# THE PROBLEM OF DISCARDS IN FISHERIES

**Y. Morizur**
*IFREMER, Brest, France*

**B. Caillart**
*COFREPECHE, Brest, France*

**D. Tingley**
*MacAlister Elliott and Partners Ltd, Lymington, UK*

**Keywords :** discards, catch, bycatch, fishery, fishing gear, species, target, impact, biology, ecology, economic, social, world, overview, wastage, marine

## Contents





## Summary

The discarding of unmarketable, restricted species and small size individuals of commercial species is a global, economic, environmental, and political problem. The discard rates vary greatly in observed fisheries according to gear, target species, season,

and area. Details are provided for such case studies as the fisheries of Northwest Atlantic, the European Union fisheries, and the Madagascar shrimp fishery. Discards have a variety of effects including biology, ecology, economic, and social aspects. The effectiveness of various regulations to reduce the level of discarding has been reviewed and regulations now include technical, administrative, and economic management measures. A great number of fisheries have not been observed and should be explored with scientific observation at sea. Research needs to be carried out on discard reduction methods while gear devices and different management systems should be evaluated to determine their effects on limiting resource wastage.

## 1. Introduction

It is now clear that the world's fishery resources are being subjected to exploitation at or above their capacity to produce maximum sustainable yields. At the same time as these trends are being felt, there is a very large wastage of fishery resources from discarding unwanted catches at sea. At the end of each fishing operation, a part of the catch is often returned to the sea after sorting by the fishermen. A 1994 FAO report provided an estimate of global discards in commercial fisheries of 27 millions of tons per year compared to 50 million tons of direct human consumption. A more recent FAO document estimated that discards were in the order of 20 million tons in 1997.

The majority of the world's fisheries are multi-species in nature and consequently it is difficult to optimize management measures for all the species caught. Management measures are most often decided from the target species perspective. However, total catches are a compound of commercial species and also non-commercial and prohibited species. In addition, catches often contain juvenile commercial species. The use of selective gears attempts to avoid capture of these young, small-sized fish. Normally, the technical regulatory measures include gear characteristics (e.g. mesh size in nets) and also minimum landing sizes in an attempt to ensure fishermen use the most appropriate gears and so limit discards.

Discards that cause the most problem are of species or individuals that do not survive when they are returned to the sea. The survival rate depends on the combination of species and fishing practice (e.g. gears). Towed gears generate low survival rates whilst at the other end of the spectrum, fixed gears do not generally damage individuals and so have very low discard mortality rates. Crustaceans, for example, have a higher survival rate after release than many fish species.

## 2. Controversial Definitions

A variety of terms have been used in the literature related to wastage in fisheries and there have been many attempts at definition. Discards do not generally include offals that are returned to the sea during primary processing on board fishing boats. It is necessary to give a more precise definition of the word "catch," which can refer to total catch and also the retained catch (i.e. landings). The term "by-catch" used in scientific and popular literature has been subject to a variety of interpretations, some of which are overlapping or contradictory. By-catch can sometimes mean discards of target and non-target species. It can also be used as a generic term, applying to that part of the catch

made of non-target species or species assemblages. Therefore, by-catch can include discarded catch plus the retained catch of non-targeted species. “Incidental catch” is another controversial term which sometimes refers to the retained catch of non-targeted species and other times can mean catch of undesirable species like mammals, some of which are discarded because of regulations covering protected species. “Protected species” are those species under international protection as outlined by international conventions. In some regulatory frameworks (i.e. European fisheries regulation), protected species are dealt with alongside commercial species under fisheries management policies.

In this paper, catch will be used to mean total catch including target and non-target catch, landings will be referred to as retained catch, and discards as non-retained catch. Care should be taken with interpretation of the discard ratio, which is the ratio of non-retained catch versus total catch. This ratio may be expressed in numbers of individuals or in weight according to available data.

## 3. Reasons for Discarding

Three are three main reasons for discarding at sea: management measures and economic and technical reasons. Management measures in some fisheries place a legal obligation on fishermen to discard a part of their catch at sea. When the allowable catch quota is achieved for a species, landings of excess catch are prohibited and the fisherman theoretically have no other alternative but to dump the over quota volume at sea. However, in reality over quota catches are often landed illegally and are termed “black fish.” Minimum landings size regulations protect juveniles from being landed but those that are caught by fishing gear must be discarded to ensure compliance.

