers worked without direct scientific supervision. IMROP received copies of their data, but there was no quality control by IMROP scientists, and no feedback of comments from IMROP to the DSPCM.

A detailed re-evaluation of all available data was made by Goudswaard in 2004. It appeared that the data were limited in number and the number of observations during one trip was extremely small. For each haul, only 2 - 4 species were recorded as by-catch, whereas it was known from direct observation that the actual number taken was much larger. Consequently, it was concluded that these data were incomplete and of little use for scientific purposes.

4.2.3. The IMROP scientific observer programme

Considering the poor quality of DSPCM observer data, it was concluded that IMROP should start its own observer programme on shrimp trawlers. A similar programme existed already for the EU pelagic fleet as part of the RIVO pelagic project. Under the pelagic observer programme, IMROP scientists and technicians had joined Dutch trawlers to collect data on catch composition and discards. IMROP had provided the manpower for this programme and RIVO the material, sea allowances, and travel cost. The results of this programme had been quite successful (Corten 2000), so it was decided to apply the same procedure to the shrimp fishery.

However, the new observer programme on board shrimp trawlers presented much greater problems than the existing programme on board Dutch pelagic trawlers. The shrimp vessels were much smaller than the Dutch trawlers, which meant that they had very little room to take extra people on board. In some cases, the vessels had to leave some of their normal crew ashore in order to take on board the scientific observer.

A second obstacle was the lack of cooperation from the ship owners and captains. Contrary to the owners of the EU pelagic trawlers, the owners of the shrimp vessels (mostly Spanish) were not very motivated to cooperate with the scientists. They did not see any advantage of this cooperation for themselves. On the contrary, they expected that the scientific observations at sea would ultimately lead to more government regulations and restrictions for their fishery. In some cases, the captains did not want to cooperate because they were using their shrimp license as a pretext for fishing illegally for small sized octopus.

Finally IMROP asked the assistance of the inspection service DSPCM to put their technicians on board the shrimp trawlers. The result was that IMROP observers were placed on board of these trawlers by force. RIVO expert Kees Goudswaard made with his counterpart the first trip on board a shrimp trawler himself in order to determine the best procedures for sampling the catch. The conditions for working and living on board the vessel turned out to be very hard. As a consequence, the observer missions were normally limited to a duration of one week.

4.2.4. Methods by the IMROP observers

During each mission, an estimate was made of the catch retained on board and the discards. The amount of shrimps retained on board could be easily estimated on the basis of the number of cartons frozen shrimps produced from each haul. The crew sorted the shrimps in size categories before freezing them, and the size distribution of the shrimps could thus be estimated on the basis of the number of cartons per size category.

In order to estimate the size and species composition of the by-catch, the fish, shrimps and cephalopods (octopus) were first separated from the non-fish component (stones, sea grass). Then sub-samples were taken both of the by-catch fraction retained on board and the discards. The sub-samples were weighed, and then all fish in the sub-samples were identified to species and measured. The species and length composition of the by-catch (split into in fish retained on board and discards) was then estimated by raising the results for the sub-samples with the ratio between the estimated weight of the total catch and the weight of the sub-sample.

4.2.5. Overview of all missions made

An overview of the observer missions made is given in the text table below. Despite the long duration of the project, the number of observer missions made (12) is relatively small. There are several explanations for this low number of missions. It took a long time to get the observer

programme started, due to the problems in getting permission from ship owners and captains. Other restrictions were the closed seasons for the fishery (September/October and May), and problems in finding suitable IMROP technicians for this programme. Since IMROP did not have a team of specialised observers, the missions had to be made by technicians in between their normal duties. This sometimes resulted in people not being available at the time when a place was found on board a shrimp trawler.

Year	Month	Number of trips
2004	December	1
2005	July	2
	August	2
	November	2
	December	1
2006	January	2
	February	2

4.2.6. Results of the observer programme

Out of the 12 observer missions made, only 10 produced results that could be used for estimating total catches and discards. The remaining missions did not produce useful results, either because the scale for weighing the samples did not work or because the vessel did not fish for shrimp but for octopus.

The results of the observer programme have been the subject of a detailed report (Goudswaard 2006). Here we present a summary of the results obtained.

The observer program was conducted on board commercial shrimp vessels in the period 2004-2006. Data were collected from 175 hauls in 10 trips. The fisheries for the three different species of shrimp take place at different depths and thereby have a different bycatch and discard composition. The percentage of discards varied from 80.7 to 86.4% in weight, corresponding to an estimated total amount of discards of 31,516 tons annually. Commercial species constituted 58.8% of the discards in the gamba fishery and 73.8% in the langostino fishery. In particular juvenile hake and roundfish are taken as discards in the shrimp fishery. The additional fishing mortality on these stocks caused by the shrimp fishery is high compared to the mortality induced by the fleets that specifically target these stocks.

4.3. Experiments with selective shrimp trawls

At the start of the project it was already assumed that the discards in the shrimp fishery were high, and that it would be worth while to try and increase the selectivity of the nets used in this fishery. For a country like Mauritania that is very dependent upon its fishery resources, it is imperative that the resources should be exploited in the best possible way, and that the fishery for one species should not destroy the juveniles of species that are targeted by the other fisheries. Hence it had been envisaged to conduct experiments with fishing gears that were more selective than the traditional shrimp trawls, and that would thus have lower by-catches.

Because of the urgency of the subject was also felt by IMROP, the institute had already established a co-operation with a Canadian organisation for applied research, the Groupe Collegia (www.collegia.qc.ca). This organisation had been working on selective shrimp trawls in Canada, and they were invited to test the same gears in Mauritania. It was decided to combine

forces with these Canadian experts, and organise a joint Canadian-Mauritanian/RIVO experiment on increasing the selectivity of the shrimp trawls.

Sea trials were organised in October 2005, in which Canadian experts tested a Norwegian separating panel, the so-called Nordmøre grid, on board a Mauritanian shrimp trawler. This Nordmøre grid is a fixed metal frame with vertical bars that are spaced in such a way that shrimps can pass the bars, but larger fish and lobsters can not. These larger organisms are deflected upwards and released through an opening in the upper panel of the net.

A commercial trawler, the Essayad No. 1, was chartered for the experiments. This vessel was 31 m long and had an engine of 820 HP. The trawler fished with two nets, one on either side of the ship. One of the nets was equipped with a Nordmøre grid and the other net was a standard shrimp trawl without selection grid. By comparing the catches of the two nets, the effectiveness of the separating panel could be established.

Due to bad weather and technical problems, only 13 hauls could be made during the trip in October 2005. Out of these 13 hauls, only 9 produced results that could be analysed. The detailed results of the experiments have been reported by Anon. 2005. Here we give a summary of the results obtained.

The tests were conducted in water depths of 190 - 300m, and the main target species was the gamba (*Parapenaeus longirostris*). Duration of the hauls was 58 - 90 minutes. The best results were obtained with a grid in which the bars were separated 19mm from each other. This small distance between the bars was related to the small size of the gambas during October 2005.

The use of the grid reduced catches of pink lobster and fish > 20 cm by almost 100%. This is important because shrimp vessels are not allowed to catch and land pink lobsters. It was estimated that the use of the grid would save about 200 kg of lobster and fish during each haul.

Due to the removal of lobsters and larger fish from the catch, the percentage of "clean" shrimps in the catch increased as an effect of the grid. The size distribution of the shrimps caught by the net with the grid was identical to those caught by the reference net. However, the total amount of shrimps caught with the experimental net was lower (by about 10-20%) than the catch in the reference net. This could have been due to obstructions of the grid, or by systematic differences between the nets fishing on the port and starboard side of the ship.

Although the results of the current experiments were very promising, it is obvious that further testing is needed before the use of a selection grid can be made obligatory for all shrimp trawlers.

4.4. Analysis of logbook data

One of the main requirements for stock assessment of demersal (and pelagic) fishery resources are reliable statistics on landings and fishing effort. These data are derived from the logbooks that have to be kept by all industrial fishing vessels.

The collection and processing of logbook data is the task of the Mauritanian inspection service DSPCM. This organisation is responsible for verification and computer entry of the data. A copy of the data is sent to IMROP as .dbf files. IMROP scientists then use these data to compile annual statistics of catches and fishing effort.

So far, the analysis of logbook data at IMROP has not been centralised. There are several scientists that work with the raw logbook data and make their own corrections and

compilations. The result is that different data sets exist at IMROP, and that there is often a confusion as to which set of data is the best. Problems in producing a good set of logbook statistics have been a recurring problem during assessment meetings, both at IMROP and at the international level.

In the framework of the RIVO project, it was decided to make a first attempt at checking the quality of the existing logbook data and making a compilation for the most recent years. For this preliminary exercise, it was decided to concentrate on effort data, and to try and produce a report on the development of fishing effort in the various fleets during the most recent ten years. Most of the computer work for this analysis was done by RIVO expert Pablo Tjoe-awie, a data base specialist working for the RIVO pelagic project at IMROP.

The results of the analysis showed that the logbook data provided by the DSPCM were generally of sufficient quality. However, about 2-3% of the data were incorrect, due to a variety of errors (duplication of files, incomplete files, errors in type of license or flag state). For some years, the data deficiencies were more serious. This applied in particular to the year 2003, for which obviously an important part of the statistics (about 20%) was missing.

The reliability of DSPCM data for the EU pelagic fleet was investigated by comparing these data with the original logbook sheets that were available from the ship owners in the Netherlands and Ireland. It appeared that a large fraction (30 - 70%) of the original logbook data for the years prior to 2003 was missing from the DSPCM data. In later years, the coverage of the DSPCM data seemed to improve. The problems with logbook data from EU pelagic trawlers may be due to the fact that these vessels do not land their catch in Mauritania, and that their logbooks cannot be collected by the DSPCM at the moment of landing. These logbooks have to be sent to Mauritania at a later date by the ship owner. It seems that some of the logbooks are not returned to Mauritania, or disappear somewhere on the way between ship owner -> Ministry of Fisheries -> DSPCM. Presumably this applies not only to the logbooks of the pelagic trawlers, but also for the EU demersal trawlers fishing for octopus, shrimp and hake.

The conclusion of the exercise was that there is a strong need for an improved logbook data base at IMROP. This could be achieved by the following steps:

- Creating a central logbook data base at IMROP
- Designating a special team that is responsible for this data base
- Verifying the quality of logbook data before they are entered into the data base
- Providing feedback to the DSPCM on errors found in the data
- Verifying the completeness of logbook data from foreign vessels

The results of the study on logbook data were presented in a joint IMROP/RIVO report (Tjoe-awie et al. 2006)

5. Stock assessment

The main objective of the project was to make new assessments of the demersal fish stocks in cooperation with Mauritanian scientists and colleagues from other countries in the region. This goal was pursued during workshops and meetings at national and international level. Two types of meeting were organised in the framework of the project: national meetings at IMROP and international meetings under the umbrella of FAO/CECAF. In addition, project staff participated in meetings of the EU-Mauritanian scientific working group, organised jointly by the EU and Mauritania. The various meetings and their results are reviewed below.

