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RIVO report

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Incidental catches of pelagic megafauna by the EU pelagic fleet in the Mauritanian Exclusive Economic Zone during the year 2001.
Results extracted from the Scientific Observer Program.

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Summary

The joint project between the Netherlands Institute for Fisheries Research (RIVO) and the Mauritanian Institute for Oceanography and Fisheries Research (IMROP) has been initiated in 1998 in order to strengthen Mauritania's capacity for research on stocks of small pelagic fish. Part of this project is the 'Scientific Observer Program' that monitors the catches (conserved and discarded) of the EU fishery for small pelagics in Mauritania.

The EU pelagic fleet in Mauritania focuses their fisheries mainly on the group of sardinella, additional target species are horse mackerel, chub mackerel and pilchard. Still, the unwanted bycatches of non-commercial large animals such as sharks and dolphins is inevitable so far. This report describes the total bycatches of the pelagic megafauna by the EU pelagic fleet in the Mauritanian Exclusive Economic Zone during the year 2001.

The current sampling of large bycatches appears to be full of shortcomings and the collected data are inadequate to apply for the evaluation of the impact of the EU pelagic fishery in Mauritania. Therefore it is concluded that the program needs to undergo a thorough renewal. Essential recommendations are given.

1 Introduction

This report describes the non-commercial catches of pelagic megafauna by the EU pelagic fleet in the Mauritanian Exclusive Economic Zone during the year 2001. It follows the report of the period 1999-2000 (Benjamins, 2002c). Pelagic megafauna will be defined as medium sized to large (total length > 1m) pelagic vertebrates. This includes the marine mammals, as well as sea turtles, various sharks and rays, and a number of large pelagic fish such as tuna, swordfish and ocean sunfish.

The results are derived from the 'Scientific Observer Program', which was initiated in 1999 as a joint project by the Netherlands Institute for Fisheries Research (RIVO-DLO) and the Mauritanian Institute for Oceanography and Fisheries Research (IMROP) in Nouadhibou, Mauritania.
The Scientific Observer Program is meant to monitor the activities of the EU fishery for small pelagics in Mauritania. In 1996, several vessels from EU member states, notably the Netherlands, started to fish in Mauritanian waters. These ships partly replaced vessels from the former Soviet Union for which the fishery in Mauritania was no longer profitable after the privatisation of the former state-owned companies.
Since 1996, the fishing effort by the EU pelagic fleet has gradually increased and the fleet has expanded with new ships that are equipped with highly developed technologies. Their fishing effort is focussed mainly on the group of sardinella *(Sardinella aurita* and *Sardinella maderensis)*. Additional target species are horse mackerel *(Trachurus trachurus*, *Trachurus trecae* and *Decapterus rhonchus)*, mackerel *(Scomber japonicus)* and pilchard *(Sardina pilchardus)*.
The catches are transhipped in the port of Las Palmas, Gran Canaria (Spain) or at sea near Nouadhibou or Nouakchott (Mauritania), before being transported to other countries, notably in West-Africa (Corten, 1999).

In the framework of the 'Scientific Observer Program', technicians and scientists from the IMROP go on board the EU pelagic trawlers in order to collect information about the amount and composition of the catches (both from the conserved and discarded fractions), including the incidental bycatches of pelagic megafauna. These data combined with landing data obtained from the ship owners give detailed information about the total catches by the EU pelagic fleet in Mauritanian waters.

Results of the sampling of pelagic megafauna are reported here separately from the results of the sampling of small pelagic fish (Benjamins, 2002a and 2002b; ter Hofstede, 2002). The reason for this is that both the sampling methodologies and extrapolation to the total catches of the EU-fleet differ from each other. Furthermore, the sampling of (commercial) small pelagic species is intend to provide data for rational management of commercial stocks, whether the objective of the sampling of pelagic megafauna is to obtain some idea of the ecological impact of the fishery by pelagic trawlers.

2 Methods

2.1 Sampling of pelagic megafauna

The fishermen search for schools of pelagic fish by sonar. In case fish schools are detected, the net is set and the ship starts chasing for the detected schools, again making use of the sonar. As soon as the amount of fish in the net seems large enough for processing, most of the net is taken on board; only the codend, the part were the fish have gathered, stays in the water. The crew connects a fish-pump to the tip of the codend, in order that the catch can be pumped directly from the net into the storage-tanks on board the ship.
Pelagic megafauna, such as sharks, rays, dolphins, sea turtles, etc. are retained in a specific part of the net (the 'shark fyke'), which consists of large meshes that allow small(er) fish to pass, but prevent these large animals from entering the codend. As a result of this, the pelagic megafauna cannot block the fish pump when the catch is taken aboard the ship. Normally, the captured megafauna is released while the net is still in the water. However, during a voyage in the framework of the Scientific Observer Program, these animals are taken on deck in order to get information about the captured large animals.