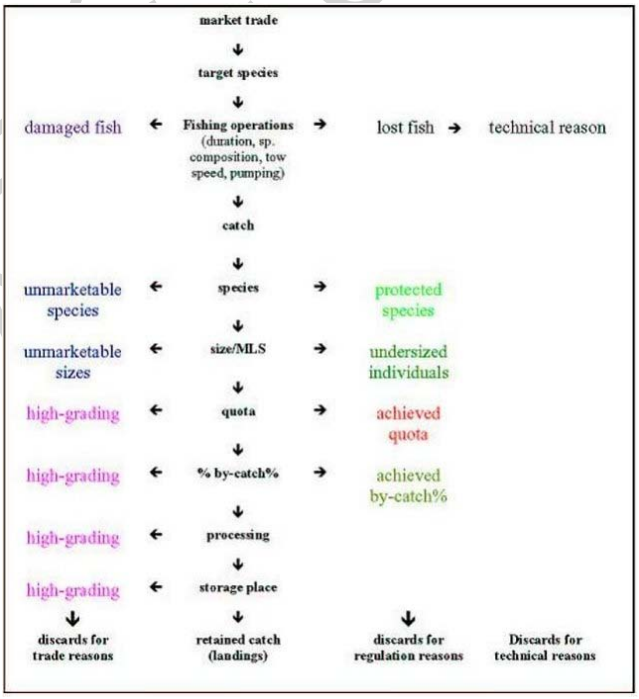


Figure 1. Chart explaining the reasons for discarding during the process of fish catching.

In some fisheries a specific small mesh size is allowed for a target species of small size but in order to protect other species being caught, there is a maximum threshold allowed in the landings for commercial non-target species expressed as a percentage of the retained catch. Closed and protected fishing areas are also used to restrict the catch of some commercial species that can not be caught at all or are allowed to be caught in a limited proportion. Some species are protected by regulations or international conventions such as the CITES list of endangered species (marine mammal, turtles, etc.), and should be immediately returned to sea when caught.