5. 1. Assessment of demersal fish stocks in Mauritania by RIVO-IMROP workshops

Two types of workshop have been organised at IMROP, corresponding to the two main objectives of the project. The first type of workshop was intended to produce assessments of all demersal fish stocks, and in particular octopus. These workshops were to produce reports that could be used by managers in the context of the revision and renewal of the EU-Mauritanian fisheries agreement. Information on octopus and other demersal fish stocks was derived from existing data collections at IMROP.

The second type of workshops dealt specifically with the shrimp fishery. This fishery was the object of new data collection by the project, and hence this fishery was analysed more in depth.

5.1.1. Workshop on demersal stocks in September 2003

The objective of this workshop was to produce a report on the state of the demersal fish stocks that could be used for the mid-term revision of the EU-Mauritanian fisheries agreement later in the year. The workshop was organised from 13-17 September at IMROP in Nouadhibou. It was attended by 3 IMROP scientists, 2 Dutch scientists from the RIVO project, and one French consultant from the French research organisation IRD (Institut de recherche pour le développement) in Dakar. In addition, Two French scientists from the University of Rennes contributed by correspondence to the workshop.

The group based its work on existing information from different sources available at IMROP. These included catch and effort statistics from logbooks provided by the inspection service DSPCM, observer data collected by the DSPCM, and data from research vessel surveys conducted by IMROP. The workshop benefited from the fact that some of these data had been analysed already for the "IMROP Groupe de Travail" in December 2002. The results of the workshop were initially published in English as a RIVO report (Corten 2003) and later in French as a combined RIVO/IMROP report (Inejih et al. 2004).

The report gave a comprehensive description of the various demersal fisheries in Mauritania, and a review of the development of catch and fishing effort in each fleet until the year 2002. The assessments for the various stocks were based mainly on the same data that had been used for the IMROP Groupe de Travail in December 2002, and the conclusions, therefore, were not very different from those arrived at in December 2002. For octopus it was concluded that the combined fishing effort of all fleets was about 30% too high.

The report turned out to be a useful document for people that wanted to inform themselves about Mauritanian fisheries and their evolution in recent years. It was widely circulated among scientists and administrators in Mauritania and in the EU.

5.1.2. Preparatory workshop on shrimps 1-3 June 2004

This workshop was organised in order to prepare the basic data for an assessment working group on shrimps that would be organised later in the year. From RIVO side, the meeting was attended by Kees Goudswaard and Ad Corten. Mauritanian colleagues in the meeting were Cheikh Abdallahi Ould Inejih, Moustapha Ould Bouzouma and Beyah Ould Meisse.

A compilation was made of research vessel data, logbook data, and the available data from observers on board commercial shrimp trawlers.

The research vessel data illustrated the fact that three different shrimp stocks exist in Mauritania, each of them occupying a different depth zone (Fig. 1 and 2).

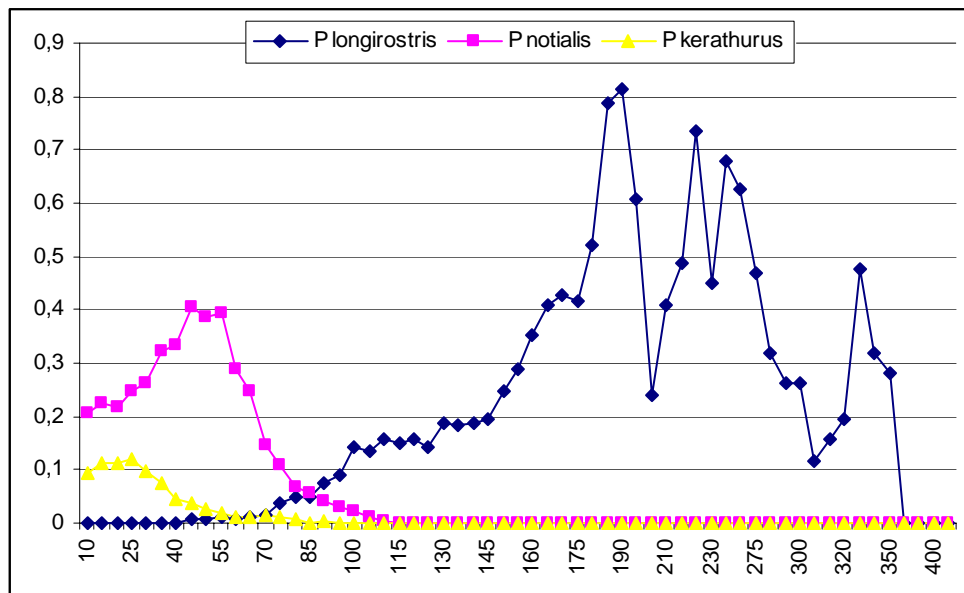


Figure 2. Mean density (log number / km²) of different shrimp species by depth zone (m)

The most shallow species is *Penaeus kerathurus* (langostino), which is found in depths of 10-40 meters. This species occurs in such low densities that it is not targeted by a specific fishery. The second species is *Penaeus notialis* (also called langostino) that occurs in depths between 10-70 meters. Finally there is the most abundant species, *Parapenaeus longirostris* (gamba) that occurs from 80 meters all the way to the shelf edge at 350 meters.

A detailed report on the workshop was presented by Inejih et al. 2004.

5.1.3. Workshop on shrimps 12-15 December 2004

The objective of this workshop was to make an evaluation of the shrimp resources in Mauritania and their current state of exploitation. The workshop was attended by six IMROP colleagues, one Dutch participant (Corten) and two French experts (D. Gascuel and D. Jouffre).

After a description of the spatial distribution and the biology of the main species, the group proceeded with an analysis of historical series of captures, fishing effort and abundance. For the coastal species *Penaeus notialis* (langostino), these parameters are presented in Fig. 3.

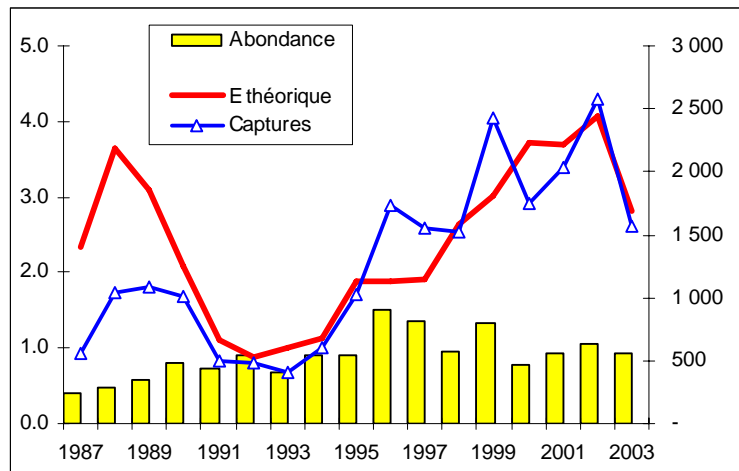


Figure 3. Time series of catches (captures), fishing effort (*E théorique*) and abundance (abondance) for *Penaeus notialis*.

It is seen from Figure 3 that catches and effort both followed an increasing trend in the period 1993-2002. It is remarkable that the abundance increased from 1993 to 1997, at a time when also the effort was increasing. Normally it is expected that abundance will drop with increasing fishing effort. The explanation given by the workshop for this phenomenon was that the increased fishing effort by the shrimp fleet reduced the stocks of roundfish species that were taken as a by-catch. These roundfish normally prey upon shrimps. So with increasing fishing effort on shrimps, the shrimp predators declined, and shrimp recruitment increased. This phenomenon lasted only until about 1997. In subsequent years when fishing effort increased still further, the abundance of the shrimp stock also declined.

In order to estimate the current level of exploitation in relation to the point of MSY, the workshop used an equilibrium production model (Fig. 4). This model only gave coherent results if the data series was divided in two periods: the years 1987-1995 with low fishing effort, and the years 1996-2003 with high fishing effort. For the earlier period, the level of MSY (maximum sustainable yield) was estimated at about 1000 tons/year. For the recent period with high effort, MSY was estimated at about 2000 tons/year. The difference in MSY between the two periods was attributed to the higher recruitment in the latter period, due to the removal of predator fish.



Catch of a shrimper on deck

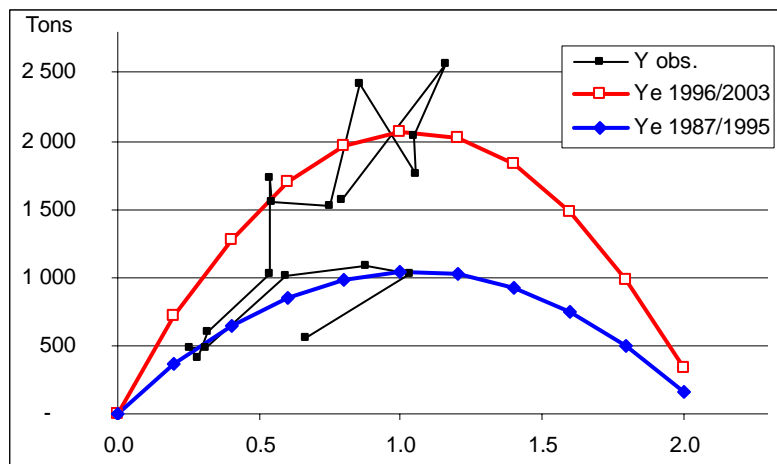


Figure 4. Results of an equilibrium production model for *Penaeus notialis*. Fishing effort on the X-axis is expressed as a fraction of the current (2003) fishing effort.

The workshop concluded that the stock of *Penaeus notialis* was presently exploited at the maximum level (the point of MSY). Viewed from the perspective of the shrimp fishery, this was an optimal situation. It was realised, however, that this conclusion would not hold if other fisheries were included in the evaluation. The removal of many young individuals of roundfish species, although beneficial for the shrimp fishery, will undoubtedly have serious consequences for the fisheries on those species. A future evaluation of the shrimp fishery should therefore also take these effects into consideration.

For the deepwater shrimp *Parapenaeus longirostris* (gamba), the results of the assessment were less clear. The available data on stock abundance from research vessel surveys and catches per unit of effort did not provide a coherent picture. The workshop came up with two alternative assessments, one based on a pessimistic interpretation of abundance indices, and one based on an optimistic interpretation.

The pessimistic interpretation is presented in Fig. 5. Here the abundance remains constant over the entire period 1987 - 2003. The increase in catches over this period is solely due to the increase in fishing effort.

The optimistic interpretation is shown in Fig. 6. In this case, the abundance increases gradually over the whole period. The increase in catches over the period 1993 - 2003 is partly due to an increasing fishing effort, and partly to an increased abundance (recruitment). In this case, the stock has responded to the higher fishing pressure by increasing its recruitment; the same mechanism that we saw by the langostino.