In principle, the observers inspect all hauls during a voyage for bycatches of pelagic megafauna. As far as possible, all megafauna is determined up to species level (according to FAO standards) and length measurements are taken.

2.2 Data analysis

All data that has been collected by the observers are entered into a standard Microsoft Excel 97 spreadsheet for further processing with the statistical analysis system SAS for Windows, release 8.01.

It is assumed that all hauls of the voyages in the framework of the Scientific Observer Program have been inspected for bycatches of pelagic megafauna outside on deck.
In order to estimate the bycatches of pelagic megafauna during all voyages of the entire EU pelagic fleet, the data obtained by the observers during their voyage will be extrapolated to the entire fleet.

1. raising based on catch weight (monthly)
The same procedure is used as done for extrapolation of the normal catches of small species (see ter Hofstede, 2002): For each month, the estimated total catches of the pelagic megafauna from the sampled voyages are raised by the ratio:

$$\frac{\text{total weight of all conserved species in total landing data of al vessels for that month}}{\text{total weight of all conserved species in the sampled voyages for that month}}$$

For months in which no sampling has been carried out, the data from the adjacent month with the highest total catch are used for extrapolation. This provides the extrapolated total numbers of pelagic megafauna for each month.

Finally, all monthly estimations are summed. This yields the estimated total annual bycatch of pelagic megafauna, for the entire EU pelagic fleet in Mauritania.

2. raising based on fishing days (annual)

The annual catch of pelagic megafauna by the entire fleet can also by calculated by raising the observed numbers of bycatches with the ratio:

$$\frac{\text{total number of fishing days of the fleet during the year}}{\text{total number of observed fishing days during the year}}$$

The calculated catch data can be validated by comparing the two methods of raising with each other; namely the estimated annual bycatch of pelagic megafauna obtained by raising with weight data and the estimated annual bycatch calculated by using the number of fishing days.

3 Results

In the year 2001, the EU pelagic fleet in Mauritania consisted of 8 ships that made a total of 58 voyages. Eight of these voyages (14%) were sampled within the framework of the 'Scientific Observer Program' (see table 1). Since there was overlap in months for these (long) voyages, some sampled voyages could be used for extrapolation up to total catches of the fleet for multiple months. This accounts for the months February and March, August and September, and October, November and December.

3.1 Bycatches of pelagic megafauna 2001

Based on the extrapolation procedures described in section 2.2, the data from the 8 sampled voyages has been used to estimate the total catches of pelagic megafauna by all the EU fishing vessels during the year 2001. The original data are given in table 6, the estimated bycatches of pelagic megafauna are presented in table 7.

According to the extrapolated data obtained from the registration of pelagic megafauna within the framework of the scientific observer program, sharks and tuna have been caught most frequent. For some species it makes a difference whether the original data has been raised based on catch weight or on fishing days, but no more than a factor 4. Although both methods to estimate the total annual catch are quite rough, the fact that the outcomes do not differ a lot makes both methods sufficient reliable.

The Smooth hammerhead *(Sphyrna zygaena)* has been registered most often, 42 individuals has actually been observed, which leads to an estimation of a total catch of more than 300 individuals.
Remarkably, no catch of dolphins has been registered within the framework of the Scientific Observer Program in the year 2001. However, from personal communications with the fishermen it appears that catches of dolphins by the fleet actually have occurred in 2001. This indicates that the observer program does not monitor the bycatches of the fleet sufficiently.