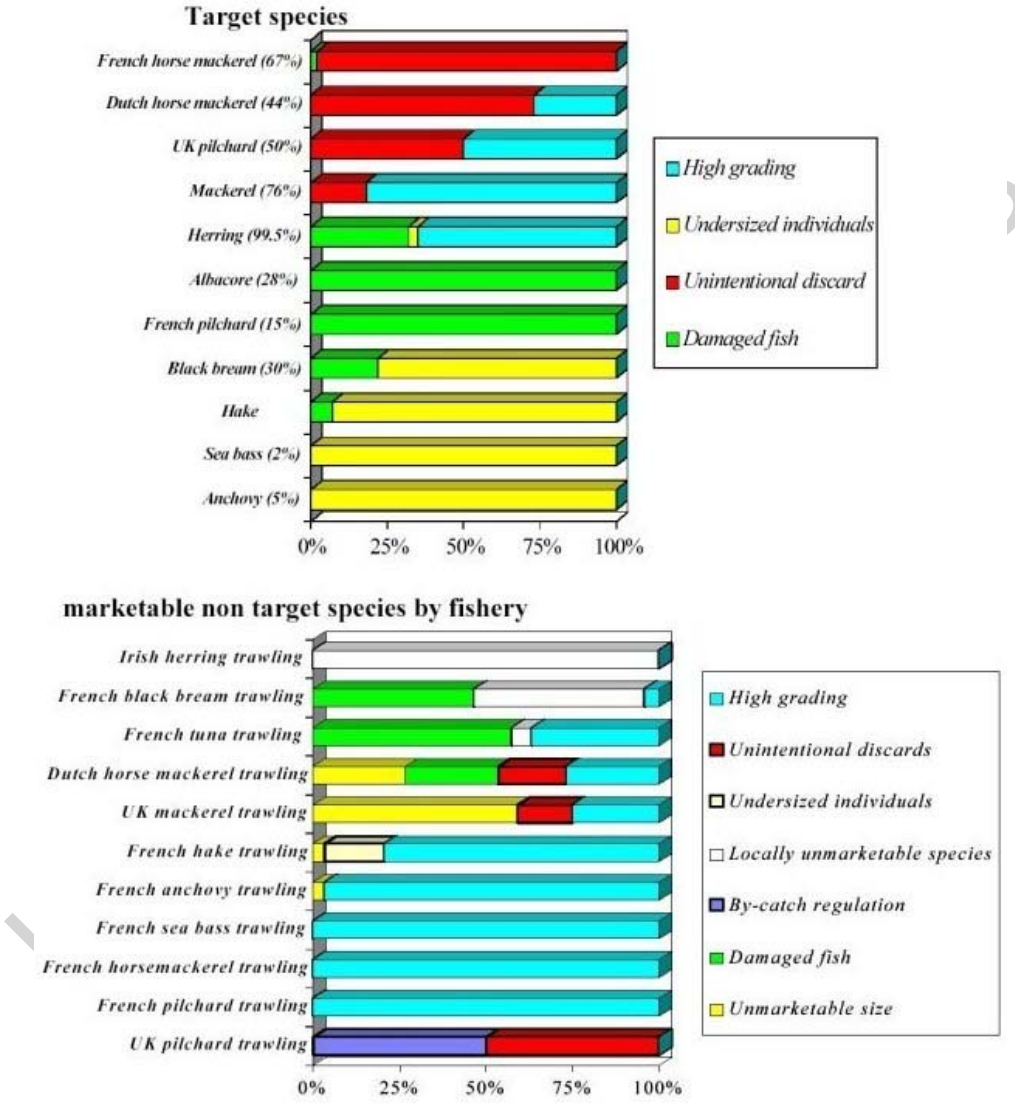


Figure 2. Reasons for discarding target species and commercial non target species in pelagic trawl fisheries of the Northeast Atlantic. Morizur Y., Tregenza N., Heessen H., Berrow S., Pouvreau S. (1997).

There is often a strong economic motivation for discarding. Some species have no commercial value locally or seasonally due to poor conditions whilst other species are caught in unmarketable sizes. After the majority of hauls, and especially during long trips, the catch is sorted to retain only that part of the catch that maximizes value. This

is commonly referred to as high-grading and discards are made of part of the catch after taking into account the value of species, the processing time on board, and the remaining storage space on board. Fish that are damaged during operations are often discarded because of their unmarketable aspect. Catch is sometimes returned to the sea even before it reaches the deck. This can occur on some pelagic trawlers if the species composition in the catch is not deemed to be of sufficient value before pumping process to bring that catch of board is initiated.

In some cases, a part of the catch is lost for technical reason before arriving on board. This induced mortality is an accidental discard that can be estimated and can occur when catch is too heavy to be hauled on deck.

The regulatory, economic and technical reasons for discarding are summarized in Figure 1 along with the different steps of fishing. For each commercial species, there can be at least seven reasons for discarding:

- damage
- unmarketable size
- undersized individuals (MLS)
- quota (achieved)
- percentage of bycatch (achieved proportion)
- high-grading (maximization of the value of the catch)
- fishing techniques

The problem of discard wastage cannot begin to be remedied unless the motivation to discard is understood. An example of reasons for discarding is taken from the study of discards in pelagic trawl fisheries of the North East Atlantic (Figure 2). Several ways of estimating discards exist but the most effective solution is to place observers on board vessels.

## 4. Variability in Discarding Practices

A high variability exists in discarding practices. Non-target species and discards are quantitatively and qualitatively unequal in the different fisheries which have been investigated according to fishing techniques and areas. The selectivity of fishing operations varies depending on the type of gear being used, which also has an effect on the survival rate of discards. Using the same fishing gear in different areas can induce different discard problems depending on local bio-diversity and species abundance of the fishing area.

The quantity and size of the discarded individuals of one species, sampled in the same area are not necessarily the same. This difference is illustrated in the western English Channel fishery for the anglerfish (Figure 3) and is due to gear selectivity and mesh size. The trawling discards are composed of juveniles and those of netting are damaged adult individuals.

Discards quantity can be locally different because of market and fishing practices. For example, a precise size range of a species can be landed specifically for the potting

vessel bait market. This activity was observed for red gurnard in a study of discards from French inshore trawling in the Western English Channel (Figure 4). If a fishery is located in a nursery area, a high discard rate can be a result of the presence of juveniles although to counter this regulatory policy can be varied in a way that minimizes discards by controlling the fishing area and season.