In a situation like this, where an increase in fishing effort is not accompanied by a decrease in abundance, the traditional production models can not estimate the current level of exploitation in relation to the point of MSY. All the workshop could conclude, was that from the perspective of the shrimp stock, there were no indications of overfishing. However, the fishery on deep-water shrimps presumably also has a negative effect on roundfish species (in particular hake). It would be prudent, therefore, not to let this fishery expand any further. The only justification for such a measure, however, would be the conservation of roundfish stocks.

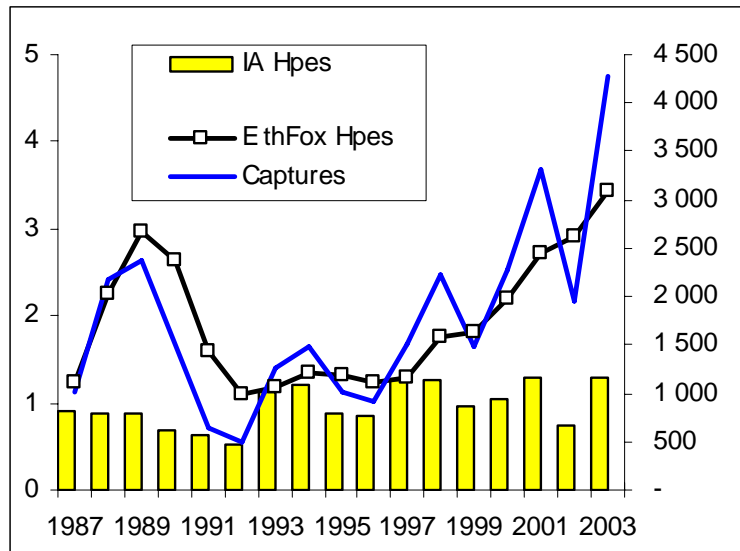


Figure 5. *Parapenaeus longirostris* pessimistic model. Trends in catches (captures), fishing effort (*E thFox*) and abundance (*IA*) according to the pessimistic interpretation of abundance data.

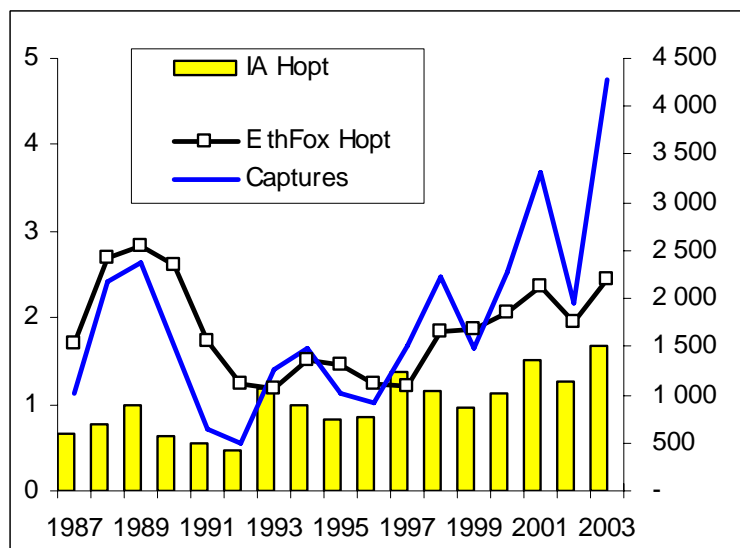


Figure 6. *Parapenaeus longirostris* optimistic model. Trends in catches (captures), fishing effort (*E thFox*) and abundance (*IA*) according to the optimistic interpretation of abundance data.

Results of the workshop have been presented by Inejih and Corten (2006) in an IMROP technical report.

5.1.4. Workshop on octopus 19-20 January 2006

The workshop in January 2006 was intended to provide new assessments on the demersal stocks that were included in the EU-Mauritanian fisheries agreement. This in preparation of the negotiations between EU and Mauritania on the renewal of the existing fisheries agreement.

Because of shortage of time, it was decided to concentrate on octopus. This was the main and most controversial species in the agreement. During earlier negotiations, there had been strong disagreement, on one hand between the EU and Mauritania, and on the other hand between various EU-countries, on the level of exploitation of octopus, and the permissible number of licenses for this fishery.

The meeting was attended by five IMROP scientists. The RIVO project was represented by Kees Goudswaard and Ad Corten. As external consultant, professor Didier Gascuel of the Agrocampus Rennes (France) had been invited to participate in the meeting.

The group based its assessments on the data compiled by the September 2003 workshop, and new data for the years 2003 and 2004 that had become available in the meantime. It also used corrections for the logbook data that had been made in the context of a special study (see section 4.4). Finally, new data on octopus catches by the artisanal fleet were made available by IMROP.

Because of the special relevance of octopus for the project, the results of the workshop are presented here in some detail. For a full report of the workshop, the reader is referred to Ould Mahmoud et al. (2006).

The updated series of catch data for the industrial octopus fleet is shown in Fig. 7. For comparison, the old data series used in 2003 is shown by a dashed line.

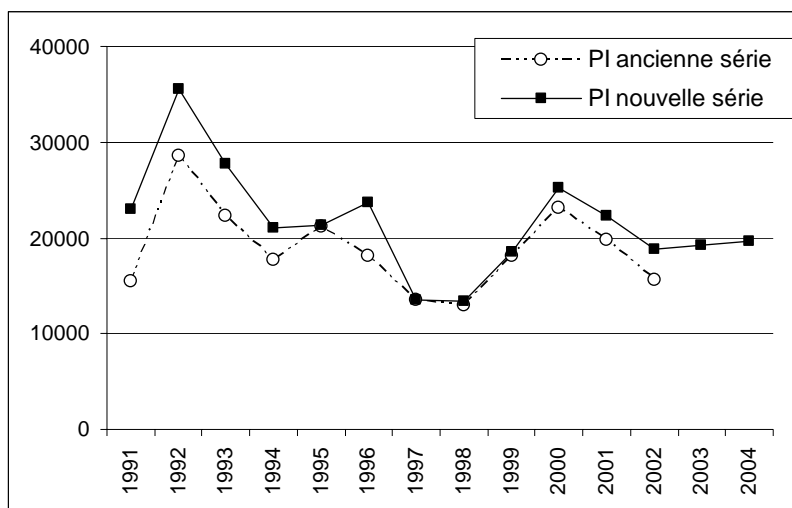


Figure 7. Updated series of total catches of octopus by the industrial fleet (solid line). The old series used by the workshop in 2003 is represented by the dashed line.

The catch data for the artisanal fleet are presented in Fig. 8. Also here, the old series used in 2003 is shown by a dashed line.

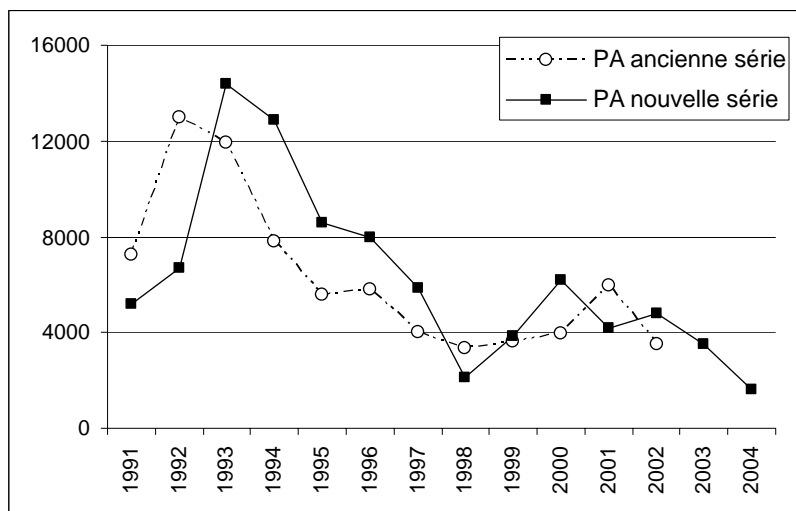


Figure 8. Updated series of total catches of octopus by the artisanal fleet (solid line). The old series used by the workshop in 2003 is represented by the dashed line.

The combined catches of octopus by the industrial fleets (foreign and national) and the artisanal fleet are presented in Fig. 9. It is seen that the catches show a decreasing trend over the past 12 years, caused mainly by a reduction of catches by the artisanal fleet.

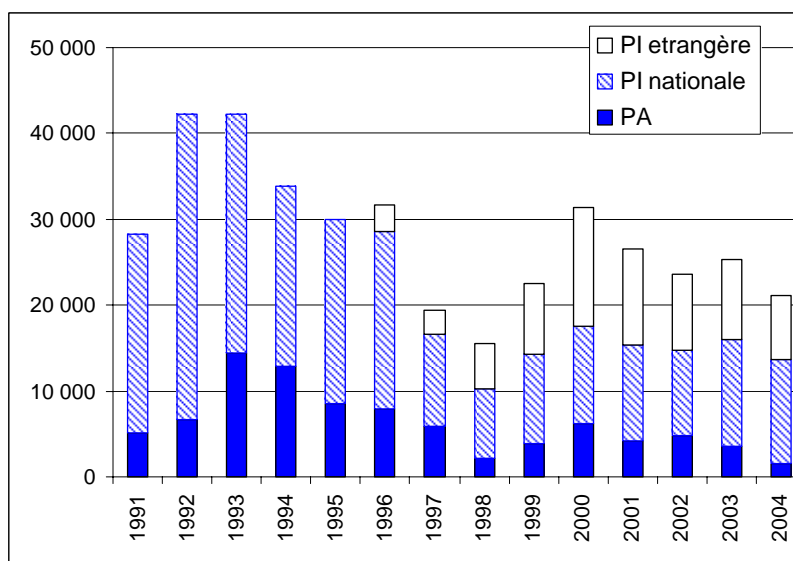


Figure 9. Total catches of octopus by the foreign industrial fleet (PI étrangère), the national industrial fleet (PI nationale) and the artisanal fleet (PA).

The development of fishing effort in the industrial and artisanal fleet is shown in Fig. 10. It is seen that the effort in the industrial fleet (foreign and national fleet combined) has continued to rise over the entire period. The effort in the artisanal fleet sharply dropped in 1997 and since then fluctuated at a low level.

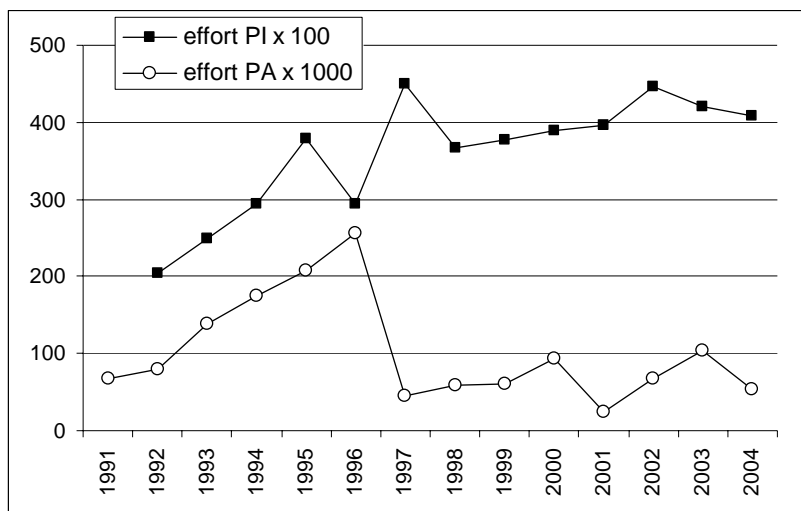


Figure 10. Fishing effort on octopus by the combined industrial fleet (PI) expressed in hundreds of fishing days, and by the artisanal fleet (PA) expressed in thousands of fishing trips.