3.2 Comparison with previous years

Comparing the previous report of Benjamins (2002c) with this one, it appears that in the preceding report an extra step for extrapolation has been used. Previously, it was assumed that not all hauls had been sampled during a voyage and therefore the number of megafauna was extrapolated by a raising factor in order to estimate the total number of animals taken during the entire trip. This has been done likewise the procedure for extrapolation of target species (see ter Hofstede, 2002), in which the raising factor is determined by dividing the total weight of all conserved species in the landing data by the total weight of all conserved species in the sampled hauls.
Executing this extra step in raising the observed bycatches of pelagic megafauna causes a very high amount of estimated total catches. For example, the observed catch of 1 single smooth hammerhead *(Sphyrna zygaena)* in August 2000 leads to an estimation of 2860 caught individuals due to over-extrapolation (Benjamins, 2002c).
Therefore, in this report it is assumed that all hauls have been checked by the observers for bycatch of pelagic megafauna, as they are supposed to do (see Appendix 1). Although this probably leads to an underestimation of the total catches of pelagic megafauna, it is considered to be a more adequate approach to the real catches of the fleet.

In order to compare the catches of pelagic megafauna in the year 2001 with those of 1999 and 2000, the data of 1999 and 2000 as presented in Benjamins (2002c) have been recalculated by using the methods as done for with the data of the year 2001, as described in section 2.2. The outcome is given in tables 2 to 5.

The catches of sharks are higher in 2001 than in previous years, meanly due to the large amount of observed smooth hammerheads *(Sphyrna zygaena)*. Also more tunas have been caught, whereas the observers have not noticed any dolphins in the year 2001.
The amount of observed pelagic megafauna is to small to give an idea about a seasonal distribution of the species. Based on the data from the Scientific Observers Program, all species are assumed to be caught randomly throughout the year in the period 1999-2001. The fact that in reality the catches of pelagic megafauna increase during summer (pers. com. fishermen), can not be deduced from the dataset. This is considered another indication that the registration of pelagic megafauna has been inadequate.

4 Discussion

Only 14% of the voyages made by EU pelagic trawlers in Mauritania in 2001 were sampled within the framework of the Scientific Observer Program, which is less than in previous 2 years (respectively 23 and 16%) (Benjamins, 2002a; 2002b). Considering the fact that observers data are extrapolated up to total catches per month of the entire fleet, it is desirable that in the future at least one voyage will be sampled each month.

4.1 Shortcomings in the sampling of pelagic megafauna

The sampling of large bycatches appears to have been full of shortcomings. Therefore the dataset is unusable and no conclusions can be drawn from it.
First, the scientific observers do not check every haul for the presence of pelagic megafauna. This is due to insufficient communication between the crew of the ship and the observers, but also to a lack of interest by the observers. A big problem arises from this. If the crew notices that the observers do not take measurements of the pelagic megafauna, they are no longer willing to bring these animals on board the ship. Namely, the captured megafauna is normally released directly into the sea, while the net is still in the water. Therefore, it is a lot of extra work for the crew to take the heavy animals on deck first and put them back into the sea after the observers have taken their measurements. The result is that the crew stops taking the pelagic megafauna on board and observations cannot be performed at all.
Both participants, the crew and the scientific observers, should truly realise the necessity of a thorough registration of the bycatches of pelagic megafauna. A weak registration is useless. The observers have to be present on the aft deck every haul in order to be ready to take measurements as soon as a sample is brought on deck. Consequently, the crew of the ship has to continue taking all bycatches of large animals on board the ship during the voyage.
Also, it is recommended to make good agreements with the crew and the shipowners about their co-operation, beforehand the voyages.

Another problem is the identification of the pelagic megafauna by the observers. There is a large variety in species, but they appear often to be difficult to distinguish. The current determination up to species level is often limited to species that are described in available literature. Good and extensive identification guides should be present on board the ships. It might even be wise to produce clear identification sheets on which the species- or genus-characteristics are summarised.

Furthermore, the registration of the bycatches of pelagic megafauna has so far taken place on the same sheets as the ones used for sampling the catches of small pelagic fish, i.e. the catches of the target species and the bycatches of small pelagic species. This sampling is quite intensive and cannot be performed every haul, which might cause loss of data of the pelagic megafauna if no sampling of small species has taken place.
Both the sampling methodology and processing procedure differs between registration of the catches of small and large species. It is therefore recommended to use separate registration sheets for the two different programs.