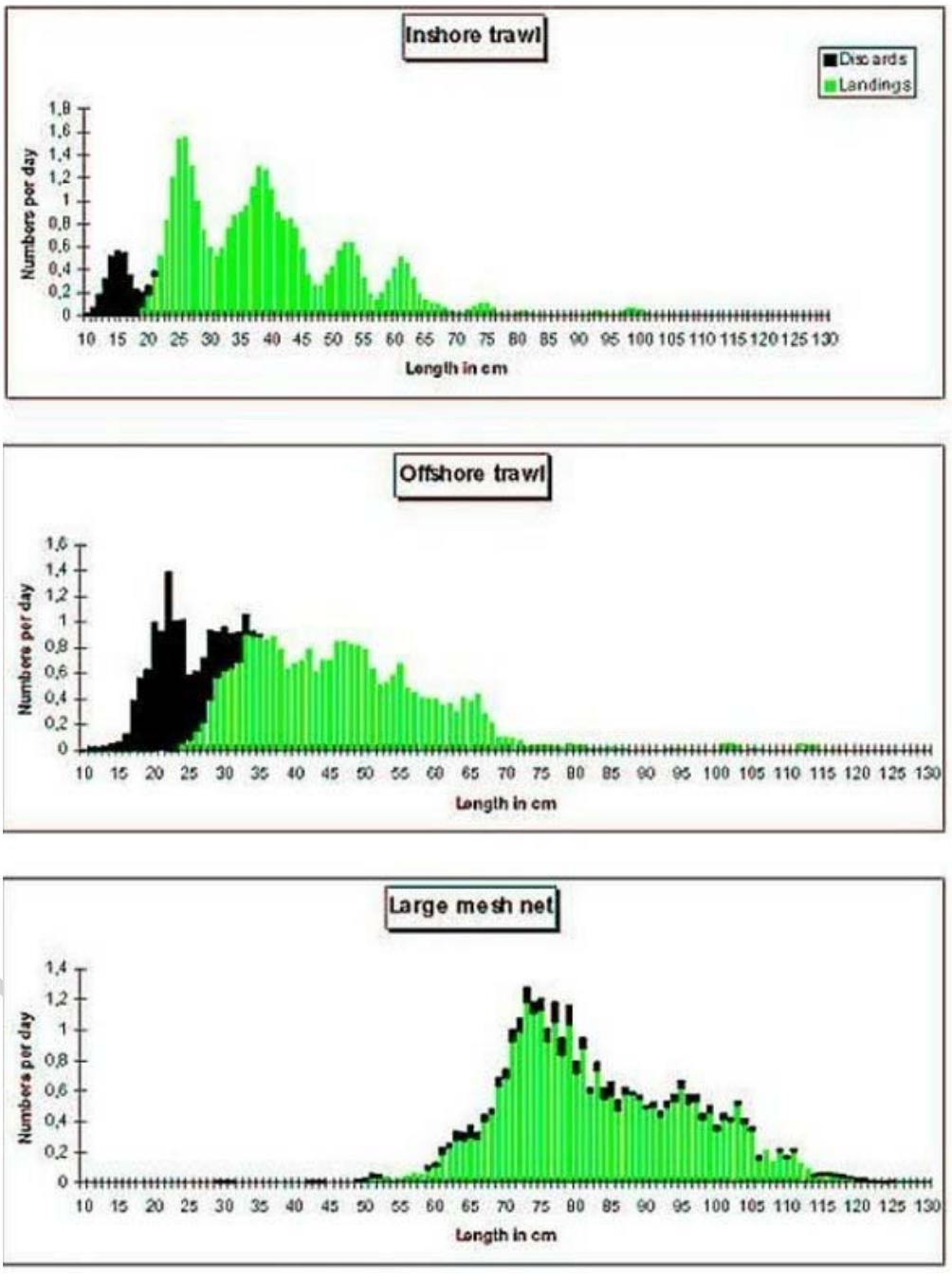


Figure 3. Length compositions of anglerfish in catches (landings and discards) with different gears and mesh size (50-60 mm, 80 mm; 270-320 mm). Morizur Y., Pouvreau S., Guénolé A. (1996