Any assessment of the state of the stock depends critically upon the series of abundance indices used. The different series available (from research vessel surveys, industrial fleet and artisanal fleet) did not always show the same trend, and it was very important, therefore, for the group to decide which series (or combination of series) to use. The group devoted much time to a comparison of the various series, and finally constructed two series that were considered to best reflect the historical trends in the stock (Fig. 11).

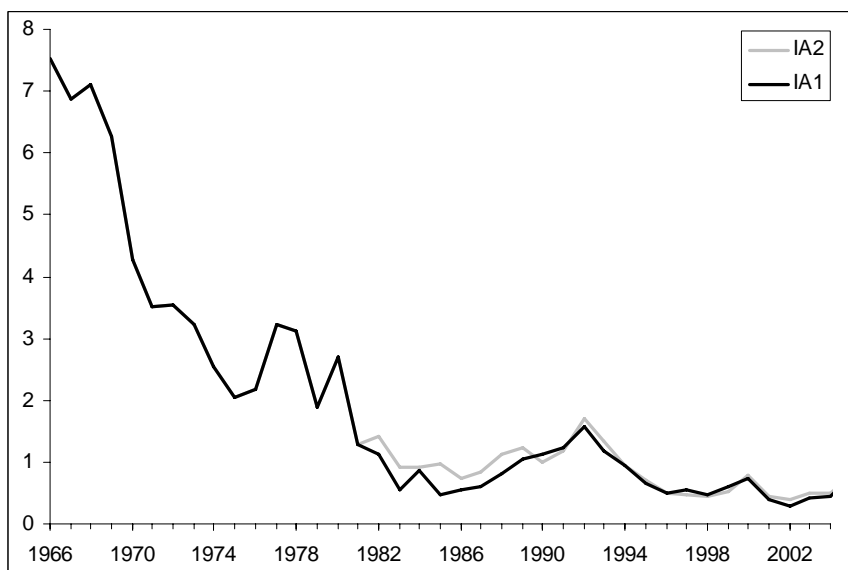


Figure 11. Development of the octopus stock in Mauritania, expressed in relative indices. Of the two indices shown, the solid line (IA1) is considered the most accurate one.

It is seen that the stock has a long history of decline, and that the current indices of abundance are the lowest in the series. The workshop therefore concluded that the stock was in a state of serious depletion.

Using the abundance indices calculated above, the fishing effort in each fleet segment can be calculated by dividing catches by that fleet by the abundance index. The result is a relative index of fishing effort that can be compared with the corresponding values obtained for other fleets. The results of this exercise are shown in Fig. 12.

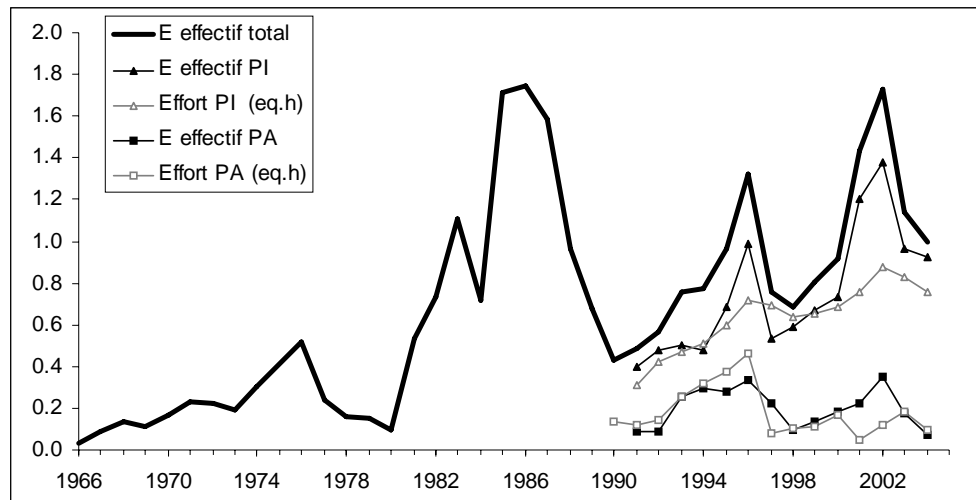


Figure 12. Development of fishing effort on poulpe. The graph shows the total combined effort of all fleets (effectif total) and the contribution by the industrial fleet (effectif PI) and the artisanal fleet (effectif PA). The grey lines (Effort PI and Effort PA) indicate the effort series for the industrial and artisanal fleet expressed in fishing days and fishing trips (all converted into indices).

The graphs in Figure 12 show that total fishing effort on octopus has doubled over the past 15 years. All of this increase in effort is caused by the industrial fleet which at present contributes 75% to the total effort; a percentage that is still increasing.

A first impression of the current situation in the octopus fishery can be obtained by comparing developments in catches, effort and stock abundance over the past 40 years (Fig. 13). It is seen that total catches fluctuated around a level of 40,000 tons/year already from the first years of the fishery (not regarding some temporary drops in catches around 1980 and 1990). Fishing effort, however, showed a steady increase over this period, and the stock abundance gradually declined. Until the early 1990s, the decline in abundance was compensated by the increase in effort, and total catches remained at about the same level. Starting from about 1993, the decrease in abundance could no longer be compensated by the increase in fishing effort, and total catches declined. We are now in a situation where a high fishing effort is producing lower catches than a much lower effort in the 1970s.

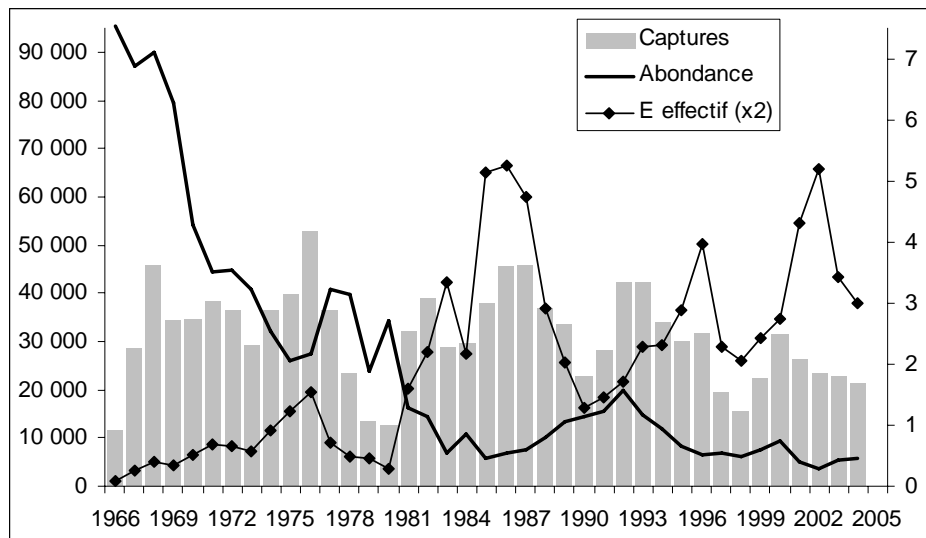


Figure 13. Development of total catches of octopus (*captures*), stock abundance (*Abondance*) and theoretical fishing effort (*E effectif*) in Mauritania since 1966.

A statistical analysis of the data was made by applying equilibrium production models to the data. For a detailed description of the methods and results, the reader is referred to the report of the workshop (Ould Mahmoud et al. 2006). Here we only summarise the main results and conclusions.

Figure 14 shows the results of fitting three different production models to the data. The curves indicate the equilibrium yield at various levels of fishing effort, expressed as fraction of the current (2004) effort. According to one of the models (Gen71), the present fishing effort (index 1.0) is considerably (46%) above the point of MSY. The other two models also indicate that present effort is too high, but here the excess effort is less (9% for Fox90 and 25% for Gen90). The difference between the models consists in the data series being used: Gen71 uses data from 1971 onward, whereas Fox90 and Gen90 use data only from 1990 onward. From a short-term perspective, it looks as if the stock is only moderately exploited, whereas from a long-term perspective, the conclusion is that the stock is severely overexploited. The difference between the two sets of data could possibly be due to a change in the ecosystem, which has reduced average recruitment in recent years.

Eliminating the most extreme option, the workshop concluded that the excess fishing effort was probably around 25%. The workshop therefore recommended to reduce the current fishing effort by this percentage. Apart from a possible increase in catch (ranging from 0 - 20% depending on the model chosen), the costs of exploitation would be reduced, thereby increasing profits for the fleet. A decrease in fishing effort would also reduce the negative impacts on the ecosystem and the stocks of other fish species.

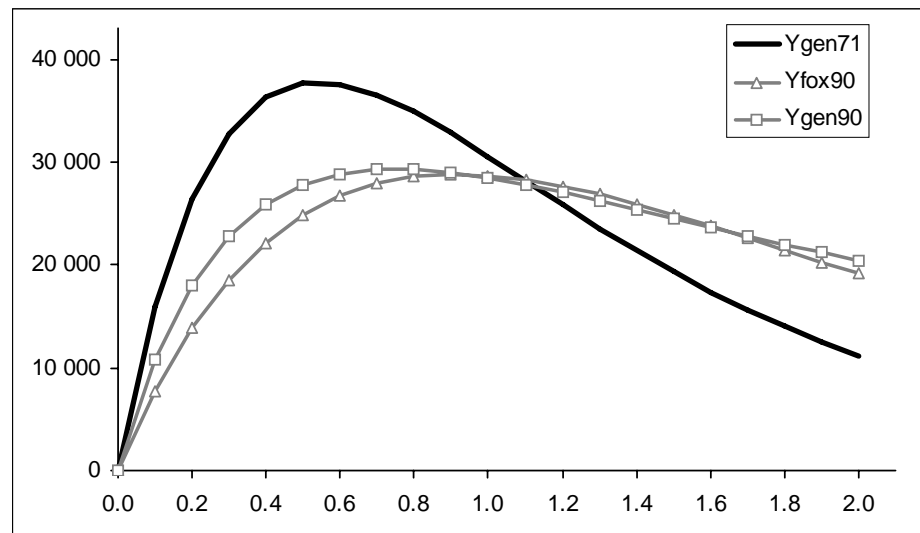


Figure 14. Production models for octopus in Mauritania. The curves correspond to the three different models mentioned in the text. Each curve represents equilibrium catches at different levels of fishing effort (expressed as fraction of the current (2004) effort).