4.2 New program for sampling the bycatches of pelagic megafauna

A new program should be developed to register the bycatches of pelagic megafauna. As with the Scientific Observer Program that is focussed on the catch composition, it is advised to monitor the megafauna during different voyages year-round.
An observer should be on board strictly for activities concerning the sampling of pelagic megafauna in order to have sufficient time to monitor each haul. The observer must be capable of good co-operation with the crew on deck that is responsible for taking the net on board, and should be scheduled for work likewise this crew. On deck, the observer has to check the presence of pelagic megafauna in the 'shark fyke', but also should collect all juveniles of megafauna species who have entered the fish pump at the moment they are pumped into the storage tanks. This way, it is possible to gather all pelagic megafauna in a little time; no time will be wasted below at the working deck, waiting for megafauna species to pass the conveyor belt.
Next, all collected megafauna should of course be determined up to species level and size-measurements have to be taken.
The deployment of an observer who is strictly on board the ship for work issues concerning the sampling of pelagic megafauna will be the only possibility to get a valuable notion of the magnitude of accidental bycatches of pelagic megafauna.

5 Conclusions

The reduction in sampling effort throughout the period 1999-2001 is considered to be a negative development, since it makes the estimates of total catches less precise.

The sampling of large bycatches appears to be full of shortcomings. Therefore the dataset is deceiving and no conclusions can be drawn from it.

Clearly, the registration procedure of pelagic megafauna within the scientific observer program needs to undergo a thorough renewal.

6 Recommendations

The following recommendations are given for the further development of the registration of pelagic megafauna in the framework of the Scientific Observers Program.

- Observers should be sent out on trips throughout the entire fishing season with as even a distribution throughout the fishing season as possible, to better describe seasonal variability.
- In order to avoid large-scale extrapolation of the observer data, it is highly recommended that these trips will take place every month.
- Observers should propagate their motivation to the crew for taking samples of pelagic megafauna every haul.
- Crewmembers have to be co-operative in bringing the pelagic megafauna on board the ship.
- Observers have to check every haul for presence of pelagic megafauna.
- Observers have to take measurements every time pelagic megafauna is taken on board the ship.
- Good identification guides have to be available on board the ship.
- The production of clear identification sheets on which the species- or genus-characteristics are summarised should be considered.
- Registration of the bycatches of pelagic megafauna should be performed separate from the registration of catch composition of small pelagic species.

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Tables and figures

Table 1: Observer trips in 2001.

2001	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
January	SCH54 (Franziska)
February	KW171 (Maartje Theadora)
March	KW171 (Maartje Theadora)
April	SCH81 (Carolien)
May	SCH81 (Carolien) / SCH24 (Afrika)
June	SCH24 (Afrika) / SCH302 (Willem v/d Zwan)
July	SCH302 (Willem v/d Zwan)
August	SCH72 (Frank Bonefaas)
September	SCH72 (Frank Bonefaas)
October	KW171 (Maartje Theadora)
November	KW171 (Maartje Theadora)
December	

Table 2: Bycatches of pelagic megafauna 1999. Data recorded by observers from sampled hauls.

species	J	F	M	A	M	J	J	A	S	O	N	D	total
Rays													
Dasyatis centroura (Roughtail stingray)						1							**1**
Dasyatis chrysonota marmorata (Marbeled stingray)					1								**1**
Sharks													
Carcharinus limbatus (Blacktip shark)											12		**12**
Mustelus mustelus (Smoothhound)									8				**8**
Rhizoprionodon acutus (Milk shark)			3		8								**11**
Sphyrna spec. (unidentified hammerhead)			3						1		2		**6**
unidentified sharks				4									**4**
Tuna													
Thunnus albacares (Yellowfin tuna)						2			1				**3**
Thunnus obesus (Bigeye tuna)					5	1							**6**
Thunnus thynnus (N.Bluefin tuna)			3	6									**9**
Thunnus spec. (unidentified tuna)			1										**1**
Dolphins													
Delphinus delphis (Common dolphin)			45	2									**47**
unidentified dolphins			48										**48**
Other													
Istiophorus albicans (Atlantic sailfish)											2		**2**
Xiphias gladius (Swordfish)			2		3				1		1		**7**
Mola mola (Ocean sunfish)			1		5	1							**7**
unidentified sea turtles			1			3							**4**

Table 3: Bycatches of pelagic megafauna 1999. Estimated catches of the EU fleet in 1999 based on extrapolated observer data. Raising based on catch weight, column most right raising based on fishing days (rf = 4.3).