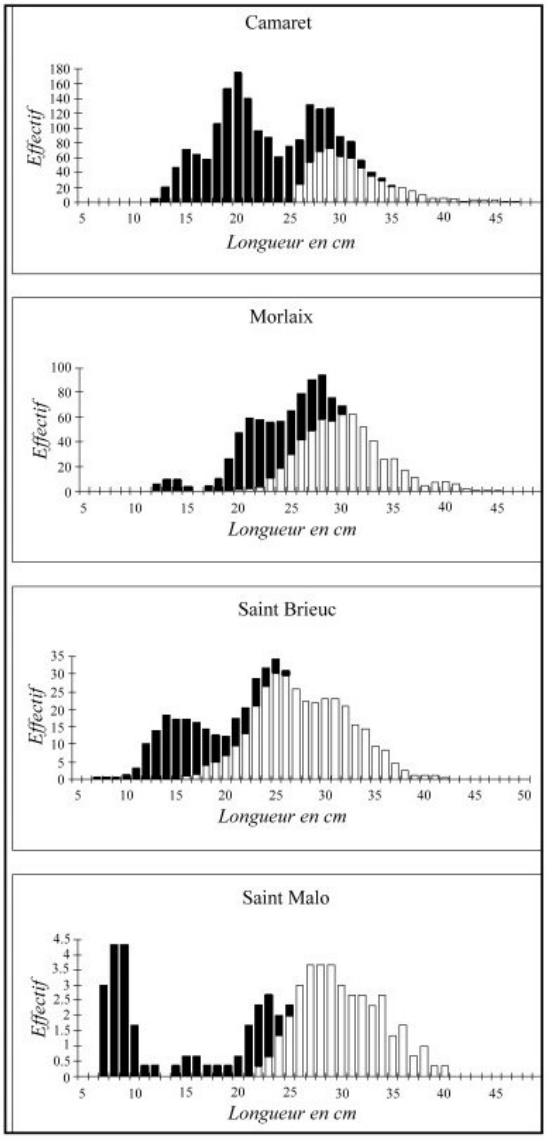


Figure 4. Length compositions of red gurnard discards and landings at French ports from the Western English Channel (Morizur et al., 1996). At Saint-Brieuc, a size range is landed to be used as bait for potting vessels instead of being discarded.

For all these reasons, the level of discards is different according to world areas (Table 1). Just over one-third of total discards originate from fisheries conducted within the Northwest Pacific. The main other areas are Northeast Atlantic, West Central Pacific and Southeast Pacific. All species are subject to different levels of discarding (Table 2). For example, shrimp and prawn fisheries suffer the highest rates of discarding while lobster fisheries are among the least affected, with discards often being of released alive.

As discard ratios are typically expressed by weight or numbers, it is impossible to conclusively rank fisheries by the highest recorded discard ratios. The discard rate varies according to the gears used and Table 3 indicates the discard rate by weight. Shrimp trawls create the highest discard ratios whilst pelagic gears (pelagic fish trawl

and purse seine) generally have the lowest discard rates. A high variation is observed between pots and trap fisheries, with the highest rates found in the Bering Sea.

| Area | %[(a)] of global discards |
|---|---|
| Northwest Pacific | 33.81 |
| Northeast Atlantic | 13.59 |
| West central Pacific | 10.28 |
| Southeast Pacific | 9.63 |
| West Central Atlantic | 5.93 |
| West Indian Ocean | 5.45 |
| Northeast Atlantic | 3.42 |
| Southwest Atlantic | 2.97 |
| East Indian Ocean | 2.97 |
| East Central Pacific | 2.84 |

[(a)]: % expressed as a % to global world discards
(modified from FAO, 1994)

Table 1. Top ten world area with the highest weight of discards (modified from FAO, 1994).

| Species groups | % [(a)] of global discards |
|---|---|
| Shrimps, prawns | 35.21 |
| Redfishes, basses, congers | 13.44 |
| Herrings, sardines, anchovies | 10.32 |
| Crabs | 10.28 |
| Jacks, mullets, sauries | 9.65 |
| Cods, hakes, haddocks | 9.40 |
| Flounders, halibuts, soles | 3.50 |
| Tunas, bonitos, billfishes | 2.74 |
| Squids, culletfishes, octopuses | 0.71 |
| Lobsters, spiny-rock lobsters | 0.42 |

[(a)]: % expressed as a % to global world discards
(modified from FAO, 1994)

Table 2. Top ten of species group with the highest weight of discards.
Table 3. Discard rates by gear type.

In many of the world's regions, more than half of the total volume of discards is generated by shrimp fisheries. Discard volumes from the all shrimp fisheries in the world were estimated at 9.5 million tons by FAO (1994). These fisheries are mainly concentrated in the Northwest Pacific and West central Pacific (these two areas represent more than half of the total estimated global discards) and in the West central Atlantic.