5.1.5. General remarks concerning the RIVO-IMROP workshops

In hindsight, the RIVO-IMROP workshops turned out to be very effective and productive exercises in the field of stock assessment. They provided ideal occasions for a concentrated analysis by Mauritanian and Dutch scientists of the data available at IMROP. An important contribution was also made by the French experts from IRD and the Agrocampus Rennes that were invited to the meeting.

The great advantage of these meetings was that no time was lost in political debates. All participants had only one objective: to present the most reliable and objective evaluation of the stocks, regardless of national interests. This is an ideal setting for scientific research.

Because the meetings were organised by IMROP and RIVO themselves, the reports of the meetings were available shortly after the meetings. This allowed the reports to be distributed quickly to all parties that had an interest in the results.

The workshops provided a valuable basis for the contribution by IMROP to various international working groups, such as the CECAF demersal working group and the EU-Mauritanian scientific working group. The results of these meetings are discussed in the following chapters.

5.2. Regional assessments by the CECAF demersal working group

The demersal fish stocks of Mauritania are closely related to those of the neighbouring countries. Both fish and fishermen migrate back and forth between the different national zones. As a result, problems of overfishing do not remain restricted to one particular country, but tend to occur on a regional scale.

For this reason, it is useful to compare developments in the various fish stocks between countries, and to see whether general patterns exist. In the past, FAO for this purpose has created regional fisheries organisations in different parts of the world. For West Africa, this regional organisation is called CECAF (Committee on Eastern Central Atlantic Fisheries). The

task of CECAF is to coordinate research, organise international assessment working groups, and advise management measures to the national governments. All West-African states from Morocco to Angola are members of CECAF.

Regional cooperation in pelagic research had already been boosted in previous years by the creation of an FAO/CECAF Working Group on Small Pelagics in West Africa. This working group, which was co-financed by The Netherlands, had been quite successful in bringing scientists together and coordinating research in the various West African States. The Working Group met each year and produced reports with the results of stock assessments and managements recommendations (e.g. FAO 2003).

In the framework of the RIVO demersal project, it was decided to take a similar approach for demersal stocks. In previous years, CECAF had not been able to organise meetings of its demersal working group, due to a lack of funds. In order to revive the CECAF demersal working group, the RIVO project financed three annual meetings of this group. The results of these meetings are discussed below.

5.2.1. CECAF meeting 19-29 September 2003 in Conakry, Guinea.

This was the first of the three meetings that were sponsored by the Dutch project. The meeting was organised by FAO, and it was attended by 33 scientists from 14 different countries. The Netherlands were represented by RIVO consultant Martin van der Knaap. The results of the meeting have been reported in FAO (2006a).

The meeting turned out to be useful from the point of regional coordination of research. Since this was the first meeting of the CECAF demersal working group in a long time, most of the time was spent on updating historical data series for catch and effort for the various species. Also much time was spent on a discussions of the appropriate assessment methods to be used. However, due to the large number of fish stocks and countries involved, there was not much time to make detailed analyses for each of the stocks. For the octopus in Mauritania, it was concluded that the stock was overexploited and that fishing effort had to be reduced. However, no clear recommendations were given as to the precise amount of effort reduction required.

On the basis of the experience obtained during this meeting, it was decided that in future the working group should be split into two separate groups, one dealing with the northwest African region, and the other with the central and southwest African waters.

5.2.2. CECAF meeting 14-23 September 2004 in Saly, Senegal.

This second meeting dealt exclusively with stocks in the north-western region, i.e. the waters from Morocco to Senegal. The meeting was again organised by FAO and attended by 21 scientists from 7 different countries. RIVO project leader Ad Corten represented The Netherlands. This time Spain had offered to co-finance the meeting because of the large Spanish interests in the demersal fisheries in the region. The Spanish interest was also apparent from the large number (5) of Spanish participants in the meeting.

Because of the smaller number of countries involved, the participants could concentrate their attention on a limited number of stocks in the north-western region. Some stocks, such as the thiof (*Epinephelus aeneus*) in Senegal and *Sparus* spp. in Morocco, were heavily overfished, and recommendations were given to drastically reduce fishing effort.

For the octopus in Mauritania, the results of the analyses depended very much on the data series used. Evaluations based on catches per unit of effort in the commercial fleet indicated a serious overexploitation of the resource. However, if the analyses were based on results of research vessels surveys, the results were inconclusive. In the end the working group concluded that the octopus was overexploited, but it did not quantify the degree of overexploitation. This was due to the objection from Spain to mention precise figures for the excess fishing effort.

The results of the meeting have been published by FAO (2006b). Corten also wrote a personal report of the meeting to the Ministry of Foreign Affairs (Corten 2004d).

5.2.3. CECAF meeting 13-21 September 2005 in Cotonou, Benin.

Because the CECAF meeting in 2004 had been devoted exclusively to the stocks in the northern area, FAO was obliged to organize a meeting for the southern countries in 2005. This meeting dealt with demersal stocks from Guinea to Angola.

The meeting turned out to be very useful for strengthening the cooperation between the southern countries and for assessing their demersal stocks. Because the assessments were restricted to the southern stocks, the results are not further discussed in this report. A full report by FAO is in preparation (FAO in prep).

5.2.4. General comments on the meetings of the CECAF Demersal Working Group.

The financial contribution by the RIVO project enabled a revival of the CECAF demersal working group. With the invaluable help of FAO, three successful meetings of this group were held in different countries (Guinea, Senegal and Benin). These meetings were very important in bringing scientists from different countries together, and to analyze common trends in the demersal fisheries in the region. The working group updated catch and effort series for demersal fish, shrimps and cephalopods. These data series now constitute the most up-to-date and reliable source of information on demersal fisheries in West Africa.

The analyses performed by the Working Group showed that several fish stocks in West Africa are in a state of severe over-exploitation. In general, the problems of overfishing are worse in demersal stocks than in pelagic stocks. This is due to the high value of these species, and their high vulnerability to even small fishing vessels. The working group highlighted in particular the serious state of the thiof (*Epinephelus aeneus*) and other high value demersal species in Senegalese waters. These species are exploited by large numbers of artisanal fishermen, using small canoes. It will be extremely difficult to obtain the necessary reduction of fishing effort on these species.

For the RIVO-IMROP project, the most important species discussed during the meetings were the octopus and shrimp in Mauritania. In this field, however, the meetings did not produce much new information or conclusions. Assessments of octopus and shrimp in Mauritania had been made already during earlier national working groups in Mauritania, and the analyses made by the CECAF working group in general only confirmed the results of national assessments. In the case of octopus, the discussions in the CECAF working group sometimes tended to get a political character. When the discussion centered on the necessary reduction of fishing effort, the (large) Spanish delegation systematically objected to the inclusion in the report of a specific figure. In this way, the working group failed to contribute to a solution of the overfishing of octopus in Mauritania.

Another problem in the working group was the large number of species and countries involved. The number of fish species in demersal fisheries is much larger than in pelagic ones. Hence, it

is more complicated to make an assessment of all species involved. In addition, the large number of countries involved created another complication. For the pelagic fisheries, the FAO has created a working group that only deals with stocks in Northwest Africa and this group meets annually. For the demersal stocks, however, CECAF insisted that the working group should cover the whole CECAF area, which is from Morocco to Angola. This was not a practical option, and after one year it was decided to split the working group into a northern and a southern sub-group. However, with the limited funds available, it was not possible to organize meetings of both the northern and southern subgroups each year.

Contrary to pelagic stocks, demersal stocks are more tied to the various national zones, and they can be quite well managed on a national basis. The need for international management, therefore, is less pronounced than in the case of pelagic stocks. Now that the CECAF working group for demersal stocks has been firmly established, the need for annual meetings of each of its subgroups has become less urgent.

5.3. EU-Mauritanian scientific working group

According to Article 4 of the Protocol on the Fisheries Agreement between Mauritania (RIM) and the EU, concluded in 2001, a joint EU-RIM Scientific Group was established in 2002. The task of this group was to evaluate stocks of cephalopods in Mauritanian waters and to advise fisheries managers (assembled in the so-called "Mixed Committee") on appropriate management measures. Later the small pelagics (sardinella and horse mackerel) were added to the terms of reference of the scientific working group

During the course of the project, the group met on three occasions (May 2003, January 2004 and November 2004). Only one of these meetings (May 2003) was a regular meeting of the group. In January 2006 the EU attempted to call another meeting of the group. However, due to the late announcement the meeting was attended only by two scientists from Spain. This meeting, therefore, cannot be considered as a normal meeting of the EU-Mauritanian working group.

The results of each of these meetings are discussed below.

5.3.1. EU-Mauritanian working group meeting 9 - 12 May 2003

This meeting, organised at the site of IMROP in Nouadhibou, was the first regular meeting of the EU-Mauritanian scientific working group. An earlier meeting in October 2002 had only resulted in the formulation of the terms of reference for the group. The May 2003 meeting had a rather chaotic start, with the Mauritanian hosts shifting the dates of the meeting at the last moment. This resulted in the Irish and German participants being unable to attend the meeting. From the EU-side, only members from Spain, Denmark and the Netherlands attended the meeting.

The working group was asked to assess the stocks of cephalopods (octopus) and small pelagics in Mauritania. For small pelagics this did not present a problem, but for octopus the meeting could not formulate a joint conclusion. The Spanish participants, who had prepared the draft section on octopus, were of the opinion that much uncertainty existed about the state of the stock, and that no clear recommendations could be given. The Mauritians, on the other hand, pointed to the results of the IMROP Groupe de Travail in December 2002, which had concluded that octopus was severely overexploited and that fishing effort had to be reduced by 25-40%. In the emotional discussions that followed, the Spanish participants absolutely refused to agree with a recommendation to reduce fishing effort on octopus. The meeting was closed without an agreed report, but it was proposed that the Spanish and Mauritanian participants would prepare a common draft before the 15th of June and invite comments by e-mail. Following the meeting, Spain circulated a draft section on octopus that was rejected both by

Mauritania and the Netherlands. A Mauritanian proposal for an amended text was subsequently vetoed by Spain. Due to this controversy, no agreed report was available by the end of 2003.

The minutes of the meeting were presented by Dia (2003). A personal report was prepared by Corten to the Ministry of Foreign Affairs (Corten, 2003).

5.3.2. EU-Mauritanian working group meeting 29-30 January 2004

During a visit by Corten to the Commission in Brussels in December 2003, representatives of the Commission stressed the need for an agreed report on the May 2003 meeting. On their request, Corten passed this message on to the IMROP director. In response to the request from the Commission, IMROP organised a short meeting from 29-30 January 2004. From the EU-side, only scientists from Spain, Germany and The Netherlands were present at the meeting. In addition, the Commission sent two representatives that had to try and sort out disagreements among the EU scientists (that meant between Corten and his Spanish colleagues). In the end, the meeting agreed on a compromise text that stated that octopus was overexploited and that fishing effort had to be reduced. The Spanish scientists, however, still refused to give a figure for the required amount of effort reduction. With the agreed text on octopus, the report of the May 2003 meeting could finally be released (IMROP 2004).