species	J	F	M	A	M	J	J	A	S	O	N	D	total	total
Rays														
Dasyatis centroura (Roughtail stingray)						2							**2**	**4**
Dasyatis chrysonota marmorata (Marbeled stingray)					8								**8**	**4**
Sharks														
Carcharinus limbatus (Blacktip shark)											13		**13**	**52**
Mustelus mustelus (Smoothhound)									58	15			**73**	**34**
Rhizoprionodon acutus (Milk shark)			8		63								**70**	**47**
Sphyrna spec. (unidentified hammerhead)			8						7	2	2		**19**	**26**
unidentified sharks				10									**10**	**17**
Tuna														
Thunnus albacares (Yellowfin tuna)						5			7	2			**14**	**13**
Thunnus obesus (Bigeye tuna)					42	2							**44**	**27**
Thunnus thynnus (N.Bluefin tuna)			8	15									**23**	**39**
Thunnus spec. (unidentified tuna)			3										**3**	**4**
Dolphins														
Delphinus delphis (Common dolphin)			113	5									**118**	**202**
unidentified dolphins			120										**120**	**206**
Other														
Istiophorus albicans (Atlantic sailfish)											2		**2**	**9**
Xiphias gladius (Swordfish)			5		21				7	2	1		**36**	**29**
Mola mola (Ocean sunfish)			3		42	2							**47**	**32**
unidentified sea turtles			3			7							**10**	**17**

Table 4: Bycatches of pelagic megafauna 2000. Data recorded by observers from sampled hauls.

species	J	F	M	A	M	J	J	A	S	O	N	D	total
Rays													
Dasyatis centroura (Roughtail stingray)				1						1			**2**
Myliobatis aquila (Common eagle ray)								1					**1**
Raja undulata (Undulate ray)						1							**1**
Rhinoptera marginata (Lusitanian cownose ray)										1			**1**
Sharks													
Rhizoprionodon acutus (Milk shark)								6					**6**
Sphyrna lewini (Scalloped hammerhead)								1		11			**12**
Sphyrna zygaena (Smooth hammerhead)								1					**1**
Sphyrna spec. (unidentified hammerhead)						1							**1**
unidentified sharks								11					**11**
Tuna													
Thunnus alalunga (Albacore)								10					**10**
Thunnus obesus (Bigeye tuna)						3		9					**12**
Thunnus spec. (unidentified tuna)				2									**2**
Dolphins													
unidentified dolphins					2	1							**3**
Other													
Istiophorus albicans (Atlantic sailfish)								10					**10**
Mola mola (Ocean sunfish)								1		1			**2**

Table 5: Bycatches of pelagic megafauna 2000. Estimated catches of the EU fleet in 2000 based on extrapolated observer data. Raising based on catch weight, column most right raising based on fishing days (rf = 6.6).

species	J	F	M	A	M	J	J	A	S	O	N	D	total	total
Rays														
Dasyatis centroura (Roughtail stingray)	2	4	5	4				3	2	1	1		**22**	**13**
Myliobatis aquila (Common eagle ray)						12							**3**	**7**
Raja undulata (Undulate ray)													**12**	**7**
Rhinoptera marginata (Lusitanian cownose ray)									3	2	1	1	**6**	**7**
Sharks														
Rhizoprionodon acutus (Milk shark)								18					**18**	**40**
Sphyrna lewini (Scalloped hammerhead)								3	31	18	15	6	**73**	**79**
Sphyrna zygaena (Smooth hammerhead)								3					**3**	**7**
Sphyrna spec. (unidentified hammerhead)						12							**12**	**7**
unidentified sharks								33					**33**	**73**
Tuna														
Thunnus alalunga (Albacore)								30					**30**	**66**
Thunnus obesus (Bigeye tuna)						35		27					**62**	**79**
Thunnus spec. (unidentified tuna)	4	7	11	9									**31**	**13**
Dolphins														
unidentified dolphins					11	12							**22**	**20**
Other														
Istiophorus albicans (Atlantic sailfish)								30					**30**	**66**
Mola mola (Ocean sunfish)								3	3	2	1	1	**9**	**13**

Table 6: Bycatches of pelagic megafauna 2001. Data recorded by observers from sampled hauls.