-
-
-



**Bibliography**

Alverson D. L., Freeberg M. H., Pope J. G., Murawski S. A. (1994). A global assessment of fisheries bycatch and discards. *FAO Fisheries Technical Paper* **339**, 233 pp. Rome: FAO. [This is an extensive worldwide report on all the aspects of discard problem].

Castro K., Corey T., DeAlteris J., Gagnon C. (eds.) (1996). *Proceedings of the East Coast bycatch conference, RI, USA, 7–8 April 1995*. Rhode Island Sea Grant RIU-W-95-001, 160 pp. USA: Narragansett. [This contains all aspects of the bycatch problem on the East coast of USA].

CEE-DGXIV/C/1 (1992). Rapport de la Commission au Conseil sur la pratique des rejets dans les pêcheries communautaires: causes, conséquences, solutions, 46 pp. Brussels: European Commission. [This is an analysis of discard practises and solutions in European countries].

Clucas I. (1997). A study of the options for utilization of bycatch and discards from marine capture fisheries. *FAO Fisheries Circular* **928**, 59 pp. Rome: FAO. [This report is an overview of solutions for better utilization of discards].

Clucas I. and James D. (eds.) (1997). Papers presented at the technical consultation on reduction of wastage in fisheries. Tokyo, Japan, 28 October–1 November 1996. *FAO Fisheries Report* **547**, 338 pp. Rome: FAO. [This compilation of papers deals with solutions for decreasing discards].

Hall M. A. (1996). On bycatches. *Review in Fish Biology and Fisheries* **6**, pp. 319–352. Oxford: Blackwell Science. [This paper provides a general analysis of discards].

Pascoe S. (1994). Bycatch management and the economics of discarding. *FAO Fisheries Technical Paper* **370**, 137 pp. Rome : FAO. [This paper presents and economic perspective on the discarding problem and considers optimal discarding scenarios using bio-economic modeling].

Pitcher T. J. (1995). *Bycatches in Fisheries and their Impact on the Ecosystem*. Fisheries Center Research Report **2**(1) (eds. Rattana Chuenpagdee), 74 pp. Vancouver: University of British Columbia. [This document provides a scope of the ecological impact of bycatch and discards].

Rawson M. V. (1997). *Fisheries Bycatch: Consequences and Management*. Symposium of the consequences and management of fisheries bycatch, Deaborn, MI, USA, 152 pp. Fairbanks, USA: Alaska Sea Grant College. [This is a proceedings report of the 1996 American Fisheries Society symposium on bycatch].

Wray T. (ed.) 1996. Solving Bycatch for Today and Tomorrow. *Proceedings of the Solving Bycatch Workshop, September 25–27, 1995*, 322 pp. Fairbanks, USA: Alaska Sea Grant College [This report is a compilation of papers presenting solutions for the bycatch problem].

**Biographical Sketches**

**Dr Yvon Morizur** was graduated in 1977 when he obtained a thesis from University of Paris VI. He was involved in Nephrops fishery studies at the Institut Scientifique et Technique des Pêches Maritimes of Lorient in France. Then he carried on research at the Centre National pour l'Exploitation des Oceans at Brest. Now he works at the Institut Français pour la Recherche et l'Exploitation de la Mer (IFREMER). At Brest, he carried out studies on artisanal fleet dynamic in the English Channel, on resource assessment.

Recently he coordinated European studies on fishery discards in support of the Common Fisheries Policy of the European Union. He is currently at the head of the fisheries laboratory at Brest in France.

**Dr Benoit Caillart** was graduated in 1988 when he obtained his PhD from the National Institute for Agronomy of Rennes. He was first involved in Tuna population dynamics in the South Pacific as Fisheries Scientist for the South Pacific Commission. When he returned to France, Dr Caillart joined COFREPECHE and became actively involved in many research projects in support of the Common Fisheries Policy of the European Union. He is currently coordinating a review of the state of the knowledge on discards and by-catches of the European fishing vessels operating in the NE Atlantic.

**Diana Tingley** graduated from CEMARE (Center for the Economics and Management of Aquatic Resources), University of Portsmouth in 1995 with an MSc in Fisheries Economics after obtaining an MA (Honours) in Economics from Edinburgh University. She has been working with fisheries consultants MacAlister Elliott and Partners (UK) for three years participating in a variety of relevant projects including a study on The Problem of Fisheries Discards within the European Union for the EU Parliament STOA Unit, analysis of the socio-economic importance of fishing within three dependent regions of the EU and calculation of fishing related compensation following the *Sea Empress* oil tanker spill in Wales.