Discussion at IMROP

5.3.3. EU-Mauritanian working group meeting 8 - 11 November 2004

The EU had called for this extra meeting on short notice in order to evaluate the existing minimum size of octopus (500 g). In addition to this request, they had added a long list with other terms of reference.

As on previous occasions, the meeting had a chaotic character, with the Spanish participants arriving halfway during the meeting, and the Mauritians leaving half a day before the end of the meeting. Apart from the Spanish and Dutch participants, there were no other scientists from the EU, as preparation time was insufficient for travel and visa arrangements.

The meeting concluded that there were no new data on which to base a recommendation for a change in minimum size of octopus. The participants criticised the hasty way in which the meeting had been called by the EU and the formulation of the terms of reference. They proposed a number of ways in which the functioning of the working group could be improved in future. One of these would be the inclusion of experts from other EU countries.

The agreed report of the meeting was prepared by the chairman (Dip, 2004). A personal report was prepared by Corten for the Ministry of Foreign Affairs (Corten 2004).

5.3.4. EU-Mauritanian working group meeting 24-26 January 2006

On the 1st of December 2005, Corten heard from the Mauritanian minister of fisheries that the negotiations with the EU about the renewal of the fisheries agreement were already in an advanced stage, but that the EU had not yet asked for a meeting of the scientific working group. Corten passed this information on to the Dutch Ministry of Foreign Affairs. On the 7th of December, the IMROP director informed Corten that he had been asked by the Commission to organize a meeting of the scientific working group at a very short notice. Apparently, the Dutch ministry had reminded the Commission of their obligation to call a meeting of the scientific working group. The proposed dates (16-17 December), however, were unrealistic, so the meeting was postponed until January. Corten contacted all EU members of the working group to find the first period when everybody was available. This turned out to be from 7 - 9 February 2006. He proposed these dates to the Commission, but the Commission insisted that the meeting should be held already in January. The Commission forced IMROP to organize a meeting in January, and the new dates (24-26 January) were announced exactly one week in advance. None of the EU members could attend, except for two Spanish members that were told by their administration to drop all other activities and fly immediately to Nouadhibou. The subsequent meeting was a mere formality with no new assessments being made, and no report distributed. Other members of the group sent formal complaints to the Commission that it had been impossible for them to attend the meeting at such a short notice.

5.3.5. General comments on the EU-Mauritanian scientific working group

When the Dutch government asked the Commission in 2001 to create an EU-Mauritanian scientific working group, the intention was that this group would help to protect Mauritanian fish stocks from overexploitation. The group would be composed of a sufficient number of international scientists that would meet at least once a year. If the group found that stocks were overexploited, it would formulate management recommendations that would assist Mauritanian and EU managers in reducing fishing effort. In this way, the group would be instrumental for the sustainable management of Mauritanian fisheries resources.

In practice, however, the scientific working group has been almost a complete failure. The few meetings that were held were badly organised, and the attendance to these meetings was low; particularly from the EU-side. The meetings failed to produce clear recommendations, and the advice they did produce was not used by administrators.

The question is why the scientific working group failed to produce the expected results. The main causes were the lack of political motivation on the side of the EU and Mauritania, and the practical difficulties of setting up a mixed scientific working group. Both aspects will be discussed below.

When administrators from the EU and Mauritania concluded the fisheries agreement in 2001, both parties probably knew that the number of octopus licenses allocated to the EU was too high. However, the agreement was a political deal in which short-term political and economic interests were probably more important to both parties than the long-term sustainability of the

fishery. The EU wanted to create fishing opportunities for Spanish fishermen that had just been expelled from Morocco, and Mauritania needed the maximum amount of revenues from the agreement. Once the agreement had been concluded, both parties were not very interested to change the number of licenses halfway during the contract. Such a change would create problems for Spanish fishermen, and it would reduce the income from the agreement for Mauritania.

In the light of this political situation, it is clear that the EU and Mauritania considered the joint scientific working group as a formality, rather than as an important source of management advice. This probably explains the lack of attention given both by the Commission and the Mauritanian government to the working group. After the establishment of the group in 2002, the Commission called only two times for a regular meeting of the group: in May 2003 and in December 2005. The last time the Commission had apparently forgotten that the working group existed, and that they were obliged to ask the group for its advice before they could conclude a new agreement with Mauritania (the existing agreement was to be renewed in January 2006).

The problems with the December 2005 / January 2006 meeting may serve as an example of the lack of interest and preparation on the side of the EU. Apart from the lack of political motivation on the side of the EU, there was no clear structure for organizing regular meetings of the group. It was not clear who, within the Commission, was responsible for calling the meetings and drafting the terms of reference. There was no focal point among the EU members of the group that could prepare and coordinate the meetings. The number of experienced EU members was too small, and the frequency of the meetings was too low.

Unless drastic action is taken to improve its organization and performance, the scientific group will never deliver the results that were expected. Corten wrote two memos to the Dutch Ministry of Foreign Affairs with proposals for an improvement of the group (Corten 2005a, 2005b). However, due to the uncertainty about the renewal of the agreement, no steps were taken to put these proposals into practice.



Vessel fishing for shrimps

6. Management advice

In the previous chapter, we have seen that the project assisted at a number of national and international working group meetings. Most of these meetings provided some kind of management advice, either in general terms ("the stock is moderately/severely overexploited"), or in more specific terms ("fishing effort has to be reduced by x%"). These conclusions were formulated in the reports of these meetings, but RIVO experts generally did not take part in the subsequent discussion of the recommendations with Mauritanian fisheries managers. The reasons for this were the following;

- Regular consultations between managers and scientists in Mauritania take place between the minister and the director of IMROP. Foreign experts normally are not invited to these consultations.
- A more open dialogue between scientists and administrators in Mauritania is organised once every four years during the "Groupe de Travail". The last of these meetings was in December 2002, and the next one will be held in December 2006. There was no Groupe de Travail held during the course of the RIVO demersal project.
- The European Commission acts on behalf of the Member States as discussion partner of the Mauritanian government when it comes to management advice. Consequently, the Commission does not appreciate individual member states to provide management advice directly to Mauritanian officials.

The only two occasions when RIVO scientists were invited to participate in a dialogue on management issues with the Mauritanian government was a meeting on octopus management and a meeting on shrimp management .

The Directorate of Management of the Mauritanian fisheries ministry organised a workshop in Nouakchott from 23-26 June 2004 on the management plan for octopus, and the RIVO project manager Corten was invited to participate. Following a request by the Director of Management, Corten also brought a second Dutch expert to this workshop. This was Mr. Gerard van Balsfoort, the former deputy director of fisheries in The Netherlands.

During the Nouakchott workshop, it appeared that the Directorate for Management had developed plans to manage the octopus fishery in Mauritania by a system of ITQs (individual transferable quotas). The ministry was interested in the experiences in The Netherlands, where such a system had been operational for the last 20 years. During the workshop, Corten pointed out that despite the theoretical advantages of an ITQ system, the practical results in the Netherlands had been disappointing. This was due to problems of inspection, inaccurate stock assessments, and fishing boats catching several species of fish at the same time. It was expected that these problems would be even more severe in the Mauritanian situation. Therefore, it was recommended to postpone the introduction of an ITQ system, and to work with a license limitation system for the time being.

However, other foreign experts at the meeting had more positive expectations of an ITQ system. They told that such a system worked very well in Australia, New Zealand and Canada, and they expected the system would work equally well in Mauritania. It appeared that the Mauritanian Directorate for Management had already developed advanced plans to introduce an ITQ system for octopus in Mauritania, and they did not seem to be very interested in the negative aspects of such a system.

A second workshop focussing on the management of shrimps was held in Nouadhibou and attended by P.C.Goudswaard. The same system of ITQs was also discussed during this meeting. Resistance from the Mauritanian side came from representatives of the DSPCM who

argued that the enforcement of such a system, with a large foreign fleet landing its catch outside the territory of Mauritania, is complicated.

Despite their maybe overoptimistic expectations of a quota system, it is encouraging that Mauritanian officials at ministerial level are actively searching for solutions to combat the problem of over-exploitation in their area.



Canoe fishing for octopus

7. Training

7.1. Training of IMROP observers

Although IMROP scientists and technicians already had considerable experience in making observer missions on board (Dutch) pelagic trawlers, the work on board Mauritanian shrimp vessels was a new experience for them. After Goudswaard had made the first mission on board a shrimp trawler himself, he trained a number of IMROP technicians in the collection of biological data on board these vessels. Setting up the observer programme on board shrimp trawlers also required the establishment of procedures for planning the missions and getting the permission from ship owners and captains. Because the vessel owners and captains had no previous experience (or only bad experiences) with having observers on board, it took a long time to win their confidence.

Once the programme had been started, Goudswaard delegated the responsibility for the continuation of this work to his counterpart and intervened only in case of problems.

7.2. Training in stock assessment methods

At the request of IMROP, the project financed part of the training course on stock assessment that was organised at IMROP in November 2004. The aim of the 4-week course was to train IMROP scientists and technicians in modern techniques of stock assessment. The course was given by Dr. Pavel Gasyukov from Russia; a world authority on the subject. The course was attended by 8 IMROP scientists. The experience gained during this course provided IMROP scientists with sufficient background to fully participate in meetings of international assessment working groups.

7.3. Training in fishing methods

One of the two research vessels of IMROP, the 25m catamaran "Amrique" had not been able to fish efficiently with the bottom trawl that was supplied by the Japanese manufacturer. IMROP therefore asked to project for advice how to increase the fishing performance of the Amrique. RIVO sent gear expert Mr. Anne van Duijn over to Nouadhibou to investigate the problem. Mr. Van Duijn advised that the vessel should use a Dutch type beam trawl. Consequently such a beam trawl was order from a net manufacturer in the Netherlands.

The captain of the Amrique, Mr. Mohamed Abdelahhi visited the Netherlands from 10 - 20 August 2005 to study the use of beam trawls on board Dutch fishing vessels. He stayed for a few days on board a Dutch shrimp trawlers together with a RIVO colleague, and he also visited the net manufacturer where he received net drawings and instructions for repairs of the net. Finally he discussed what adaptations of the Amrique had to be made in order to allow the vessel to use the Dutch beam trawl.

8. Institutional support to IMROP

In addition to the expenditures related to the specific activities of the project, IMROP asked the project on some occasions to provide help of a more general nature. These requests were considered justified, as the activities of the project were closely related to the functioning of the institute in general. One can not expect a single project to run successfully in an environment where other research activities are seriously hampered by a lack of essential material. Of course it was not the responsibility of the project to solve all technical problems at IMROP, but a modest contribution to the general functioning of the institute was considered appropriate.

An important element of institutional support were the various training activities outlined in section 7. In addition, the project provided equipment to IMROP, and it started the development of a data base on catch and effort statistics. Both aspects are briefly discussed below.