species	J	F	M	A	M	J	J	A	S	O	N	D	total
Rays													
Dasyatis centroura (Roughtail stingray)					2								**2**
Raja miraletus											1		**1**
Rhinoptera marginata (Lusitian cownose ray)											1		**1**
Sharks													
Alopias vulpinus				4									**4**
Carcharhinidae spec. (unidentified…)					1								**1**
Carcharhinus limbatus (Blacktip shark)					1								**1**
Isurus oxyrinchus (Shortfin mako)						2							**2**
Leptocharias smithii									5	1			**6**
Mustelus mustelus (Smoothhound)										1	3		**4**
Sphyrna zygaena (Smooth hammerhead)				1	7	21	4	1		8			**42**
unidentified sharks		1											**1**
Tuna													
Thunnus alalunga (Albacore)										28			**28**
Thunnus obesus (Bigeye tuna)				1									**1**
Thunnus thynnus (N. Bluefin tuna)										16			**16**
Thunnus spec. (unidentified tuna)											2		**2**
Other													
Mola mola (Ocean sunfish)		1		2	1	3							**7**
Tylosurus crocodilus						1							**1**

Table 7: Bycatches of pelagic megafauna 2001. Estimated catches of the EU fleet in 2001 based on extrapolated observer data. Raising based on catch weight, column most right raising based on fishing days (rf = 8.2).

species	J	F	M	A	M	J	J	A	S	O	N	D	total	total
Rays														
Dasyatis centroura (Roughtail stingray)					11								**11**	**16**
Raja miraletus											1	1	**2**	**8**
Rhinoptera marginata (Lusitian cownose ray)											1	1	**2**	**8**
Sharks														
Alopias vulpinus				18									**18**	**33**
Carcharhinidae spec. (unidentified…)					5								**5**	**8**
Carcharhinus limbatus (Blacktip shark)					5								**5**	**8**
Isurus oxyrinchus (Shortfin mako)						23							**23**	**16**
Leptocharias smithii									14	2			**16**	**49**
Mustelus mustelus (Smoothhound)										2	4	2	**7**	**33**
Sphyrna zygaena (Smooth hammerhead)				4	37	242	27	3		13			**326**	**344**
unidentified sharks		4	5										**9**	**8**
Tuna														
Thunnus alalunga (Albacore)										46			**46**	**230**
Thunnus obesus (Bigeye tuna)				4									**4**	**8**
Thunnus thynnus (N. Bluefin tuna)										26			**26**	**131**
Thunnus spec. (unidentified tuna)											3	1	**4**	**16**
Other														
Mola mola (Ocean sunfish)		4	5	9	5	35							**58**	**57**
Tylosurus crocodilus						12							**12**	**8**

Annex 1

Manual for the work of scientific observers on board PFA ships
6th version, June 2002,

Protocol sampling of the catch

Estimation of species composition of a haul
- In principle, all hauls in a voyage are sampled. The maximum working time is 12 hours per day. When it proves impossible to sample all hauls during a voyage, a selection must be made encompassing both night–and day hauls. The absolute minimum is to sample two hauls a day.
- At the end of the conveyor belt where the catch is sorted in different categories, the percentage of each category is estimated visually, including the category 'discards'. The category 'discards' will be estimated as one single category.
- At the end of the conveyor belt where the catch is sorted in different categories, a sample is taken from each category, including the category 'discards'. Each category sample should at least weigh 20 kg and in the case of catches greater than 50 tonnes, the sample of the main target species should weigh at least 40 kg.
- The samples are taken randomly from the conveyor belt, also the sample 'discards'. The sample 'discards' will be taken from both sides of the conveyor belt.
- For samples of each category that is conserved, the weight of the sample is recorded, and the fork length of each individual in the sample will be measured.
- The sample of the category 'discards' is sorted by species, and for each species the weight of the sample will be recorded and the fork length of each individual in the sample will be measured.
- The total weight in the catch of each conserved category is estimated, based on the total catch volume (captain's first estimate) and the percentage of that particular category in the total catch (observer's estimate based on the sorting on the conveyor belt).
- The total weight of all discards is estimated, based on the total catch volume (captain's first estimate) and the percentage of all discards combined (observer's estimate based on the sorting on the conveyor belt)
- The total weight of each discard species is estimated, based on the estimate of the total amount of discards, and the weight distribution of the species in the discard sample.
- Observers will take notice of the incidental capture of large animals (sharks, rays, sea turtles, dolphins, tuna, etc.). Work conditions on deck permitting, the observers inspect these catches take length measurements.

Collection of biological data
- At least one biological sample is taken each day, alternately during day and night.
- A biological sample will be taken for every main species (sardinellas, sardines, mackerel and horse mackerel) that is present in the haul and will be conserved.
- A biological sample consists of at least 25 specimens of each species. These represent all length categories in the catch.
- For each fish, fork length, weight (total and empty), maturity stage, stomach content and fat content will be recorded.