8.1. Provision of material

One of the fields where the project provided general support to IMROP was the acquisition of computers and other electronic equipment. The institute had been hampered for years by a chronic shortage of computers and laptops. At the request of the IMROP director, the project financed the acquisition of a number of computers, laptops and video projectors. This acquisition enabled the institute to considerably increase the working capacity of its scientists and technicians. A list of all material supplied to IMROP is presented in the text table below.

item	specification	number
desktop computers	HP dx2000 MT P4 3GHz 80 Go 512 Mo COMBO Norton XPPro Garanti 3-1-1	37
flat screens	HP ECRAN 17" TFT - L1706 LCD MONITOR -	37
laptops	HP nx6110 PM750 15" 512MB 60GB DVDrwLS Wifi MDM BT XPP PROMO - >28/02	18
briefcases for laptops	Sacoche rigide pour notebook 15 pouces	18
power stabilisers	APC BK 650EI 650VA	38
video projectors	HP mp2220 Vidéoprojecteur - XGA 1024x768 - 1400 Lumens - 2000:1	3
power stabilisers	APC LINE-R 1200VA AUTOMATIC VOLTAGE REGULATOR, 230V,	4

As mentioned in section 7, the project also supplied a beam trawl for the research vessel "Amrique". The utilization of this net, however, requires an adaptation of the vessel. IMROP has not yet found the necessary funds for this adaptation.

8.2. Training on the spot.

During the project several actions and discussions with counterparts resulted in the active participation in the design of a sampling programme for observers on board demersal vessels. For some of the researchers it was the first time to work on board demersal vessels. It was shown to the management of IMROP that a lot of data can be obtained from these observer trips at very low cost compared to research vessel observations.

8.3 Data base development

In cooperation with the RIVO pelagic project, a data base for logbook statistics was created. So far this data base contains only statistics on fishing effort (expressed in numbers per days). The data base was used in a study on the development of fishing effort in the various Mauritanian fleets (see section 4.4). The present data base, however, can be extended to include landing data. The further development of the data base is the subject of a new project proposal that has been submitted to the Dutch Ministry of Agriculture, Nature Conservation and Food Quality.



Raft used by single fishermen

9. Discussion and conclusions

In this chapter we will summarise the results of the project and compare them with the original project objectives (paragraph 9.1). One of the most complicating aspects of the project were the political sensitivities that were involved in the stock assessment of octopus. These will be briefly considered in paragraph 9.2. Finally some future requirements for a responsible management system will be outlined in paragraph 9.3.

9.1. Project results compared with project objectives

9.1.1. Adaptation of EU fishing effort on octopus

The main objective of the project was to provide new assessments on demersal stocks that could be used to adapt - if necessary - the number of licenses for the EU-fleet working under the EU-Mauritanian fisheries agreement. This objective was only partially reached. At the mid-term revision of the agreement in 2003, a new report on the status of the demersal stocks had been produced by the project, and this report stated that the octopus stock was overexploited. However, this information was not used by the EU-Mauritanian "mixed committee" to decrease the number of EU licenses for octopus halfway during the period of the agreement. When the renewal of the agreement was negotiated in February 2006, two project reports with updated assessments were available: one dealing with octopus and another, dealing with shrimp. In the agreement that was concluded just three days before the end of the project (27 June 2006), the number of EU licenses for octopus was reduced from 55 to 43. For shrimp, the new agreement restricted total tonnage to 9440 GT. Under the old agreement, the tonnage of the shrimp fishery was restricted to 6000 GRT. The ratio between GRT and GT is different for each vessel, and it is not possible to compare the new agreement for shrimp with the old agreement.

It is hard to estimate how much the results of the project have contributed to the reduction in fishing effort by the EU octopus fleet. The negotiations between the EU and Mauritania are a bargaining process in which many aspects play a role. It is certain that the Mauritanian government this time took a firmer stand than in 2001, insisting that the EU fishing effort on octopus and shrimps should be reduced. This firmer stand was probably based partly on stronger advice from its scientists. This stronger advice may have been partly related to the results of the project, but this is impossible to quantify. Other factors that played a role were the more responsible attitude of the new Mauritanian government (a government that was established after the military coup of 3 August 2005), and a reduced dependence on the EU because of the new oil revenues of Mauritania.

On the EU side, the results of the project may have refrained the Commission from putting its demands too high. In the preceding months and years, the project had consistently drawn attention to the overexploitation of octopus, both in scientific working groups as well as in discussions with government officials in Mauritania, the Netherlands, Germany and in the EU. The conclusions of the project had been disseminated through newspapers, fisheries magazines and NGOs. The project also played an active role in the EU-Mauritanian scientific working group, involving colleagues from Germany, France and Ireland, and thereby increasing the awareness in the EU that the octopus stock in Mauritania was being overfished.

9.1.2. Improving the assessment of demersal stocks in Mauritania

The project contributed to an improved stock assessment of octopus and shrimps in a number of ways. In the first place, the various working groups organised by the project in Mauritania allowed a better analysis of existing data, making maximum use of the expertise of the Mauritanian colleagues and the foreign experts that were invited as consultants. Secondly, the project contributed to a number of international meetings of the CECAF working group on demersal stocks. This allowed an exchange of information and ideas with scientists from neighbouring countries, and also a comparison of the state of the stocks in Mauritania with those in neighbouring countries. Through the CECAF working group, the project not only contributed to an improved assessment of demersal stocks in Mauritania but also those in the neighbouring countries, in particular Senegal.

The results of the various workshops and meetings clearly showed the state of overexploitation of the octopus, and the need for a reduction of fishing effort. For the shrimp stocks, the assessments showed that these stocks had probably increased as a result of intensive fishing and the removal of predators. Although fishing effort on these stocks was optimal from the perspective of shrimp fishermen, the intensive shrimp fishery has a negative effect on other commercial fish stocks. For this reason, a further expansion of these fisheries should not be allowed.

Through the new observer programme on board commercial shrimp trawlers, the project collected new data on the actual catch composition of shrimp trawlers and the amount of discards. This information allowed a first assessment of the impact of the shrimp fishery on other commercial fish stocks.

9.1.3. Increasing the selectivity of the shrimp fishery

Increasing the selectivity in the shrimp fishery is a major operation that requires a larger project, specifically dedicated to this task. During the current project, only a first start could be made with this subject. It was fortunate that the project could combine forces with the Canadian experts that had been invited by IMROP to work on this subject. The preliminary trials with the Nordmøre selection grid in October 2005 produced promising results. If these experiments can be extended in the course of a new project, there are good prospects that the selectivity in the shrimp fishery can be increased in a few years from now.

9.2. Political sensitivities

The project was commissioned by the Dutch Ministry of Foreign Affairs as a result of an internal conflict in the European Union about the number of octopus licenses that should be allocated to the Spanish fleet in Mauritania. The project should provide information on the state of the octopus stock that was to be used during future negotiations. If the project results would prove that the octopus was indeed overexploited, the number of licenses for the Spanish fleet might have to be reduced.

Both the Commission and the Spanish scientists saw the Dutch project as a direct threat to the Spanish interests in Mauritania. Even before the project had started, the IMROP director received a fax from the Spanish research organization IEO, urging the institute to reconsider the intended cooperation with RIVO in view of "duplication" of the work that was done already by IEO, and the possible access of RIVO scientists to confidential data on the Spanish fleet.

During the first two years, the Spanish scientists remained suspicious of the intentions of the Dutch project. In addition, it seemed that the Spanish scientists were under pressure from their

own administration not to agree with conclusions that the octopus was overexploited, and certainly not to agree with recommendations specifying the desirable amount of effort reduction. This rigid position frequently resulted in hot debates between Spanish, Mauritanian and Dutch scientists. In an attempt to strengthen the Spanish position, Spain sent large delegations to meetings of the CECAF demersal working group, and also the EU-Mauritanian working group. In 2004, Spain even decided to co-finance the meeting of the CECAF demersal working group. The European Commission apparently was also concerned about the Dutch influence in the discussions on octopus. During the meeting of the EU-Mauritanian working Group in 2004, the Commission sent two high ranking officials as "observers", apparently in an attempt to reduce the Dutch resistance against the Spanish position. Furthermore, the Commission sent signals through the Dutch Pelagic Shipowners Association and the Dutch Ministry of Agriculture that they were not pleased with the activities of the RIVO demersal project.

Fortunately, the relationship between Spanish and Dutch scientists improved during the last year of the project. On the Spanish side, it was realized that the existing overexploitation of octopus could no longer be denied. In addition, the confidence and mutual respect between Spanish and Dutch scientists increased as both parties started to know each other better. Scientists from both sides agreed that the main objective of their work was to cooperate with the Mauritanian colleagues in order to provide the best possible assessments of the Mauritanian fish stocks.

9.3. Requirements for future management of demersal stocks in Mauritania

9.3.1. Strengthening the EU-Mauritanian scientific working group

The renewal of the EU-Mauritanian fisheries agreement for another six years (2006-2012) offers an opportunity for the EU to contribute to the responsible management of fish stocks in Mauritania. This contribution will primarily occur through financial aid to research and fisheries inspection in Mauritania. In addition to this financial contribution, however, the EU could assist Mauritania through the sharing of expertise in the field of stock assessment and management advice. There is already an instrument in place for this task: the joint scientific working group.

As described in section 5.3.4, the performance of the joint scientific working group under the former agreement has been far from optimal. A number of recommendations has been put forward to increase the effectiveness of the working group. These include the extension of the group with more experts from other EU countries, and a better preparation of the meetings of the group.

The main requirement for a better organisation and functioning of the group is a stronger support from the side of the European Commission. Whereas the European Community on paper advocates the need for support and cooperation in the field of research (European Community 2002, 2005), the Commission in practice has done little to strengthen the EU-Mauritanian working group. It is hoped that this situation will change under the new agreement, and that the Commission will do its utmost to make the joint scientific working group a success.

9.3.2. Development of selective gears for the shrimp fishery

As described in sections 4.2.6 and 4.3, the shrimp fishery in Mauritania destroys a large number of undersized fish that otherwise would have recruited to the roundfish and cephalopod

stocks. The combined yield of all demersal fisheries could therefore be increased by minimizing the by-catch of undersized fish in the shrimp fishery.

The experiments with a Nordmøre selection grid in the shrimp trawls in October 2005 have shown one possibility to increase the selectivity of the shrimp fishery. Other avenues should be explored as well, such as the use of traps and set nets, especially in the shallower coastal zone.

9.3.3. Improving catch statistics

Stock assessment of demersal resources is very dependent upon reliable catch and effort statistics. Our preliminary research into the reliability of the Mauritanian logbook data has shown a number of errors in these data. It is the responsibility of IMROP to set up a data base for catch and effort statistics that is based on the logbook data of the DSPCM. In order to do so, IMROP should designate a team that is responsible for data verification and data base management.

9.3.4. Extending the IMROP programme of scientific observers on board commercial vessels

Except for the data that were collected on board commercial shrimp trawlers during the project, IMROP has a great lack of accurate data on catch compositions and discards in the various types of demersal fisheries. To remedy this situation, IMROP should expand its programme of scientific observations at sea. This requires the establishment of a special IMROP observer team. Data collected by this team should be verified and entered into a common data base. IMROP should designate a special team that is responsible for this task.

10. List of reports produced

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Annex 1. Contrat de collaboration entre le RIVO (Pays Bas) et le IMROP (Mauritanie)

Programme conjoint de recherche sur les ressources démersales de Mauritanie

Plan d'action 2002-2005

Préambule

Les ressources démersales (céphalopodes, poissons et crustacés) de la Mauritanie font l'objet d'une exploitation soutenue et active. En plus des flottilles artisanales et industrielles nationales qui exploitent ces ressources démersales, il y a aussi la présence d'une flotte européenne qui travaille dans le cadre d'accords de pêche entre la Mauritanie et l'UE.

Le gouvernement hollandais qui est membre de l'EU est intéressé à concourir en aidant la Mauritanie dans son objectif de conservation de ses ressources halieutiques en développant la coopération scientifique entre les institutions des deux pays et en menant notamment des programmes de recherches scientifiques qui serviront d'assises pour les décisions de gestion du secteur des pêches. Ainsi partir de 1998, le gouvernement hollandais a supporté des recherches scientifiques sur les petits pélagiques qui sont les espèces ciblées par les chalutiers européens hollandais en Mauritanie. Actuellement, les ressources démersales sont exploitées probablement plus intensivement que les ressources pélagiques et le gouvernement hollandais a ainsi exprimé sa volonté pour appuyer également des recherches sur les ressources démersales ; Les résultats des différents programmes de recherches doivent contribuer à la gestion rationnelle des ressources halieutiques de la Mauritanie.

Le présent document décrit le programme conjoint de recherches entre le RIVO et le IMROP sur les ressources démersales de Mauritanie et financé par le Ministère des Affaires Etrangères des Pays Bas. Il s'agit d'un programme qui identifie les activités à mener par le IMROP pendant la durée du projet qui est de trois ans (1 juillet 2002 – 30 juin 2005).

Contexte et problématique

Les poissons démersaux de la ZEE mauritanienne sont une composante importante de l'écosystème marin mauritanien car ils contribuent à sa richesse et à sa biodiversité. Les ressources sont actuellement l'objet d'une pêche artisanale émergente dont le développement est une priorité nationale. Elles constituent, par ailleurs la principale composante des captures accessoires de la pêche démersale céphalopodière et crevette. Ces deux pêcheries ont des niveaux de rejets de poissons très importants atteignant 46 et 90% des captures des navires pêchant respectivement les poulpes et les crevettes.

Par ailleurs, les niveaux de potentiel halieutique mauritanien de poissons, espèces à longue durée, encore très mal connu, serait en relation avec celui des céphalopodes et crevettes dont la durée de vie est très courte. Les fluctuations des captures des uns seraient en relation avec celles des autres.

Actions de recherche

Partant de cette situation des ressources démersales de poissons, où des espèces montrent déjà des signes de rareté sous l'effet des pêcheries peu sélectives, il paraît urgent de mener des activités de recherche permettant d'édifier sur les voies et moyens de gérer ces

ressources dont dépend étroitement le développement de la pêche nationale et artisanale en particulier.

Les actions de recherches suivantes seront menées dans le cadre du présent programme :

- suivi et descriptions des pêcheries démersales artisanales de poissons et des pêcheries industrielles de poulpes et de crevettes nationales et européennes
- analyse des prises accessoires de poissons dans la pêcherie de poulpe et de crevettes et étudier les possibilités technique de limiter les captures accessoires et rejet de poissons dans les pêcheries de poulpe et de crevettes
- évaluer par les méthodes directes les stocks de poissons démersaux du plateau et du talus et analyse de la co-évolution des indices d'abondance de poissons démersaux avec celles des céphalopodes et crevettes
- études des paramètres biologiques des principales ressources de poissons
- organisation d'un groupe de travail annuel de synthèse pour évaluer les stocks de poissons et analyser la relation avec les pêcheries de poulpe et de crevettes en vue d'identifier une stratégie intégrée de la protection des ressources côtières mauritaniennes.

L'une des contraintes les plus fortes de l'étude envisagée sur les poissons démersaux et leur lien avec les céphalopodes et les crevettes (impact des pêcheries industrielles), réside dans la qualité des statistiques actuellement disponibles. Cela suppose que la recherche puisse établir des modèles d'estimation des captures et mettre en place un système performant de collecte des statistiques et de suivi des débarquements. C'est à cet effet qu'une action ciblant l'amélioration du système de collecte des données et/ou mise en place de réseaux nouveaux sera à inscrire dans l'actuel programme.

Echéancier

Année 1

- Campagnes à bord du N/O Al Awam pour l'évaluation des stocks et l'étude de la sélectivité (30 jours de mer)
- Bilan sur les données d'observation en mer saisies au IMROP par pêcheries (crevettes, merlus et céphalopodes)
- Mise en place d'un système de collecte des statistiques (données de fréquences de tailles et débarquements)
- Estimation des captures de la pêche artisanale sur la période des enquêtes par métier 1995-2001 et analyses des statistiques de débarquement
- Synthèse des données biologiques collectées lors des campagnes de pêche démersales.
- Réunion de synthèse des données collectées durant l'année 1.
- Rédaction du premier rapport annuel axé sur la description des pêcheries et sur l'évaluation des stocks (poissons et céphalopodes)

Année 2

- Analyse des données d'observation en mer sur les pêcheries démersales et embarquement des scientifiques du IMROP à bord des navires de pêche commerciale (3 céphalopodiers, 3 crevettiers et 2 poissonniers)
- Campagnes à bord du N/O Al Awam pour l'évaluation des stocks et l'étude de la sélectivité (30 jours de mer)
- Evaluation du système de suivi du système des statistiques mis en place (pêche artisanale et industrielle)
- Synthèse bibliographique et analyse des données biologiques collectées lors des campagnes.
- Premiers éléments sur les rejets des pêcheries démersales opérant en Mauritanie

- Rédaction d'un premier rapport conjoint sur l'évaluation des ressources démersales en Mauritanie
- Rédaction du deuxième rapport annuel axé sur les rejets des pêcheries démersales opérant en Mauritanie

Année 3

- Embarquement des scientifiques du IMROP à bord des navires de pêche commerciale (3 céphalopodières, 3 crevettiers et 2 poissonniers)
- Estimation des rejets des pêcheries démersales
- Analyse comparée des données statistiques des captures et des indices d'abondance crevettes-céphalopodes-poissons.
- Evaluation et bilan du système de collecte statistique et des bases de données du IMROP
- Campagnes à bord du N/O Al Awam pour l'évaluation des stocks et l'étude de la sélectivité (30 jours de mer)
- Edition du bulletin IMROP des statistiques 2002-2004
- Groupe de travail sur l'évaluation des ressources démersales de Mauritanie
- Rédaction d'un deuxième rapport conjoint sur l'évaluation des ressources démersales en Mauritanie
- Rédaction du rapport final (évaluation des stocks et mesures de gestion des pêcheries démersales)

Résultats à produire

Un des objectifs du projet est de produire des rapports techniques et scientifiques produits notamment lors des groupes de travaux et réunions d'évaluation qui seront organisés par le IMROP. Les contenus de ces rapports sont précisés dans le tableau ci-dessous.

Dates	Auteurs	Titre	Contenus spécifiques
30 sept 2003	IMROP-RIVO	Premier rapport du projet conjoint IMROP/RIVO : les pêcheries démersales en Mauritanie	Description des principales pêcheries démersales et évaluation des stocks de poulpe et de poissons démersaux
Juin 2004	IMROP-RIVO	Second rapport du projet conjoint IMROP/RIVO : Pêche démersales et rejets	Première étude des rejets des pêcheries démersales opérant en Mauritanie
30 mars 2005	IMROP-RIVO	Troisième rapport du projet conjoint IMROP/RIVO : Etat des ressources de crevettes en Mauritanie	Evaluation des stocks de crevette ; résultats des expériences avec des engins sélectives
31 mai 2005	IMROP-RIVO	Quatrième rapport du projet conjoint IMROP/RIVO : Amélioration de la sélectivité de la pêche aux crevettes	Résultats des expériences avec des engins sélectives ; recommandations pour des mesures de conservation
15 juillet 2005	IMROP-RIVO	Rapport final du projet conjoint IMROP/RIVO : Synthèse de l'étude des ressources démersales mauritaniennes;	Evaluation des stocks de poulpe, crevette, et poissons démersaux et perspectives de gestion

Le projet va aussi produire des données sur les crevettes et la pêche des crevettes qui vont augmenter l'expertise du IMROP sur ce terrain. Les expériences avec des chaluts de crevettes sélectifs peuvent amener à des recommandations pour l'introduction des engins sélectifs dans

la pêche commerciale et ainsi contribuer à la conservation des stocks des poissons dans les eaux côtières.

Le projet contribuera aussi à la formation des chercheurs du IMROP dans l'étude des poissons démersaux. Finalement, le projet donnera de l'appui institutionnel au IMROP (informatique, communications etc.).

Budget

Montants en Euro

Activités financées par le RIVO	An 1	An 2	An 3
25 jours de mer N/O "Al Awam" à 2000 Euro/jour	50.000	50.000	50.000
250 jours de mer observateurs du IMROP à 12 Euro/jour	-	3.000	3.000
matériel de laboratoire	10.000	5.000	5.000
engins de pêche (chaluts + pièces de rechange)	40.000	18.000	18.000
ordinateurs	12.000	6.000	6.000
stages	15.000	10.000	10.000
Frais personnel (indemnités temps partiel)	10.000	10.000	10.000
Imprévu	8.000	8.000	8.000
Frais de gestion	12.000	10.000	10.000
Total (1)	160.000	120.000	120.000
Contrepartie IMROP			
40 jours de mer N/O "Al Awam" à 2000 Euro/jour	80.000	80.000	80.000
Salaires chercheurs	30.000	30.000	30.000
Salaires techniciens	15.000	15.000	15.000
Bureaux	10.000	10.000	10.000
Edition et reprographie	10.000	10.000	10.000
Total (2)	145.000	145.000	145.000
Total générale	305.000	265.000	265.000

Les virements seront faits par le RIVO selon le calendrier suivant:

Date	Euros
1 juillet 2002	160.000
1 juillet 2003	120.000 après l'approbation du premier rapport annuel
1 juillet 2004	60.000 après l'approbation du deuxième rapport annuel
1 juillet 2005	60.000 après l'approbation du rapport final

Les virements seront fait à la Générale de Banque de Mauritanie, BP 444, Nouadhibou, sur un compte qui sera ouvert par le IMROP sous le nom « RIVO démersales »

L' IMROP présentera un bilan financier chaque an dans le rapport annuel. Le virement pour l'année prochain ne sera fait jusque le rapport annuel, y compris le bilan financier, soit approuvé par le RIVO.

Signature:

Date:

November 13, 2006